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Conference On  
*Civable Cities*  
ICLC2015

Conference Theme:

'Designing Cities In Our  
Global Economic Uncertainty'

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(ICLC2015)**

A Joint Conference With

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Technology (EIT2015)**

“Designing Cities In Our Global Economic Uncertainty”

Universiti Sains Malaysia, Penang, Malaysia  
30<sup>th</sup> November – 2<sup>nd</sup> December 2015

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# **3<sup>rd</sup> International Conference on Livable Cities (ICLC2015)**

A Joint Conference With

## **2<sup>nd</sup> International Conference on Engineering, Innovation and Technology (EIT2015)**

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## MESSAGE FROM THE CONFERENCE CHAIRMAN

On behalf of the Organizing Committee and Universiti Sains Malaysia, it gives me the utmost pleasure in welcoming all of you as the paper presenters and participants to the 3<sup>rd</sup> ICLC2015. Allow me to first commend the Organizing Committee for their tireless endeavour in a preparation of this conference. It is therefore hoped that this concerted and collaborative effort will continue in the years to come as ICLC continues to grow in repute and stature to hopefully blossom into *the* definite regional conference in issues related to livable city.



The theme this year, 'Designing Cities In Our Global Economic Uncertainty' is perhaps one of the important topics of what our world is in dire need of, especially in these challenging times where 70% of the world population today live in the cities. Discussion in remapping the idea of livable city through history and theory is an important asset in this conference in rethinking the approach and steps for the future research study in shaping our livable cities in the future. Studying the past history and theory of development of our cities is an important key understanding the present and action for the future development. New research methods and tools should be discussed to uncovered new map of livable cities around us. Among research discussions are as follows: What new forms of archival research should be discussed and highlighted by the researchers and industrial players? What new or alternative models of history and theory in shaping livable cities should be made visible and through what new research methodologies and technologies of inquiry? What is the role and value of history and theory which capable to form livable cities for the local context, culture, communities and environment in a particular place and time? We however do not have clear figures how many researches that have taken place by researchers, practitioners and thinkers from various disciplines and professions in proposing development for livable cities. It is thus the aim of this conference to provide a platform in a discussion in remapping development of livable city through history and theory by introducing new ideas, testing questions, defining methodology, developing technology, raising social issues and promoting critical discourse.

Any and all efforts toward making this a reality are indeed welcome and cherished, and therefore; all of you here, by your mere participation, have sowed and nurtured these seeds of change. I would like to extend my sincere gratitude for all the cooperation given by the Centre for Research Initiatives and School of Housing, Building and Planning from Universiti Sains Malaysia and TuEngr Group from Thammasat University. I also would like to thank to our Advisory Committee, Scientific Committee, Organising Committee and Secretariat, especially Mr. Muhammad Nasrul Abu Bakar for generous efforts and supports in ensuring the ICLC2015 a success.

Thank you.

Prof. Dr. Ahmad Sanusi Hassan

**Professor Dr. Ahmad Sanusi Hassan**

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## STRATEGIES IN FORMING DIFFERENT PROCUREMENT APPROACHES (PPP, DESIGN-BUILD, IPD) IN A COLLABORATIVE METHODS FOR INTEGRATED PROCESSES

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### ABSTRACT

The IPD is a project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency. The process can be achieved through different procurement approaches by forming and work as a partner's such as private public partnership, design-build, design-assist, through working under a collaborative approach or partnership in construction, in construction is through sharing roles, responsibility to the participant, taking decision at different stages of the processes through communication and sharing reward at the completion of the project. The purpose of this paper is to provide separate procurement's under collaborative approaches for Integrated Project Delivery the techniques use BIM as a tools for different construction professional working in one entity.

**Keyword:** Integrated project Delivery IPD, Building Information Modelling BIM, Team Professionals, Project Reward and Lost, Dispute Resolution

### INTRODUCTION

IPD is a collaborative approach between the owner (s), contractors and design professionals in order to plan, design, permit construct and commission a capital project. Historically, this collaboration has been achieved through many different approaches, including design-assist, design-build, public-private-partnerships as mentioned by Lahdenperä (2011), also written in conference paper title Defining cooperation and collaboration in the context of lean construction by Annett, Shervin and Fritz (2014) even traditional design-bid-build as agreed by KPMG (2013) through early contractor involvement in the design process. The benefits of collaboration are well understood in the industry examples of improved in the industry and can be clearly demonstrated through examples of improved cost estimating constructability Anvari et al., (2011), condensed schedules, reductions in field conflicts and increased value to the owner.

The current form of IPD was as a result of the general belief that traditional contracting approach create barriers to collaboration, transparency and the trust needed to truly collaborates, hence the rise of the multi-party document as agreed by Thomson et al. (2009). The intent of the multi-party agreement is to creates a contractual vehicles that removes barriers to collaboration (i.e protecting profit blaming others, hiding contingency and the mentality of every company for itself). There are many IPD proponents in the industry who believe this environment can only be created through the use of multi-party agreement as agreed by Thomson et al. (2009), in which there is shared risk/reward pool and no traditional financial cost guarantees, However, having witnessed numerous IPD approaches, we have seen projects succeed and fail with and without multi-party agreement.

## INTEGRATED PROJECT

Conventional method of delivery and procurement approaches consider as a separate method of accountability that, on site, produce inefficiencies each time there is no performance as mentioned by Howell and Koskela, (2000) from one side to another. Moreover, the conventional projects delivered affected because contributor accomplishment and project achievement are not automatically associated. Certainly, it is moderately possible for one or more project professional to “achieve something” despite generally project disappointment. IPD, though, constitute a functional modification as mentioned by Mann (2009) in the industry by violating behind the responsibility as mentioned by Forbes and Ahmed (2011), involving close cooperation with all main professional, and positioning the participants achievement to project accomplishment.

IPD purposefully reposition professional responsibility, depending on motivations as agreed by Eriksson and Westerberg (2011), and series of performances on a project to apply each professional’s capability and abilities at the most useful period. Achievement is centric-project under an integrated delivery approach and depend on partnership. The determination is on a jointly execution shared objective relatively than assembly individual potential. Achievement is considered by the quantity to which general goals are achieved.

The repositioning of conventional responsibility and project achievement in this project may, however, unavoidably which may leads to assess about what should be achieved next to the integration as mentioned by Urbis (2012). Consequently, IPD introduce a number of impact that must be measured when investigate this approach for a project. Furthermore to examination about how the professional’ input must be modified as mentioned by Sanchez and Nagi (2001), a different expected examination related to risks connected with better collaboration. Whereas it might appear contrary to talk of the risks of collaboration, as more extreme trouble emerge when people fail to work as a team than when they do, no project delivery approach is risk-free.

Recognized are below situation that emerge when setting up a project for integrated delivery. These situation are familiar to all IPD projects, and are generally related despite of the stage of integration really working on a project.

## IPD Team Building and Functioning

The professional team is the inspirational of IPD. In IPD, project professional approach together as an integrated team, with the general paramount goal of designing and constructing a achievable project (NHSC 2013). The difficulty emerge on a conventional project, the propensity is regularly to “full down the difficulties” and defend the cost interests. Collaboration experience the construction [blunder](#).



In dissimilarity, IPD request that professional team work jointly while difficulty emerge. This “collected” against “crouch” difference is vital. Since the crouch down character in the features of difficulty is so power fly in the design and construction industry at present, transforming to an integrated, or collective, approach is equivalent to intellectual revolutionize (Urbis 2012). Consequently, the constitution of the integrated team, the capability of team members to adjust to a modern way of executing their functions, and individual team members’ performance contained by the team are significant.

### **Project Team Formation and Team Building.**

The integrated project, the project team is created as proximate as promising in period to the project’s initiation. For examples, the project professional team will institute itself according to pre-existing levels of reliance, comfort and acquaintance developed through long-ago operational associations. In other example, the owner might gather the construction professional without considering the old association relationships between the construction professional as mentioned by Pryke and Smyth, (2006).. In some event, and to the utmost level promising, project team members are recognized and gather at the initial probable point in the period.

Normally, the Integrated team involve two classification of team member: the principal participants, and key assisting participants. The principal participants are those member that have extensive association and responsibilities during project as mentioned by AlNimr and mohammed (2010), from commence to completion. For an illustration, in a conventional project the principal members include the owner, architect and contractor. In contrasting the association in a conventional project, the principal members in the IPD might be distinct additional largely and they are bound together by either a contractual relationship, or by virtue of their individual interests in a single purpose entity (SPE) recognized for the project. Refer to Section 2.4 for details regarding potential contractual arrangements and SPE possibilities.

The assisting members on an integrated project provide a vital responsibility on the project as mentioned by Bower, (2003), but execute more separate functions than the principal members. In a conventional project, the assisting members involve the principal design consultants and subcontractors. In IPD, the assisting members go into contracts directly with either one of the principal members, or with any single purpose entity, the principal members have formed. In any event, assisting members have to accept to bound by the collaborative process and methods guiding the relationship between the principal members.

In IPD approach, the distinction among the principal members and the assisting members is a solution to dissimilarity that will automatically differ from project to project. For instance, on a generality of a projects, a structural engineer is not considered a principal member as it execution distinct function as agreed by Graell, (2012) for the project and is infrequently considerably included for the period of the project. If, however, structural design is the paramount project apprehension as, for instance, in infrastructure construction, the structural engineer would contain extensive function and project association during the path to the project. Consequently, the structural engineer would provide as a principal member. Enormous concern will occupied to create an IPD team where teams can work as a mutual entity. Team development considers potential, team dynamics, similarity, communication, confidence building and dedication to an integration method. Even though with no means essential, the method of team development and succeeding team building might involve character assessment, communication training, and other techniques to mould a strong team from different parts as mentioned by (Bower, 2003, Palacios, *et al*, 2013). After team is formation, it’s significant to produce a team impression where collaboration and open communication can prosper. Positioning the team in a

cooperative ability might assist open communication and cooperation, and efficient meetings might be useful when co-location is unsuitable. Despite of the processes engaged, it is essential to create a team where members will be willing and able to work as a team successfully and to offer the team with tools and conditions that assist collaborative performance as mentioned by Palacios, *et al*, (2013). Collectively-establishment project achievement and metrics to determine performance, next to with reimbursement models that support individual accomplishment with project achievement, also supply incentives to work as a team.

### **Project Team Decision Making**

To accomplishment for integrated project an assessment have to be make, methods and processes that each team professional have to acquire and accept to stand by. In a fully integrated project, final decision making abilities are not place in a single team member. Rather, all decisions are made generally by a determine decision making body as agreed by Graell, (2012). Despite of how the teams decide to organization the conclusion making body, in an integrated project one paramount opinion control the decision making body: all resolution are completed in the greatest consideration of the project.

The constitution of the resolution creation body varies from project to project, but for all time comprises of some collaboration of the principal professional and assisting members operating collaboratively to deliver decisions in the greatest regard of the project. The authentic combination of the resolution creation body is concerned at the start of the project as mentioned by (Logan et al. 2008, Collins 2001) and reflected in the different acceptances among the parties.

In application, team resolution making is the part in which the difference among principal professional and assisting members is generally noticeable. The principal professional, by nobility of their steady participation on the project, are all the time part of the project's resolution making body as mentioned by Christopher, (2005). Even though probable, assisting project members are normally not part of the resolution making body, but they provide an advisers to the resolution making body on matters related to their areas of professionalism. Throughout the members of all of project teams in the resolution making methods, whether as a member of the resolution making body or in an suggested responsibility, the project benefits since the method permits all project members to present their professional to carry on the issue at hand.

An instruct to be present regular, appropriate and steady resolution, the resolution making body meets frequently base on a collaboratively set schedule as mentioned by Perera *et al.*, (2011). The more regular the coming together, the better the resolution making body's capability to adjust to the project situation. In addition to regular meetings, IPD also requires a methods by which team participant can call for urgent meetings to resolves issues that might emerge without notice and need instant decision. In the absence of this flexibility, the project team cannot quickly reply to, and resolve, significant issues emerge throughout the project.

### **Team Communications**

For a prosperous team performance depend on partnership, which, in revolve, essentially dependences on solution and open communication as mentioned by Fernandez-Solis *et al.* (2013). Therefore, generate an impression and mechanisms that assist the sufficient sharing of information among and between the professional team participant is important to an effectively application of IPD.

The advancement and application of a detail communication procedure streamlines communications and documentation convey of project data amongst members and among technologies as mentioned by Howell *et al.* (2004). The communication procedure and other communication tools are improved as agreed by Bashir *et al.* 2011), through cooperative meetings in which the project team explore the decision on how information will be applied, maintained and shared to ensure reliable and suitable application of sharing information. The resolutions and communication procedure recognized at the meetings can be documented and develop into the project's information specification.

### **Building Information Modelling**

Building Information Modelling (BIM), is a digital, 3D model connected to a database of project information, is part of the most influential tools assisting IPD. Since BIM can collaborate, between other professional application tools as mentioned by (Low and Gao 2011; Gao and Low 2013), the design, fabrication information, erection instructions, and project management logistics in one database, it produces a linked surfaces for partnership during the project's design and construction. In addition, since the model and database can be available for the life of a building, the owner might applied BIM to maintain the service well ahead of completion of construction for such reason as a space planning as mentioned by Mossman (2013), furnishing, monitoring long term energy performance, maintenance, and remodelling.

BIM is a progressive technology and might not be constantly be applied in the industry at the current time. For instance, a small project of this size or a section of a bulky project might applied a particular model, but a huge, compound project might rely upon numerous interconnected models as mentioned by (Camarinha-Matos and Abreu's 2007; Liker and Hoseus 2008) advancement by professional participants. main fabricator models might cooperate with a design model to create fabrication information directly and to coordinate dispute as the design and obtain proceed simultaneously. Differentiating with analogy performances, the constructor's work model can decrease period and material waste by interacting with design model to present construction phases and scheduling to produce 3D project model form distance in move on of actual construction. Models also permit a better accurate costing and estimating initially in the project. The use of BIM permit the competent advance of enormously as mentioned by Glover *et al.* (2012) compound projects in way that circumstances might not be promising given constraints of site, period or finances.

BIM as a tool, for IPD process work hand with BIM as mentioned by Ashcraft (2008), and resistance the tool's abilities. The IPD project team meeting for consideration concerning the model development, accessed, and application, and how information can be interchangeable among models and professionals. Without a clear input, the model can be applied wrongly or for an unplanned reason. Software selections are made on the basis of quality and collaboration. Open technology policy are important to the incorporation of BIM and other models into the method and they advance communication to betterment of the project at all stages as mentioned by (Mossman, 2013; Pavez and González, 2012). To assist in this section, collaborative information sharing procedures are in advance and are achievement agreed in the marketplace.

Resolutions are also prepared and recorded concerning the stages of detail to be modelled, the understanding is vital for particular application, and the reason the model will provide, such as if the model will be applied to generate cost data, and the function as a contract document. If it assist as a contract document, then the connection among the model(s) and other contract documents is firm. Procedures are also to recognized for dispute resolution and work re-examine also. When the model is

applied to generate cost data, procedure are invented for how cost information will be generated and interchanged. Additionally, the processes providing, managing and document the model are firm.

These resolutions and procedure are essential to the efficient use of BIM in IPD as agreed by Ashcraft (2008). Comparable to the communications resolution and procedure explore above, BIM resolutions and procedure are best advancement during cooperative meetings. Any and all resolutions are recorded and readily accessible to any professional that will employ the model—thus ensuring steady apply of the model over the course of the project.

### **Sharing Sensitive, Proprietary or Confidential Information**

Collaborative contracting engagements examine the sharing large amount of information at different occasion as agreed by Dave, Boddy & Koskela, (2010) and conditions than is expected on conventional models. Confidentiality acceptance assist to make all IPD professional updated of the significance of the appropriate application of collective confidential information. During cautious participant collection and contract drafting, IPD professional accomplish at this stage of relieve that project information interchanged will be explore for purposes of the project.

### **Compensation**

The idea of partnership and incorporation, conventional delivery processes suffer since the individual professional's economic accomplishment is not essentially attached to the project's achievement, specified human nature, construction professional will work firmly to conserve their own economic achievement. In conventional delivery methods, that performance at times result in penalty that are damaging the project, other participants, or both. Processes of compensation that attach the professional achievement to the generally achievement Smit *et al.*, (2011).of the project are influential tools for unifying expert and project accomplishment. In IPD, participant financial accomplishment depend on project achievement. For this cause, the IPD professional's usual character to protect and improve its own economic concern results in performance that profit the project.

There are numerous alternative as agreed by Ethington (2014) obtainable to teams focused in crafting processes of reward that set participant achievement with project accomplishment. The suitability of any processes will automatically rely on the exclusive quality of the specified project and its Professional. Suitable to involvement of motivation supplies, IPD contracts can be extra difficult than conventional construction contracts. As well, to the degree that cost penalty run from the accomplishment of exact objective (e.g., completion milestones, health and safety requests, life-cycle costs, etc.), conflict may occur later over if and to what degree convinced objectives be attained. Cautious contract drafting, uncomplicated and explicit precision of motivation milestones, and due thoroughness in team collection, will reduce the possibility that such conflict will emerge.

### **Withdrawal/Assignment**

As discussed in 2.0, formation of a joint team is significant to the achievement of IPD as mentioned by Anvuur & Kumaraswamy, (2007). Whereas at early collection of team professional is significant to an IPD project, stability of principles and incomplete devotion between the team professional's is maybe presently as significant to the project's ultimate achievement. While with some project, the disappearance of a professional is disrupting, but in IPD the disappearance exacerbated agreed the significance of the project team to the project's achievement.

The disappearance and appointing a team member is troublesome to the essential collaborative nature of the team. While a team professional disappearance, some possible new

professional is appointed to meet the same standard as the formal. Wide change takes place so that the methods may persist efficiently, and numerous of the similar team building hard work happen with the new team professional as mentioned by Anvuur & Kumaraswamy, (2007). Though, rely on when the professional is disappearance, the substitute professional may face an ascending conflict defeat the opinion of existence outsider to the remaining professional of the team.

Therefore, in directive to obtain the maximum advantage from IPD, each attempt is made to preserve the stability of the team. Leaving of team participant, if during project or voluntary end, is extremely dejected. At the origin of the project, the team resolution the few examples, if any, where removal is suitable. Any such resolution are made part of the acceptance(s) in position and the acceptance may involve damage supplies for extraction in confident circumstances.

### **Team Member Dispute Resolution**

If compared to conventional delivery approaches where conflict associations consideration, IPD is form upon association in which team stability is of the extreme significance as pointed by Ethington (2014). As a consequence of this project association and performance of the team's resolution creation method, mainly inner conflict between team professional are avoided. It would be inexperienced, though, to disregard the probability that conflict might still emerge between and among the team professional, even inside the mainly collaboration and well significance teams.

When conflict emerge during conventional project, regularly the parties' only possibility is to give in claims, which directly thrusts the parties into characteristics situation requiring them to perform in their own greatest interest – approving the “crouch down” character. When the team attain this stage, the team is damaged. At this point, the advantage of IPD are depart Ethington (2014), and it is very complicated to recover shortly the collaborative traditions within the team. To conserve together the team and the project in IPD, these conflicts are determined within without the requirement of filing claims and assume adversarial positions.

Inner conflict are resolute by the project's resolution-making team, which, as mentioned in Project Team Decision Making, present resolution agreement in the greatest concern of the project. Exploit the project's resolution making team to determine conflicts produced team professional with a intellect of possession in the resolution that are ready. To this conclusion, the acceptance controlling the project teams' association highlight inner conflict decision and present for particular protocol to effectuate such decision. In some cases, the professionals accept to a “no suit” supply, which surrender their rights to litigate or arbitrate.

At a great component, the achievement of inner dispute promise will rely less on the exacting protocol employ and extra as mentioned by Salvén (2013) on the amount to the level the team members have acquire the team approach of IPD. If the team professional depend on the concept of separate individual responsibility, the project suffers. The improved team works collaborative, the extra likely to be able to endure inner conflicts. Could inner conflict promise not succeed, the professionals' acceptances address processes for outer conflict promise, a “no suit” condition. In this consideration, the teams might follow extra conventional process of conflict promise, such as arbitration followed by mediation or lawsuit.

The inner promise of conflicts underneath IPD intensify the disparity among it and conventional project delivery require for cultural modify between the team professionals to effectuate IPD as mentioned by Salvén (2013). Conventional contracting is about produce limitations. A well-drafted



conventional construction contract legible defines the parties' function and the results of disappointment. Functions hardly be related as that produces double-talk as to the accurate responsibility. The contract's centre on the operation – the action must be complete. Integrated contract approaches, on the opposite side, centre on the associations essential for the prosperous conclusion of the project. Such relational contracts, dissimilar transactional contracts, are fairly uncommon in the home design and construction industry. As a result, a insufficiency of authorized precedent exists. Consequently, if conflicts emerge, it might be extra hard to assess one's rights and functions or forecast possible outcomes.

## Defining Roles, Responsibilities and Scopes of Services

Conventional contracting observe project professionals performance inside their own separate performance as agreed by (Lahdenperä 2011, Schöttle and Gehbauer 2013, Fulford and Standing 2014) of function. IPD attempt to crack down these barricades by having all main professionals centre on concluded shared objectives. It is not to say, though, that IPD professionals should not have unrelated work scopes for they are principally responsible. On the opposing, each professional has a evidently distinct work scope. The most part of the designers continues principally function for design facility and the constructors principally function for construction of the facilities.

### Service Scope

Though resolute to a degree by registration laws, licensing laws and agency wants, IPD team professional functions and facilities are examine functionally with function allocate on a greatest individual foundation, still when that varies from conventional responsibilities appointment. The project team ensures that the professional participant's duty and roles, or capacity of services as mentioned by Walter and Rodrigues (2011), are undoubtedly place away and understood at the initial potential stage. A carefully drafted matrix of teams, responsibilities and roles supplies precision for facilities, duties, control and assisting responsibilities and is frequently applied for this reason, while other way may be applicable.

The particular approach in which the conventional extend of facilities for the individual team members are realigned will change on a project-by-project source. Though, the accepted achieve on conventional extend of the facilities can be usually categorized in conforming with elements common to all integrated projects. Therefore, the normally anticipated outcome of IPD on designers, constructors, and owner are set below.

#### i. Designers

IPD depend seriously on a wide and detailed design method that collaboration contribution and participation of other team professional Suresh, Bashir, and Olomolaiye, (2012), including constructors, through the design stage. Therefore, the design method takes on supplementary significance as last team professional come to recognize how the integrated project can work from initial to completion. As a team professional, the designer is essentially concerned in interpret the design methods that can be used on the project.

Integrated projects permit for supplementary widespread for planning stages as mentioned by Arbulu et al. (2005), of construction attempt associated to recognized and determined possible design disputes that conventionally could not be revealed pending construction. As a product, designers are necessary to execute in an initial phase confidently facilities that are conventionally execute later in the



project. The consequential progression of facilities possibility increases the quantity of facilities supply in the design phase.

Recurrent relations with other team professionals through the design stages necessitates that designers present many repetition of their design as mentioned by Arbulu et al. (2005), record to other team professional for their assessment and contribution. This relations outcome in an supplementary roles to pathway during the design stages together the position of repetition provided to other team professionals and the character and material of the contribution obtain from them.

Moreover, the designer might not unavoidably offer as the “initiator” for the run of communications among the owner and constructors, as is applicable in conventional project delivery. Normally, communications are initiated by the combined team structure and do not depending on a particular member as initiator.

## ii. Constructors

The nature of the constructors’ capacity of facilities is principally elaborated in IPD by their initial participation on the project and their professional inside the integrated team. Particularly, the constructor’s responsibility elevated in an important mode through initial phases of design, in which constructors at present offer planned function as mentioned by Arbulu et al. (2005), such as schedule production, cost estimating, phasing, systems evaluation, constructability inspection, and untimely buying programs. Whereas constructors might offer these function in conventional projects, the period of these functions is advanced.

Constructors are introduces in through initiation of the project stages to offer know-how and completely contribute in the design of the project as mentioned by Arbulu et al. (2005). The consequence is a better responsibility in remark on and guide design innovation. This improved responsibility through design needs the constructor to offer, on a progressing source, estimating functions and/or objective value design functions through the design stage.

## iii. Owner

The owner in IPD, hold a significantly superior and supplementary determine responsibility in accessing and determine design options. Furthermore, the Owner is essential to contribute in starting project metrics at an initial phase than is representative in a conventional project. In light of the move for operation IPD needs, the Owner have to called on extra frequently to support in settle issues that emerge on the project. As professional of the resolution making team, the owner will be occupied on extra project-associated particulars and needs to act fast in consideration to permit the project to carry on resourcefully as mentioned by Rother and Shock (2004).

## Multi-Directional Duties

Generally conventional construction contracts search for retrain the teams to whom responsibility are owed. In straight difference, IPD takes under the premise that projects move extra efficiently where all teams officially identify what happens on site – that every construction project is a association of inter-connected, responsibility, dedication and combined promises as mentioned by Sioutis and Tweedale (2006).

Individual effect on this method is a combination of conventional responsibility. For instance, IPD needs that the constructor cover better participation in the design process (Andrade et al., 2012; Caixeta et al., 2013). Although it is not the issue that “constructors design and designers construct”

under IPD models, the separate roles of the two are supplementary intertwined than in conventional models. The combination of responsibility, even as to support the inspired process, can direct to the enquiry of who's role is exact scopes of work. Meant for that reason, a well-drafted IPD conformity evidently spells out member work scopes. Collaboration is not an alternative for responsibility, at least as it regard to the principal role for taken one's scope of work.

Present principles of concern for designers and constructors stay whole for those function that are conventionally carry on. Yet, IPD needs that, to several degree, the risk of non-performance be shared, therefore supporting collaboration, as mentioned by Sioutis and Tweedale (2006), across conventional responsibility and roles. IPD accepts frequently increase the risk of non-performance across all through the participants. With this method, the designer can openly allow some risk of constructor non-performance, and vice versa. During conclusion agreements and building project team associations, this case is documented and resolved up front. The participants automatically agree the stage of risk sharing they are in cooperation comply with, on a project-by-project source.

### **Defining and Measuring Project Outcomes**

When considering IPD, as relate to conventional projects, the risk of faulty to reach potential remains. Since achievement in IPD is considered by clearly stated shared goals, and in numerous issues of economic failure as agreed by Bhattacharjee and Ghosh, (2011), run from attaining, or faulty to attain, such goals, IPD acceptance clearly predict project objectives and the penalty of accomplishment or failure.

The IPD project plan includes project metric values and reporting intervals to observe improvement of the project. Metrics include generally presentation of the project as well as the conventional cost, schedule, and scope measurements. Reaching these metrics may also be attached to financial incentives for the parties.

### **Goals & Standards**

Even though the team possibly will present option and guide the owner, goals wait the owner's area. The owner directs its program and what it needs to accomplish. Though, principles establish upon objectives and applied to evaluate project achievement and compensation are in cooperation established upon. It's essential for all teams to be comply by the agreed-upon expected results as mentioned by Annett Schöttle, Shervin Haghsheno and Fritz Gehbauer (2014) as they may influence possible extra and compensation structures.

When the objectives are basically financial, principles of project period and cost may sufficiently determine achievement of these objectives as mentioned by Forbes and Ahmed (2011). Goal presentation criteria, such as energy efficiency, are also easily resolute. Quality of construction and design creativity are fewer simply considered. These factors may need a weighted index, contrast structures, and self-sufficient evaluators. The teams have to accept when the principles should be considered. For instance, the team regulate if energy efficiency is measured during commissioning, or is amount over a period or seasons. When the amount lowered preservation cost is an objective, the team regulate when achievement is measured.

### **Project Cost**

The generally project cost is a major metric that is recognized at the project initiation as agreed by Abdel-Wahab and Vogl, (2011) and followed during the existence of the project in decided upon

importance on life cycle and sustainability components. incorporated the cost of the real work, non-motivation according to compensation (fees for services) and suitable contingencies. The possible for a through association among the design and quantity survey through all stages produce a influential tool to decide and direct the project cost. This is one of the prime opportunities to observe the effectiveness promising with IPD.

The important advantage of IPD is the chance to substitute importance engineering through target pricing as mentioned by (PATH 2002, Pan and Goodier 2012), or target value design methods (a structure of estimated allocation). Under numerous IPD engagements, important penalty move from exceeding (or beating) the target price as mentioned by (PATH 2002, Blismas and Wakefield 2009). Untimely in conceptual stage, the team confirms if a project can be assemble for the resources available that will gratify the owner's objectives. Assuming the team justify the budget assumptions, it then follow objective value design. Distinct conventional design methods where design, budgeting, and then improve is an relative methods, a target value design methods applied instant response on budget, schedule and quality to notify the progress of the design. It advance designing to a detailed estimate, relatively than estimating a detailed design. In respect of this to be accomplished, information requirements to be communicated efficiently to all concerned teams, feedback received, and resolution through an open and sensible basis. When this is correctly completed, traditional "value engineering" disappear. Furthermore, by tying the resolution methods to the schedule, option that need information that can proceed on similar paths pending the suitable "final role moment."

Towards the level the situation target price is a collaborative effect, there is an amount of case to regard as. In the first case, each project professional has a straight financial interest where the target price as mentioned by (PATH 2002, Blismas and Wakefield 2009), is set in place. The owner's comfort frequently support a lower price, while the designers or contractors may have a financial incentive to look for a higher target price. The dispute is control during careful participant of assortment, open book estimating, and appropriate use of self-determining consultants.

### **Project Schedule**

The main prospective benefits of IPD is the decrease of construction period due to the wider planning and alternatives to project methods. This advantage is regular in determinant in choosing IPD as an ideal methods by owners. The capability to connection schedule, phasing and detailed construction sequencing through design will offer competency in substance procurement as mentioned by Vrijhoef & Koskela (2000). Untimely ordering of equipment by assisting member trade contractors to organize with the progress of the design decrease the time from the completion of design to the establishment of active work on the project site.

### **Project Quality**

Modern technological tools accessible to IPD team professional, comprises BIM, offer the chance to decrease mistakes in design documents also disputes among trades--all fit ahead of buying of the systems and goods. Partnership between the participants leverages the tools are used to produce a better quality of service, design and execution are essential to the project as agreed by Souza & Koskela (2013).

The amount of feature is deploy upon metrics suitable to the project category and is contrast to earlier completed projects of related nature. As extra IPD projects are accepts by owner or in industry, feature principles may increase.

### **Operational Performance**

The organizational presentation basis for main building structure inside a project is completely through untimely design and advanced as the design proceeds. The process is associated with the project objectives as pointed by Anklam (2003), and position with recommendation of the main trades engage with the project along by means of the related design participants.

The chance to stay for economic presentation metrics of the concluded project to be recognized and follow after achievement. The involvement of the project team creates in progress achievement of the presentation of the completed project appropriate to feature of design and application might guide to royalty or other extensive term financial return Barlow and Ozaki (2005) sharing engagements for the principal input participants.

### **Sustainability**

The main input area for progress from the conventional delivery methods is to place extra persistent objectives as pointed by Anklam (2003), for sustainability. Metrics be capable of recognized for lifecycle objectives for all direction of the project. Classification of principles such as Green Globes, Leadership in Energy and Environmental Design LEED® or SB Tool may be combined into the general objectives and related to steps observation during the design and delivery method. The chance as well available to place objectives for carbon footprint and integration of substitutes energies.

### **Legal Considerations**

#### **Non-Standard Contracts**

Integrated methods engage contractual associations that are relatively altered from conventional contract models. Improving the criterion non-integrated contract form as agreed by Eriksson and Westerberg (2011), to identify for integration be able to challenge since the methods are extremely dissimilar. Settling and drafting consensus without the support of previous comparable contracts or criterion forms can enlarge the cost of attainment an agreement. The AIA at present advance criterion forms to support teams seeking to agree and execute an IPD concurrence.

#### **Professional Responsibility and Licensing**

Since project professionals stay on role for participant capacity of effort as pointed by Sacks (2004), an IPD methods shouldn't modify conventional needs with regard to participant or commerce licenses. Partnership connecting designers and constructors does not essentially result in a combination of expertises. If allocate occupational scopes need a constructor to execute design services, it will require to feel the charge steady with registration needs. The process is no altered than in the issues under a non-integrated method. When the IPD facility are to be offer during a separate legal entity particularly shaped for the project (e.g. limited liability company), the entity can necessary to attain design and/or construction licenses, relying upon entity state laws.

#### **Insurance**

Applying BIM and other tools to create a building virtually in progress of a real as pointed by Hines et al. (2004) construction considerably reduces the risk of design mistakes and removals. When the professionals acquire "no outfit" requirement, for the risk sustain inner first-party claims for financial disparity can be removed during these waivers. Though, when professionals do not remove first party claims but suppose non-conventional accountability, conventional insurance outcome may not be obtainable in present's insurance market. Insurance for third-party claims for personal injury and property damage may also not be available. It is now current ahead the insurance industry to extend

and recommend different insurance outcomes that support with the project objectives and particular risk portion terms recognized between the IPD project professionals.

Moreover, the progress and acceptances of bonding and insurance need a modern method that support the risk sharing structure of IPD. This may need extra than the expected communication as pointed by EdumFotwe and McCaffer (2000), with guarantor and insurance markets. Conventional legal risk organization utilize on a ethics that risk attend duty and the extra responsibility one owes to extra teams, the extra authorized risk one sustain.

### **Entity Formation**

Though if completely promising to organization, an IPD project simply during contractual engagements among the separate professionals (and is expected that mainly will be so shaped), this is promising to perform as mentioned in (CIDB, 2004) such projects during the conception of a particular reason entity, such as a Limited Liability Company (LLC). The tax and organization cases to resolve where a separate legal entity is formed to complete the project

### **Joint Liability and Joint Venture**

IPD engagements consider a high extent of combined attempt as pointed by Mc Lean, (2009).. The numerous issues, of project professional share, to a single quantity or a new one, in the accomplishment or collapse of the general enterprise. To this consideration, IPD engagements are further probable to be arrangement as a combined ventures than the self-regulating contractor engagements normally experience under conventional processes. An isolated risk characteristic of collaboration ventures is the combined charge of all cooperative ventures as pointed by Anklam (2003). Consequently, when all main IPD professionals are consider joint ventures, they may be accountable to third teams for the shortcoming of the collaboration venture associates. The methods in this way, the construction team may fit tolerate the risk of design mistakes and the design team might be at risk for construction mistakes. The risk will be able to governed during cautious planning (e.g., suitable insurance outcomes and structuring the lawful associations among the parties) and contract drafting.

## **CONCLUSION**

The paper provides the different entity requirement for procurement approach in construction for the acquisition of construction entity. It is favourable that the construction industry works under one entity and appropriate and that they are procured at the best possible cost to meet the needs of the client in terms of quality, function, time and cost. This is as a result of conventional delivery process remain fragment as supported by Tenah, (2001), and it depends on linear based modes of communication, as supported by Hampson, (2003) Errors and omissions in paper documents often cause unanticipated field delays, and eventual lawsuits between the various parties in the team, These problems causes friction, financial expenses, and delays. Efforts to address such problems have includes, the use of alternative organizational structures such as the design-build, PPP method; the use of real-time technology, such as project web sites for sharing plans and documents and the implementation of 3D CAD tools. Though these methods can improved the timely exchange of information. They can do little to reduce the severity and frequency of conflicts caused by linear documents or their electronic equivalentents.



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## A STUDY OF INDOOR ENVIRONMENTAL QUALITY OF SCHOOL BUILDINGS IN MALAYSIA

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### ABSTRACT

Thermal Comfort in buildings are dependent on air temperature, humidity, radiation, internal lighting, air movement, activities, clothing and climatic change. It is an important component of Indoor Environmental Quality (IEQ) which has a very significant impact on occupants' comfort and productivity including on conducive teaching and learning activities in schools, especially on pupils' attention span. Building envelope is an imperative contributor on effective IEQ besides lighting, sufficient ventilation, minimum noise level as well as the efficient use of materials and finishes which includes those with low Volatile Organic Compound (VOC). This paper is based on a research conducted on two schools in Malaysia of varied construction materials as the building envelopes to ascertain the various components of IEQ and its effectiveness. Elements of IEQ such as air temperature, air movement, humidity, daylighting and noise level were taken of various classrooms to fulfill the required objectives of determining the level of quality and compared to actual survey conducted on the students comfort level. From the data collected and analysed the study shows that the schools is far from reaching the comfort level in terms of air temperature which range from 30°C to 34°C, with insufficient daylighting in some classrooms and too much glare in some. The measurement taken shows unsatisfactory level of air movement of none in certain classrooms and an exceeding the threshold on noise level of 35dB for school classrooms. This research also concluded that the use of materials and orientation in the school design are the major determinant factors towards good IEQ levels in school buildings.

**Keywords:** Indoor Environmental Quality, Thermal comfort of school building, School building Envelope

### 1.0 INTRODUCTION

There is a fundamental belief that school planning and design can play an important role in enhancing teaching and learning outcomes by creating better indoor environments. Poor school conditions make it more difficult for effective teaching and learning. Every effort should therefore be made in the design stage to create the ideal conditions for learning to take place (Barrett and Zhang, 2009). According to Olson and Kellum (2009) the two elements of sustainable building design, daylighting and indoor air quality, have direct effects on student performance. Studies now show that

better indoor air quality in schools results in healthier students and faculty, which in turn results in lower absenteeism and further improves student achievement (CHPS, 2003). Considerable evidence also shows that there is an explicit relationship between the physical characteristics of school buildings, and the spaces within them, and educational outcomes (Barrett and Zhang, 2009). Mendell and Heath (2004) concluded from their study on schools in USA that to avoid adverse effects, factors to pay close attention to are adequate outdoor ventilation, control of moisture, and avoidance of indoor exposures to microbiologic and chemical substances.

Researchers have been studying the temperature range associated with better learning for several decades. Harner (1974) found that the best temperature range for learning reading and math is 20.0°C to 23.3°C. As temperature and humidity increase, students report greater discomfort, and their achievement and task-performance deteriorate as attention spans decrease (King and Marans, 1979). Kwok (1998) studied the thermal comfort conditions in classrooms in Hawaii. Both naturally ventilated and air conditioned classrooms were included in the study. Neutral temperatures for the two types of classrooms were 26.8°C and 27.4°C, respectively. Busch (1990) carried out a field study in Thai offices in Bangkok. The results from his study were that the neutral temperature or effective temperature for the air conditioned buildings and naturally ventilated buildings were found to be 24.5°C and 28.5°C, respectively. Nyuk and Shan (2003) concluded from their field study conducted in 2002 in Singapore, that for classrooms mechanically ventilated by fans the acceptable temperature ranges are from 27.1°C to 29.3°C, implying that the ASHRAE Standard 55 is not applicable in the free running buildings in the tropical climate. Sharifah (2005) on the other hand has concluded from her studies on schools especially the PWD prototypes, that students face discomfort especially in afternoon sessions from heat gain and glare into classrooms. Hussin and Abdul Rahman (2009) conducted a field study on the environmental conditions and occupant comfort was carried out in two schools, which is a primary and secondary school, and in a public waiting area in a health clinic in Johor Bahru, located in the southern region of Malaysia. The results obtained showed that more than 80% of the respondents found that their indoor thermal conditions acceptable even though the thermal sensation votes (TSV) exceeded those specified by ASHRAE Standard 55 and the environmental assessments exceeded the standard. In this study, it seems that the occupants in the tropic environment such as Malaysia have a higher heat tolerance and can adapt to the environment that they are used to.

The challenge on catering for school design lies on the simultaneous catering for thermal comfort, indoor air quality and energy conservation with no apparent obvious solution. Becker et al (2006) denotes this dilemma as: the EE-TC-IAQ Dilemma (energy efficiency—thermal comfort—indoor air quality dilemma) which should be the primary concern for optimal solutions in school classrooms design. Most literature are more focused on energy reduction such as the alternative use of solar energy (Davies, 1986) or construction features namely thermal insulation, thermal mass and shading (Ubertini and Desideri, 2003). In spite of the dire need to tackle the issues of the EE-TC-IAQ Dilemma in school buildings, many literature either emphasize the need to improve IAQ on one hand (Besler, 2000, Ellis, 2003), and the other to focus on energy imposed by direct IAQ ventilation (Davies, M.G), very few publications integrate the thermal and energy analysis especially on classroom wings. According to Becker et al, (2006) survey revealed that research in the area has been mostly concerned with improving the implementation and control of natural ventilation, or specific features of the HVAC system. They concluded that no research focuses on addressing enhanced energy conservation by utilizing some of the supporting architectural features and spaces of classroom wings (such as the layout, which includes corridors, lobbies or atria that are vacant during classroom hours), and the prospect of these spaces in providing a holistic design and management of mechanically controlled day



and night ventilation schemes that are concerned with solving the EE-TC-IAQ Dilemma. This paper also focused only on classrooms conditions and not the supporting areas.

## 2.0 RESEARCH QUESTIONS

The main concern over energy and running cost has meant that most public schools in Malaysia have to settle for natural ventilation and not air-conditioning. In order to provide a conducive teaching- learning environment for schools it is vital for the building envelope to reduce heat gain to keep the indoor air temperature lower than outdoor temperature. According to Abdul Shukor (1994) the comfortable indoor temperature for Malaysia is between 24 °C to 28 °C. Whilst Hussein et al (2009), narrowed the accepted range of temperature for Malaysia from 27.1° C till 29.3 °C. There are three main factors that affect the human comfort, and they are the effective temperature, moisture content of air (relative humidity), and air movement. In spite of the various research on thermal comfort in school building in Malaysia there are no solution in developing a series of alternatives as to the best envelope in particular facade treatments and features that can help to reduce heat penetration into the indoor spaces and help reduce the indoor temperature. Bathish (2007), stated that in order to exploit full potential from daylight but reduce radiant heat some design features must be tackled by designers by the right selection of window type and daylight harvesting devices. Puteh et al (2012, 2013) concluded from the study on students' perceived comfort and relationship to thermal conditions in Malaysian classrooms shows that the classroom thermal unsatisfactory level i.e. too hot not only affects the learning but also the students' health. This research was therefore conducted to establish the relationship between facade materials, shading devices on thermal comfort and lighting level in selected school classrooms.

## 3.0 METHODOLOGY

The Indoor Environment Quality study was conducted using two main methods which were qualitative and quantitative assessment. The first method entails an indoor quality assessment based on a subjective survey through questionnaires conducted on the pupils of the classrooms. The second was to measure the Indoor Environment Quality criteria namely thermal comfort parameters (temperature, air flow velocity, and humidity) as well as the noise and daylighting level. The Indoor Air Quality is outside the scope of this study. The two case study school buildings chosen were based on varied facade materials and comparison on the materials on the heat penetration as well as shading devices (horizontal and vertical) used in the facade design to observe the shading impact on the indoor of the classrooms.

## 4.0 RESULT AND DISCUSSION

### 4.1 Questionnaire Survey

The objective of conducting a questionnaire survey is for correlational attempt to determine the extent of the relationship between various indoor environmental quality variables and distributions of variables. Variables are not manipulated; they are only identified and are studied as they occur in a natural setting. The survey on the students perception of the indoor thermal comfort, pupils of two classrooms for each school were chosen to fill the questionnaires. As this research was conducted on primary school, the age range of the respondents were from 10 to 11 years old. Although the eldest are 12 year olds but due to a critical primary school examination (UPSR (Ujian Penilaian Sekolah Rendah – Primary School Evaluation Test)) was around the corner when the survey was conducted, the students were not given the greenlight to be involved in the survey. The survey was conducted through guided,



one to one interview to ensure they fully understood the questions given. As the questions were mostly simplified to ensure students full comprehension, the data does not require analysed by any software other than excell. The survey was conducted and presented on 5 main areas: 1. Demography of respondents 2. Percieved air quality in the classroom 3. Percieved thermal comfort in the classroom 4. Percieved lighting quality in the classroom and 5. Percieved noise level in the classroom.

#### 4.1.1 Demography of respondents

The demography data for this research does not play a critical role in survey variable as all respondent are of the same age group. On the other hand, the physiology and response to the indoor environment based on gender are beyond the scope of this research. Student were surveyed on the awareness on what a green building is and less than 5% of students from both schools have heard on green building terminology.

#### 4.1.2 Percieved Air Quality In The Classroom

From the survey conducted on the pupils, 92% of respondents from school A percieved that the quality of air is satisfactory while only 83% from school B express the same opinion. The 8% whom find the IAQ unsatisfactory from school A attribute it to stale smell and heat, whilst the 17% from school B blame it on heat alone.

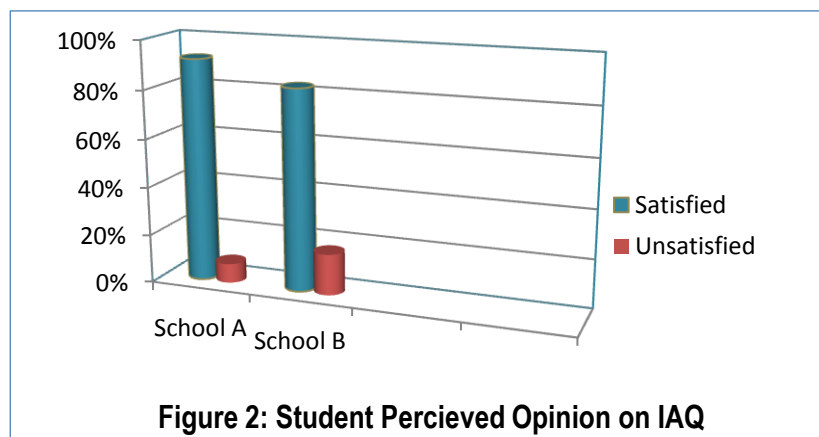


Figure 2: Student Percieved Opinion on IAQ

#### 4.1.3. Percieved Thermal Comfort in the Classroom

Thermal comfort are influenced by three main factors which are; effective temperature, moisture content of air (relative humidity), and air movement. The survey results show a vast contrast between students opinion in the two case study schools, 90% of respondents from school A percieved that they achieve comfort in their classrooms where as only 51% feel the same way in School B. This condition will be furthe discussed in the measurement section. Pupils from both schools expressed that they felt the most discomfort between 12.00 to 2.00pm as shown in Table 1.

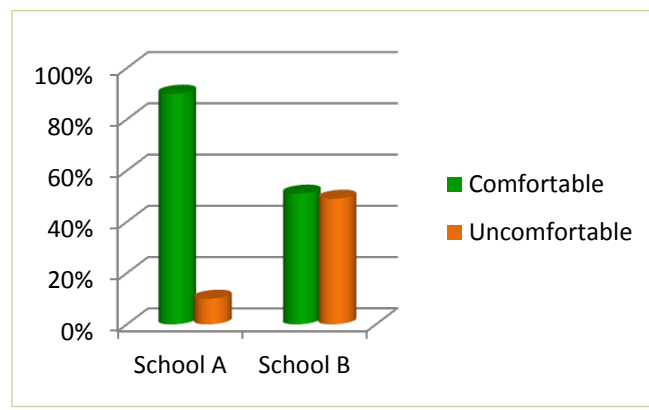


Figure 3: Student Perceived Opinion on Thermal Comfort

Table1: The Perceived Comfort Level in Classrooms in Relation to Time

Comfortable	Uncomfortable	Most Uncomfortable
8 – 10 am	10- 11 am	12 – 2 pm

#### 4.1.4 Perceived Lighting Quality In The Classroom

On the aspect of lighting the students were posed two question which are one, on whether they get sufficient daylighting from the window without artificial lights and second is whether they are subjected to glare from the window. Results again differ from School A where majority of 79% feels they have sufficient daylight whilst only 45% of pupils in School B feel they have sufficient light. On the subject of glare however, majority from both schools perceived that there is no glare problem in classrooms.

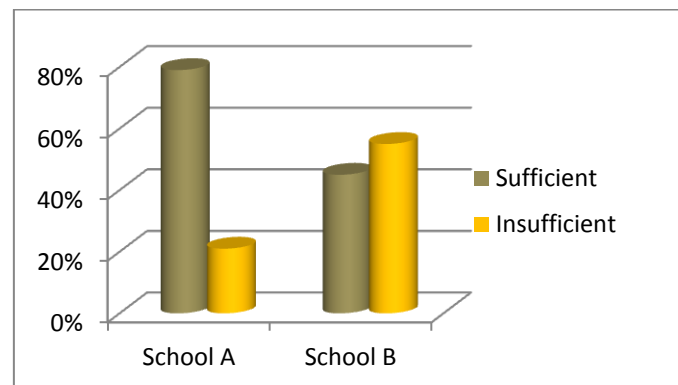


Figure 4: Student Perception on Daylight in Classroom

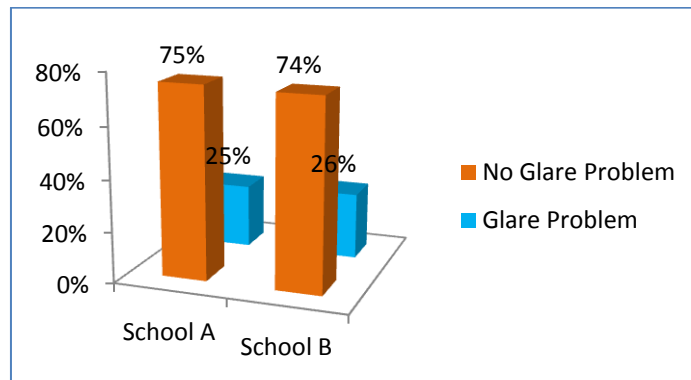


Figure 4: Student Perception on Glare in Classroom

#### 4.1.4 Percieved Noise Level In The Classroom

On the element of noise, both schools perceived that they are subjected to noise from adjacent classrooms although both schools are constructed with either brickwork or precast concrete panels partitions between classrooms as well as concrete floors which provide the mass required to effectively reduce the transmission of sound. Even though the separating walls may perform adequately in reducing the transmission, but noise levels from the adjoining occupancy are still unacceptable as they are transmitted as airborne sounds via the doorway and louvered windows along the corridors. It is a difficult issue to tackle as good ventilation and air movement are required to cool the classroom which result in the doors and windows open at all times. Only fully air-conditioned classrooms can seal any outside noise but at the moment air-conditioned classrooms are quite implausible for public schools.

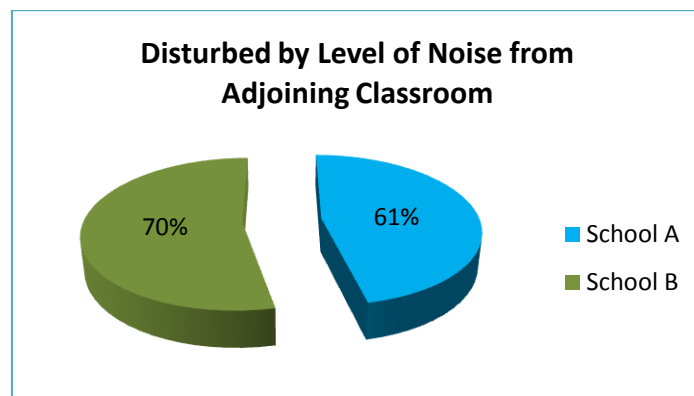


Figure 5: Student Perception on Noise Level in Classroom

## 4.2 Fieldwork Measurements

### 4.2.1 Sekolah Kebangsaan Sungai Gelugor

As mentioned in methodology section 5 elements were measured and they are air temperature, humidity, air movement, daylighting and noise level. Two classrooms were measured for each school. In School 1, Sekolah Kebangsaan Sungai Gelugor, the two classrooms varied in facade materials where classroom A is new wing completed in 2014 of precast concrete panel with concrete floor having vertical as well as horizontal fins. Whilst Classroom B were built in 1980's using brick wall with plaster and paint as its facade.

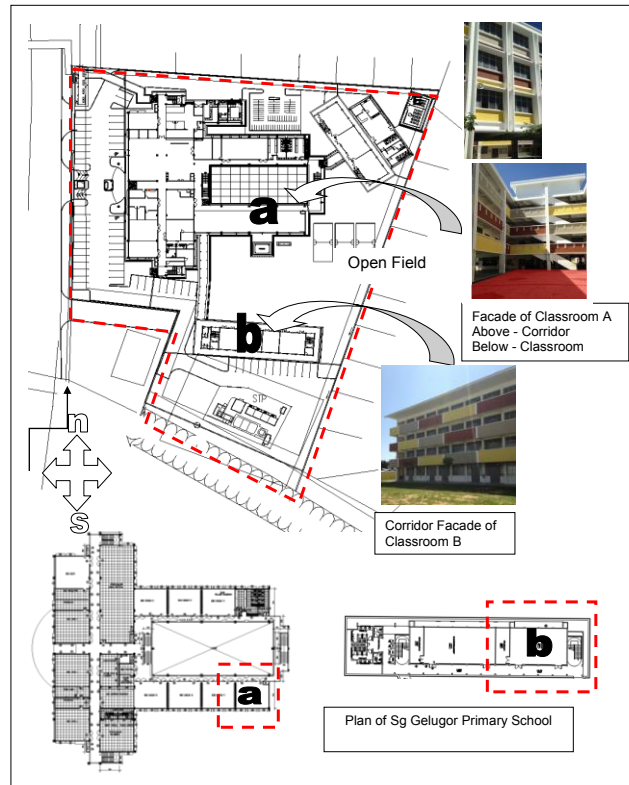


Figure 6: Plans and Photos of Sekolah Kebangsaan Sungai Gelugor

Table 2: IEQ Measurements taken for Classroom A

Time/Type	1000	1100	1200	1300	1400	1500
Indoor Air Temperature(°C)	30.7	31.0	31.7	32.5	32.2	32.8
Humidity(%Rh)	68.2	66.2	64.9	62.0	60.3	61.6
Air speed (M/S <sup>-1</sup> )	0.6	1.2	0.9	1.0	0.4	0.0
Noise Level(dB)	70.0	60.8	77.0	76.1	88.8	72.8

Table 3: IEQ Measurements taken for Classroom A

Time/Type	1000	1100	1200	1300	1400	1500
Indoor Air Temperature(°C)	30.5	30.8	31.6	32.0	32.5	32.9
Humidity(%Rh)	68.3	68.3	66.7	64.5	60.1	62.2
Air speed (M/S <sup>-1</sup> )	1.0	0.4	0.6	0.9	1.5	1.4
Noise Level(dB)	58.2	68.6	59.9	61.3	67.7	70.7

#### 4.2.2 Sekolah Kebangsaan Minden Height

The same measurement were taken for this school. The new construction of the school also completed in 2014 of precast concrete panel with concrete floor having vertical as well as horizontal fins. Whilst Classroom B were built in 1980's using brick wall with plaster and paint as its facade.

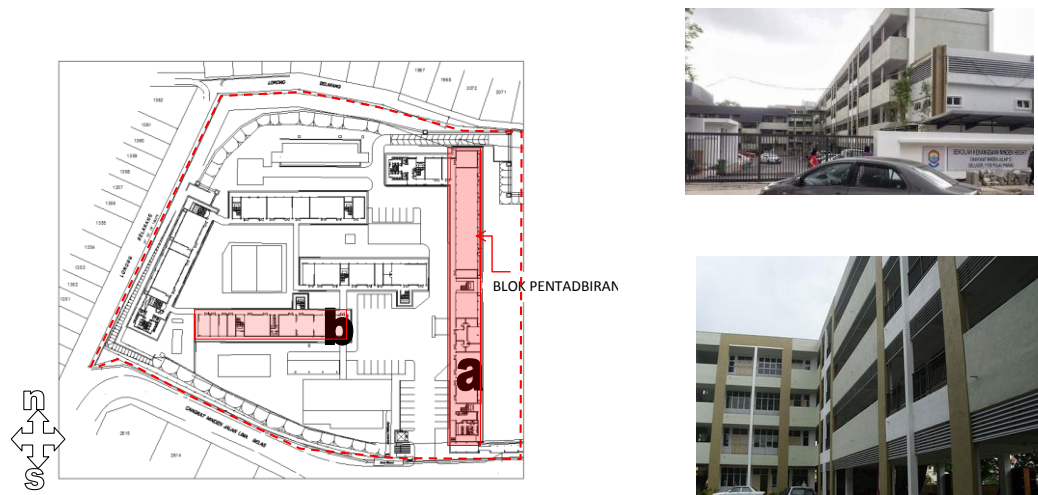


Figure 7: Plan and Photos of Sekolah Kebangsaan Minden Height

Table 4: IEQ Measurements taken for Classroom A

Time/Type	1000	1100	1200	1300	1400	1500
Indoor Air Temperature(°C)	29.5	32.2	32.6	33.0	33.5	33.5
Humidity(%Rh)	77	69.4	61.6	53.6	51.4	55.9
Air speed (M/S <sup>-1</sup> )	0.0	0.8	0.0	0.0	0.0	0.0
Noise Level(dB)	64.5	77.2	49.1	44.9	54.9	57.0

Table 5: IEQ Measurements Taken for Classroom B

Time/Type	1000	1100	1200	1300	1400	1500
Indoor Air Temperature(°C)	28.0	32.2	32.9	33.7	34.1	34.5
Humidity(%Rh)	78.9	67.0	60.0	53.8	49.1	52.3
Air speed (M/S <sup>-1</sup> )	0.0	0.0	0.0	0.0	0.0	0.0
Noise Level(dB)	56.0	57.8	52.7	51.3	55.3	43.8

## 5.0 RESULT AND DISCUSSIONS

From the measurement taken, it clearly shows that both schools have an indoor temperature exceeding the recommended rate for tropical climate from 24°C to 29°C. The high dissatisfaction percentage in School B is justified not only because the highest temperature readings appear in their classrooms whereby they are 2°C to 3°C higher than school A but the discomfort is further increase due to stale air as the classroom reading shows no air movement at all in both classrooms. The reading also shows the consistent increase in temperature during the afternoon and the highest at 2.00 to 3.00pm which again correspond with the student observation. The readings also showcase the consistency that humidity decreases when the temperature increases as the heat dries up the humid air. Another factor to be considered is that on readings of temperature of walls, the brick wall shows slow rate of increase in temperature compared to concrete especially on east wall which is not shown here. The design feature of school A with horizontal and vertical fins as decorative elements as well as

shading device does not show any significant role in reducing the temperature as the rate of temperature where the fins are adopted has no difference compared to the older block with no fins.

The recommended acceptable noise threshold is 35dB for classrooms but clearly both schools exceed the recommended level which tally with majority of student opinion on high noise level. As for the daylighting measurements the recommended figure for reading, writing and drawing in a classroom is 300lux while for writing and reading on blackboard is 500lux (de Bruin-Hordijk and de Groot, 2015) However for School B, the reading ranges from as low 60lux in blocks facing north and south and as high as 1106lux for other classroom facing the sunpath, whereas School A shows a reading of lowest at 528lux and highest of 2263lux which is consistent with the survey result of almost half of School B feels the lighting is insufficient. The high reading in some zone accounts for the survey result showing that 25% and 26% from both schools found that there was too much glare in the classrooms.

## 6.0 RECOMMENDATIONS AND CONCLUSIONS

The study clearly shows that the public school in Malaysia has still not achieved a desirable IEQ quality for conducive learning. The new design (2014) adopted for both schools as the case study still focus on aesthetics and safety such as the use of solid corridor railings which hinder wind flow across classrooms. Although the one used in School A has vented holes but are insufficient to allow for cross ventilation and reduce heat penetration. To achieve maximum thermal comfort, the temperature reduction is critical together with the need to increase air movement and would require more researches on facade materials, effective shading, breathable skin for the walls. Another obvious factor is the orientation but in this study the result shows no vast difference between east/west versus north/south orientation when corridors are used as buffer and recess walls are adopted to reduce the sunpath on the perimeter walls.

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## LIVABLE CITY WITH COMMUTER BOAT SERVICES IN CHAO PHRAYA RIVER

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### ABSTRACT

This work studies the passengers' satisfaction of commuter boat services in Chao Phraya River, Bangkok, Thailand, in term of service by using questionnaire as a study tool. The questionnaire survey has 100 respondents from major piers including Nonthaburi, Maharaj, and Tha Chang. This study has 55 female respondents with the age ranges 36-45. Moreover, 43 percent of the respondents are not graduated while another 45 percent are graduated and the majority of passengers are employees and students who earn less than 15,000baht (US\$450) per month. In term of passengers' satisfaction toward the services, the results indicate that passengers are moderately satisfied to all aspects. The study finds that only the level of income has an effect on the passengers' satisfaction. In overall, passengers moderately satisfied with every aspects of travelling by transit/commuter boat, still improvement is recommended for punctuality, and lifesaving facilities. Having more than forty thousand daily users, boatpool commuter services make Bangkok a livable city in aspects of efficient and sustainable public transportation issues.

**Keywords:** questionnaire survey, passenger's satisfaction, transit boat, boatpool, Bangkok, Thailand.

### INTRODUCTION

In Bangkok and its outskirts areas, a series of canals had been dug around 1830s. The main purpose was for water transportation on which the Bangkokians were relied. Having a lot of canals made Bangkok being called "Venice of the East" during much of the 19th Century (Bodry, 2012). Comparison between Bangkok and Venice, the canals system in Bangkok was far more pervasive than ever existed in Venice. Rapid transformation to land transportation has emerged since 20<sup>th</sup> century. These days, many of the *khlongs* (canals) have been filled in to make roads, for examples, Silom, Sathorn, Phloenchit, Sukhumvit and Asoke roads. However, a vast waterways network can still be witnessed across the city. The existing water transportation is mostly available in the Chao Phraya River and some canals. There are commercial commuter motorized boat services on which this study will be focused.

## CHAO PRAYA RIVER

Chao Praya River is the major river in Thailand. Chao Praya River runs through the center of Bangkok into the Gulf of Thailand. The Chao Phraya is a major transportation artery for a vast network of river buses, cross-river ferries, and water taxis. There are more than 15 boat lines operate on the rivers and canals of the city, including commuter lines (Wikipedia, 2015a). Each day, thousands of commuters travel by motorized boat on the canals and on the Chao Praya River (Bodry, 2012).

## REVIEW OF LITERATURE

Even though boatpool is similar to vanpool (Witchayangkoon *et al.*, 2015) and carpool in that it can help commuters reach their destinations with saved cost. Ongwandee and Chavalparit (2010) studied commuter exposure to in-vehicle benzene, toluene, ethylbenzene, and *m,p*-xylene (BTEX) in public transportation modes in metropolitan Bangkok, Thailand by investigating volatile organic compounds (VOCs) concentrations in four public transportation modes including an air-conditioned bus (A/C bus), non-air-conditioned bus (non-A/C bus), electric sky train, and a canal commuter boat (Saen Saeb canal boat), during rush hours. Results showed that the transportation modes significantly influenced the abundance of in-vehicle BTEX. From median BTEX concentrations, sky train and commuter boat have lower BTEX compared to A/C bus and non-A/C bus. Velasco *et al* (2013) reported a quantification commuter exposure to black carbon, CO and noise when waiting for and travelling in the mass transport Saen Saeb canal boats in Bangkok, Thailand. This report also found similar concentrations of CO to roadside areas of Bangkok. The continuous sound levels measured at a landing pier were similar to roadsides, but significantly higher values were recorded inside the boats.

Armstrong (1997) studied accessibility effects and proximity related externalities of commuter rail service by modeling the data with paired data analysis, quasi-experimental hedonic models, and pooled hedonic models. The study found local accessibility to commuter rail stations does have various impacts upon property values.

The commuter boat services have not been studied and reported as no literatures found. Therefore this work studies the services by focusing on passengers satisfactions through the use of questionnaire as a study tool.

## CHARACTERISTICS OF PUBLIC COMMUTER MOTORIZED BOAT SERVICES IN THAILAND

In 1971, Chao Phraya Express Boat (CPEx) received a concession from Marine Department of Thailand, to give commuter boatpool services in the Chao Phraya Bangkok area. Currently, CPEx sails from Nonthaburi (Pakkret pier) to Ratburana, covering a distance of 21 km, with 65 serviced boats including 15 super size boats and 50 regular size boats. The capacity is 200 people for each super size boat and 150 for regular size boat. CPEx serves more than 40,000 passengers daily, with 38 pier-stations. The commuter boat arrives main passenger piers every 15 minutes. The services have four routes based on color of the flags: orange, green, yellow, and no flag. The last boat of the day will have an additional black flag on the front. Figure 2 shows passengers who travel with commuter boat services in Chao Phraya River. Passengers can connect their trips with buses and sky train.

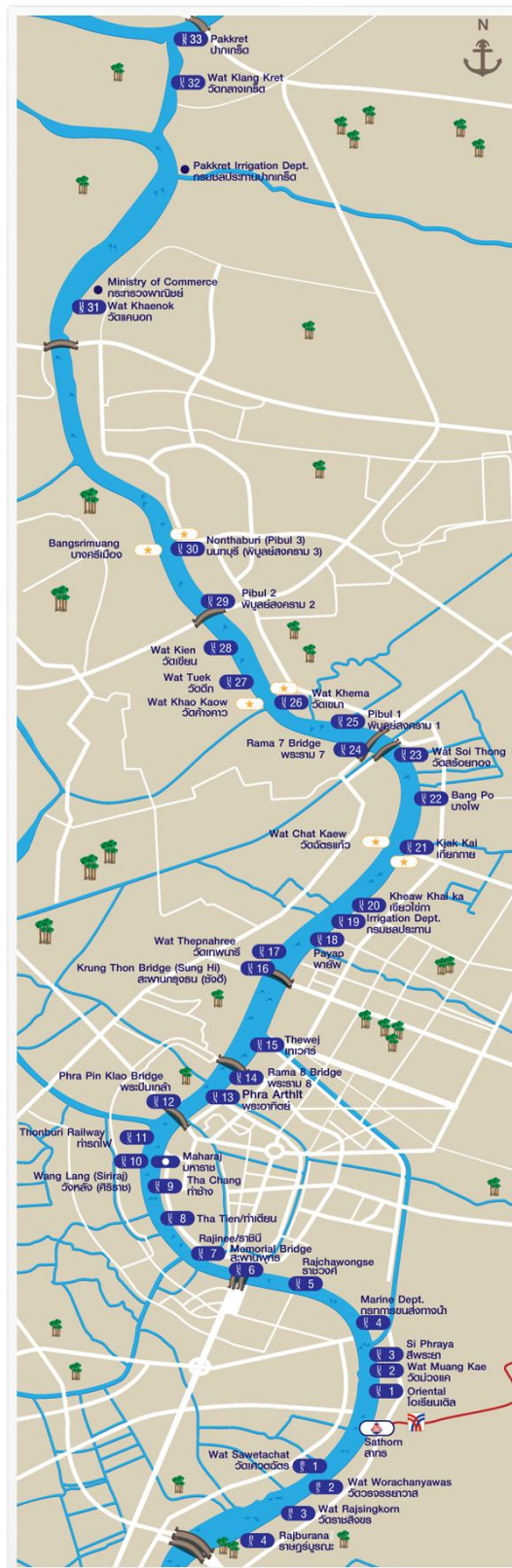


Figure 1: Map of CPEX piers commuter boat services stations along the Chao Praya River (CPEX, 2010).








Figure 2: Passengers (a) waiting at the pier, (b) getting in the commuter boat, and (c) sailing in Chao Phraya River.

## BOATPOOL FARES AND OPERATIONS

In Chao Praya River, fares of boatpool commuter are fixed prices, depending on route and distance. For example, Chao Praya Express Boat current fares are from 10Baht (about US\$0.30) up to 32Baht (about US\$1.00) per single trip. Travel fares of each boatpool commuter route are posted at its take-off station. Boatpool commuter daily service hours vary on the route, mostly start about or before 6AM until about 8PM or later.

Table 1: Operation and fare information for Chao Praya Express Boat (CPEX, 2010)

Type	Route	Operation	Fare
LOCAL LINE (NO FLAG)	Nonthaburi (N30) - Wat Rajsingkorn (S3)	Monday – Friday Morning Service 06.45- 07.30 Afternoon Service 16.00 - 16.30	10 / 12 / 14 Baht (Depending on distance)
 ORANGE FLAG BOAT	Nonthaburi (N30) - Wat Rajsingkorn (S3)	Everyday 06.00-19.00	15 Baht
 GREEN FLAG BOAT	Pakkred (N33) - Nonthaburi (N30) - Sathorn (Centre)	Monday – Friday Morning Service 06.10 - 08.10 Afternoon Service 16.05 - 18.05	13 / 20 / 32 Baht (Depending on distance)
 YELLOW FLAG BOAT	Nonthaburi (N30) - Sathorn (Centre) - Ratburana (S4)	Monday – Friday Morning Service 06.15 - 08.20 Afternoon Service 16.00 - 20.00	20 / 29 Baht (Depending on distance)

## METHODOLOGY

### PASSENGER SATISFACTION

Similar to vanpool services (Witchayangkoon *et al.*, 2015), passenger satisfaction for boatpool services signifies how services meet or beyond passenger expectations or specified satisfaction goals. In this work, questionnaire is applied as a study tool to survey passengers' perceptions regarding their satisfactions of the uses of commuter boat services.

## QUESTIONNAIRE SURVEY

A questionnaire comprises a series of questions about respondents' experience and perceptions of their boatpool travel in the previous six months. Having nine respondents to conduct the pilot test questionnaire, feedbacks are then used for improvements, especially to have clearer questions for better understanding. This study has total 100 respondents (45 males and 55 females) that are chosen randomly from a wide range of males and females. The survey is conducted at major piers including Nonthaburi, Maharaj, and Tha Chang piers during April 2015. Respondents are asked to answer with their perceptions and experiences they have with the commuter boat services within the past six months. The questionnaire first portion asks about general information including gender, income, and education background. Identity of each respondent is not collected.

The main part of the questionnaire asks about the service on multiple satisfaction items including distance from home (convenient distance), cheap transportation, public image, lifesaving facilities, fare, punctuality of service, and overall satisfaction on services. In the questionnaire, respondents' satisfaction levels are derived from the five Likert scale questionnaire with

- 5: Strong Satisfaction,
- 4: Good Satisfaction,
- 3: Moderate Satisfaction,
- 2: Partial satisfaction, and
- 1: No satisfaction.

## STUDY RESULT

Tables 2, 3, and 4 provide information of respondents regarding ages, income, gender, occupation, and education level. Most of the respondents are female with the age ranges between 36 and 45. Moreover, 43 percent of the respondents have not graduate a bachelor degree while another 45 percent have got their graduate degree / studying a bachelor degree and the majority of passengers are employees and students who earn less than 15,000baht (US\$450) per month.

Table 2: Respondents classified by ages, income, and gender

Ages	Income (Baht per month)								Total
	Below 15,000 (<US\$450)		15,001 -25,000 (US\$450-750)		25,001 - 30,000 (US\$750-900)		More than 30,000 (>US\$900)		
	Male	Female	Male	Female	Male	Female	Male	Female	
Under 20	9	9	2	2	0	0	0	0	22
20-35	4	6	4	7	1	3	1	0	26
36-45	3	3	2	10	5	7	1	3	34
46-60	3	1	1	0	1	1	3	2	12
Over 60	1	0	1	0	2	0	1	1	6
Total	20	19	10	19	9	11	6	6	100

Table 3: Respondents classified by occupation and income

Income	Occupation					Total
	Government Officer	Employee	Business owner	Students	Others	
Below 15,000	2	7	5	21	4	39
15,001- 25,000	5	13	5	6	0	29
25,001 - 30,000	10	7	1	2	0	20
More than 30,000	3	1	7	0	1	12
Total	20	28	18	29	5	100

Table 4: Respondents classified by education level and gender

Education Level	Number of respondents		Total
	Male	Female	
Below bachelor degree	19	24	43
Having/studying a bachelor degree	20	25	45
Higher than bachelor degree	6	6	12
Total	45	55	100

From the questionnaire survey, respondents' satisfaction levels are given in Table 5, together with means and standard deviations. From the survey result, it finds that all respondents' satisfaction levels are moderate satisfactions. It can be noticed that 27 people has partial satisfaction and no satisfaction for matters regarding lifesaving facilities. Only 33 people have partial satisfaction and no satisfaction for matters punctuality of the commuter boats.

Table 5: Respondents' satisfaction levels with mean and standard deviation

Elements	Frequencies					Averaged level of satisfaction and standard deviation			
	Satisfaction Level					Male		Female	
	5	4	3	2	1	mean	SD	mean	SD
Distance from home / convenient distance	7	40	41	8	4	3.40	0.837	3.36	0.93
Cheap Transportation Mean	9	36	46	8	1	3.44	0.841	3.44	0.788
Fare	10	25	48	16	1	3.22	0.902	3.31	0.879
Lifesaving Facilities	6	24	43	24	3	3.07	0.915	3.05	0.931
Punctuality of Service	5	21	41	27	6	2.89	1.027	2.95	0.911
Overall Satisfaction on Services	6	22	58	13	1	3.20	0.919	3.18	0.641

## CONCLUSION

This study conducts a survey on passengers' satisfactions of commuter boat services in Chao Phraya River, Bangkok, Thailand, in term of service by using questionnaire as a study tool. Having questionnaire as a study tool, total 100 respondents are passengers from major piers. Even though this study finds that passengers are moderately satisfied to all aspects, the boatpool services still need improvement for punctuality, and lifesaving facilities. It is interesting that only the level of income has an effect on the passengers' satisfaction. Commuter boat produces less air pollution as no traffic jam in river. However, good maintenance to boat engine is required to give less noise and polluted air. In addition, propeller of the boat can possibly transfer more oxygen to water. Today Bangkok and many provinces still depend on canals and rivers for transporting people and goods. With more than forty thousand daily users, boatpool commuter services make Bangkok a livable city in aspects of efficient and sustainable public transportation issues.

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## CITY DISTURBANCE BETWEEN HUMANISTIC LIVABILITY AND RAPID TRANSITION OF CIVILIZATION.

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### ABSTRACT:

The concept of the livable city is changed daily by the rapid transitions in the civilization, and this occurred due to global differentiation between communities in: economy, technology, social relation, and life styles. Livability guides by "humanists planning", with a desire to preserve, or in most cases to replicate traditionally "comfortable" formal values in the environment; the gentility of living, sense of personal identity, and enjoying socializing.

Humanists planning must take in the consideration efficiency as a way of measuring city performance and guides to city enhancement. Efficiency is a more strategic view of the role of the planning system, as policies to maintain cities like for example: The need to travel can be reduced by the appropriate location of development and by encouraging forms of development which decrease the needs of travel and promote sustainable modes of transport, including public transport.

This paper is try to find a ground to the concept of the livable city in recent time circumstances, and putting out lines of strategic efficiency oriented by livable urban renewal.

**Key Words:** *Humanistic livability, Strategic efficiency, Rapid Transition of Civilization*

### 1. INTRODUCTION

The recent civilization changes our concepts of the city livability and efficiency. There are differentiation between cities round the world, livability can consider as measurement tool of cities. This can be an approach of reorientation of urban planning in the recent time to make strategic vision of city livable, efficient, and civilized enhancement. This paper discuss planning reorientation toward city livability by discussing nine fundamental factors in making city morphological composition: city zoning, resource leveling, detailed zoning, infrastructure skeleton, land values, the city micro-morphology, zonal growth models, the city macro-morphology, and urban growth boundaries. Urban planning as a general concept in this paper take in consideration the particularity of the developing countries.

### 2. UTOPIANISM OF CITY IN THE NOTIONS OF RECENT CIVILIZAION

"Civilization" can describe as identity and system of organizing of a complex society, governed by constitutions and legal statutes, with a complex culture, division of labor, specialized economic activities, and with special habits in religion and living behaviors. Civilizations characterize settlements to produce better standards of living for their inhabitants, this can used as measure between societies in the standards of order, welfare, individual behaviors, knowledge and used technology. Human thoughts of perfect and welfare system of living establishing their thinking in "Utopia". (Mannheim, Karl) defined utopia as: representation of future direction, and a hope of achieving some of the things that are in no position in reality between the things that ideologues bent on keeping it.



The main anon stage transition related to real time city are:

1. In the 19th century, the appearances of the Colonization Empires, and the competition over world natural resources and markets, cause industrial revolution in Europe and north America. The city guided by economical utopia to increase productivity. This affect city by: industry make clear impacts on urban form, evolution of industrial cities guided in shape and function by industrial process within city, the need of labor increasing in urban population. Industries make pollution and environmental damages. Also increasing global links between global world as trade lines within developed transportation system to transport the raw materials and the final commodities.
2. In the 20th century, the post colonialism, the divisions of a countries, which increase in the number of capitals and cities worldwide and national system or regional governing system. There are differentiation between cities in urban situations and the welfare of residences, especial between the developing countries cities and developed ones. The country development concept cause scientific and technology utopia thought advanced science and technology will increase living standards, political transparency, democracy process and economic productivity. The evaluation of urban and regional planning: modern city suffer migration from rural area to the cities\ polarization, and uncontrolled urban growth and sprawl, this make Mega cities scale: as metropolitan urban areas. Later the development of new global threats, such as: nuclear proliferation, worldwide epidemics of diseases, global climate changes, massive deforestation, overpopulation, and the dwindling of global resources (particularly fossil oil).
3. In the 21st century, the development of the global system, Globalization with highest-order global cities. Information exchange, remain concentrated in the cores of the most highly developed central metropolitan areas of the most highly-developed national economies. Major metropolitan cities as a whole continue to expand. The developing countries cities suffering from: Poverty, Unemployment, and outer migration of qualified citizens. The massive using of the natural resources and producing of environment pollution make an ecological utopian of saving the natural resources, and finding cheap and renewal sources with limited ecosystem of energy. The transnational transportation and economical relation make a global utopian as one world community. This create methods of measuring between cities, as how they: Sustainable: related to human, environment and using of natural resources, Intelligent: related to Advances in communication and transportation system, Network: related to services distribution system, urban agglomeration and city entrepreneur, and Global: related to interconnectedness and internationalization of the connections between certain sections of most cities and the outside world, impacting on all quarters of the city.

## 2.1 Information civilization notions for cities:

The recent human civilization discriminatory with information technology and its affects in all human life aspects. This of course also affect and will continue affecting city in different ways:

### 2.1.1 City activities:

- Teleworking start replacing physical commuting to work; tele-education and tele-health will replace schools, universities and doctors; tele-services will replace face-to-face services; teleshopping-based 'virtual' malls will eventually supplant town centers and out-of-town retailing. Iron out geographical differences, totally redefine cities and make location virtually irrelevant. There are differentiation between cities in interesting and consumption in tele-mediated social interaction but this turn to be necessities.
- This advantages some individual behaviors in support distant social and familial links. It is parallel systems linking presence in urban places with presence in electronic spaces. 'Digital

living' 'will remove the limitations of geography'. Telematics networks will replace physical concentration and will also overcome the need to travel, and solve many of the problems which futurists and utopianists see as the results of concentration in industrial cities.

- A time society in which each individual has two bodies: a 'real' body consisting of its physical presence, and a 'fictional' body shaped by the information directed at or received by it" (Ito, 1994). The 'fictional' body is becoming more and more demanding. Soon, he believes, the presence and growth of our 'fictional bodies' will dissolve all traditional communal links in our cities. Communities, localities and families, and all their contingent relationships based on face-to-face physical contact, will be replaced by non-space-demanding relationships between fictional bodies.
- Urban studies must explore the complex and recursive interactions between urban places—as fixed sites which 'hold down' social, economic and cultural life—and electronic spaces—with their diverse and real-time flows of information, capital, services, labour and media. Often these webs—the new industrial spaces, the research and development parks, the high-level corporate and financial services, the centralized back-office functions, the social, leisure and shopping activities, the clusters of educational and innovational activities, the massive transport infrastructures—are actually strengthened by the shift to tele-mediation.

#### 2.1.2 City inner relation:

- As Castells (1989) and Sassen (1991) global cities have demonstrated as global transport and telecommunications hubs, along with their concentrations of scarce skills, social and cultural advantages, tacit information, and the importance of face to face exchanges at the apex of corporate power, have all reinforced the positions of these cities. They now function as key command, control and financial centers, for globally scattered multinational corporations as well as an integrated global financial marketplace.
- Space and time, and speed and distance are thrown together in new and often be wildering ways within the physical arenas of dominant cities. This represents not transition to romantic rural ways of life, but the emergence of a 'superurban' and 'super-industrial' capitalist society operating via global networks. Telecommunications seem to support new types of urbanization, which often strengthen and remake place-based relational meanings in cities.

#### 2.1.3 City inner networks:

- Advanced telecommunications are used to control, monitor and facilitate ever intensifying transport movements; they help increase the capacities of road, rail and airline networks; and they limit the negative effects of transport congestion (as with the use of mobile phones, for example).
- The 'urban' seen as a locus for many social, economic, institutional and technological networks spread out over diffuse and extended regions. Notions of 'community' are required which take account of the fact that geographical neighbors may or may not have meaningful social contacts with each other, whilst they may each link into geographically stretched 'virtual communities' based on phones and electronic media. Complex combinations of electronic propinquity in the 'non-place urban realm' and place-based relational meanings based on physical propinquity and transport need to be considered in parallel.
- Approaches to 'urban culture' must similarly address the fact that urban public space may or may not emerge as a common cultural arena, but interact with the forging of diverse cultural identities via both passive mass media (for example, transnational television) and interactive electronic media (such as the Internet).

- Urban economy: must address the fact that firms may or may not create linkages with adjacent or local firms, whilst they are likely to be tied into geographically stretched transactional and linkage chains, based on advanced telecommunications.

#### 2.1.4 City regional context and influence:

- Telematics allow large cities to extend their strategic dominance by 'acting at a distance' in regional and global ranges, and dominating what goes on in other places, in a volatile and global economic environment. The vast city region, tied intimately into global grids of electronic flow and held together by electronic as well as place-based connections. For large sections of urban populations who, without access to either physical or electronic communications, remain physically trapped in the traditionally marginalized life of the impoverished.
- New rural societies will emerge, as people exercise their new freedom to locate in small, sustainable, attractive settlements that are better suited to their needs (Goldmark 1972).

#### 2.2 City issues in 21st century:

There are nine factors mention in this paper as important issues affect city and urban planning:

- **City scale:** In 1800, only 3% of the world population lived in cities, a figure that has risen to 47% by the end of the twentieth century. In 1950, there were 83 cities with populations exceeding one million; by 2007, this number had risen to 468. The UN forecasts that today's urban population of 3.2 billion will rise to nearly 5 billion by 2030, when three out of five people will live in cities. This increase will be most dramatic on the least-urbanized continents Asia and Africa. Cities challenged with: The restructuring of urban form, the growth of edge cities as the new urbanism, and reformation the darker side of the outer and inner city. *How to sustain city efficiency?*
- **City compaction:** The increase of the city dweller and the expansion of the city in the land. Decentralization increase in recent time for development in technology especially in the information and communication. This make a need of compact city; to protect the natural environment and decrease the cost of infrastructure. *How to decrease the cost of urbanization?*
- **City sustainability:** Some planners argue that modern lifestyles use too many natural resources, polluting or destroying ecosystems, increasing social inequity, creating urban heat islands, and causing climate change. (Wheeler,1998), defines sustainable urban development as "development that improves the long-term social and ecological health of cities and towns." He sketches a 'sustainable' city's features: compact, efficient land use; less automobile use, yet better access; efficient resource use; less pollution and waste; the restoration of natural systems; good housing and living environments; a healthy social ecology; a sustainable economy; community participation and involvement; and preservation of local culture and wisdom. City challenged with environment issues as the sustainability and green architecture. *How to keep and enhance the beauty of present?*
- **City management:** In the formulation of the public city the public sector offered the potential for a more egalitarian equity city, while the pursuit of capital and private goods was seen to be inevitably implicated in the exploitation of one class by another. The public was thus celebrated as a space where working-class needs could be met and where gains in the form of public housing or public services were won. The city must work not just in the interests of view but in the interests of all citizens. The public services were seen as potentially emancipator and necessary to be independent and able to enter the public realm. Though in its welfare role the state was seen to have something to offer, the state saw its potential as a space of reform, equality legislation, and provider of resources (Watson 1989). But the limit of what the state offer variation from country to

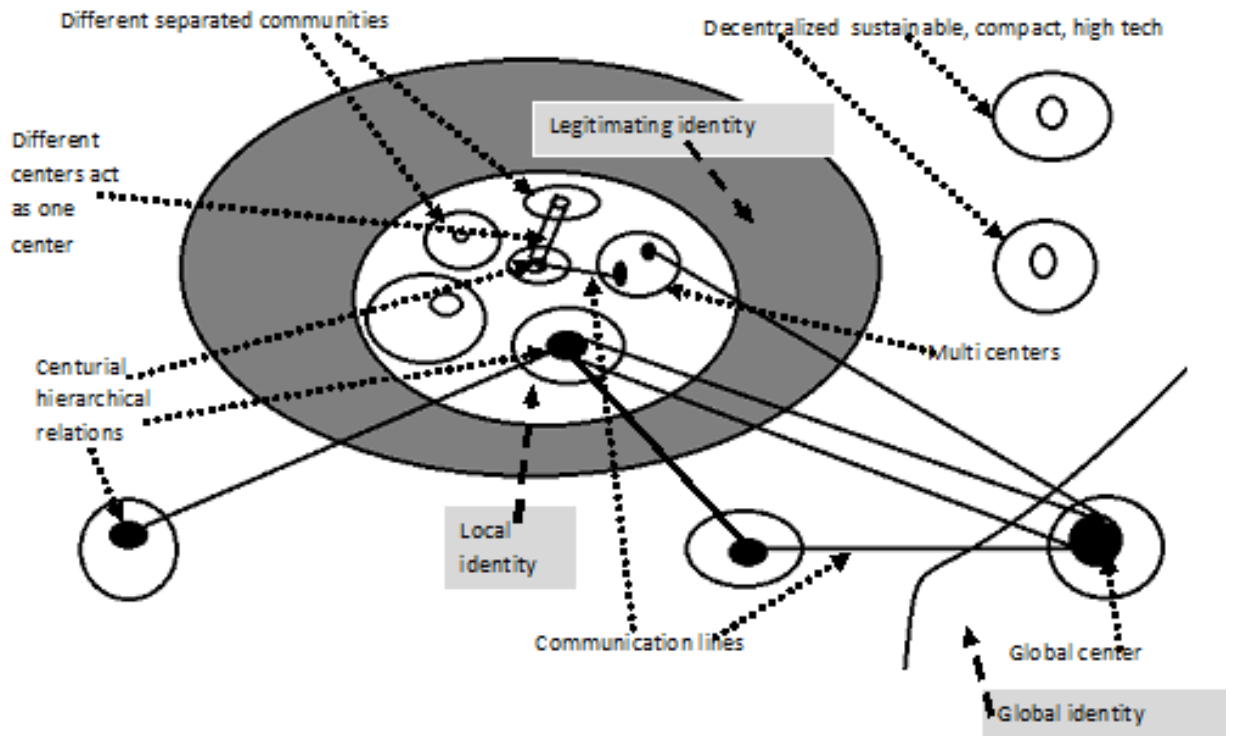
other. This make a need of restructuring of the political economy of urbanization and the formation of the primacy of production in the recent global economy. The traditional modes of urban governance under threat in all parts of the world; they work under an impossible informational handicap compared to the market. Where entrepreneurs can demonstrate the ability to take on functions once administered by the state, markets will develop in these services; alternative organizations will emerge; and with them new institutions to govern those markets. How to make public welfare?

- **City justice:** Stress on the diversity of city dwellers can increase the cultural and aesthetical elements in the city. Ethnical markets, neighborhoods or streets. Also diversity of classes and income rates reflect as diversity of commodities and services. Diversity of price, atheistic and ideal values. Diversity of form and shapes and places. The pressure of class or ethnic group in the hierarchy of the arrangement of distribution. This make a need of restructuring social mosaic and the emergence of new polarizations and inequalities as the new community relation and context, especially with the concept of open communities. How to deal with differences?
- **City intelligence:** Intel Cities aim to create a new and innovative set of interoperable, e-government services to control environment, city entrepreneur, and provide information to all citizens and businesses about all aspects of city life via interactive city-wide Internet based applications, participate in the global community. Aimed to: Address poor quality information that prevents the effective use, management and planning of cities; Support the everyday needs of citizens and business by providing 24 hour access to transactional city services; Develop more efficient city management by integrating services across city authorities, regional and national government agencies, utility and transport system providers, non-governmental organization networks and citizens; Enable citizens and businesses to play a far more participative and inclusive role in city planning via more reliable city modeling, predictive planning, and advanced visualization technologies. Also cities challenged by: the restructuring of urban imaginary and the increasing hyper reality of everyday life: simulating urbanism as a way of life is variations on a theme park; the protecting of cities fictional bodies, information technologies and the substitution of police for polis as the cities of quartz, further elaborations, and interdictory spaces in the built environment. How make smart, competitive and fortress cities?
- **City networks:** As we move into the twenty-first century, we see changes in the technology of infrastructure, transportation, communications and information . Technology and instantaneous communications are making cities, or reinforcing the importance of big cities as centers of the knowledge and economy. Jobs shifts over several decades form manufacturing toward service and the more recent growth of entrepreneurial cybernetics continue to lure workplaces from downtowns to regional locations accessible only by car. Cities need to use technology and communication to create more efficient agglomerations in terms of competitiveness, innovation, environment, energy, utilities, governance, and delivery of services to the citizen. How to make efficient network relations in and within cities?
- **City globality:** The city is seen as a container where skills and resources are concentrated: the better able a city is to concentrate its skills and resources, the more successful and powerful the city. This makes the city itself more powerful in the sense that it can influence what is happening around the world. World city, is a prominent centre of trade, banking, finance, inovation, and markets. The terms "Global City", (Saskia Sassen 1991), whereas "megacity" refers to any city of enormous size, a global city is one of enormous power or influence. Global cities, according to Sassen, have more in common with each other than with other cities in their host nations, heavily influenced by economic factors and, thus, may not account for places that are otherwise significant. Globalization and informationalization together result in the increasing importance of cities at the very top of the hierarchy, the so-called world cities or global cities. All capitals demand a high

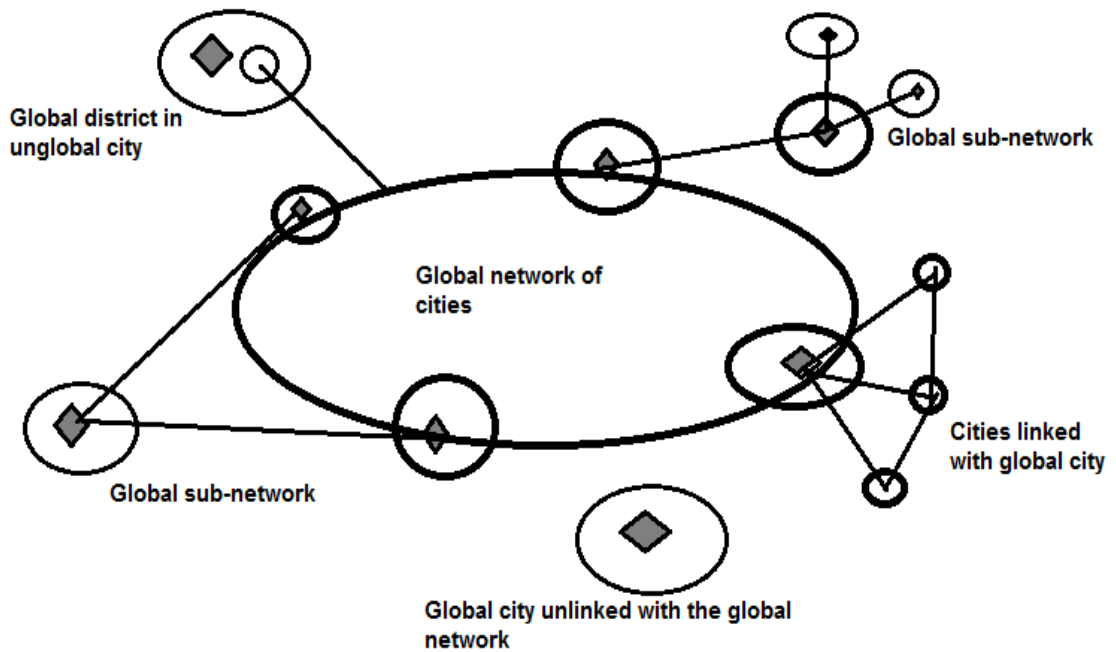
degree of immediacy and face-to-face exchange of information, so that they have strong agglomeration forces operate; All are synergistic, with many key activities – hotels, conference centers and exhibition centers, museums and galleries, advertising – overlapping from one category to another and so operating critical interstitial spaces. Thus, strong agglomeration tendencies apply not only within each sector, but also between them. Global cities challenged by: the gated community acts as artifactual evidence not simply of globalization, but of globalization's peculiar urbanistic outcomes, much of the analysis of gated communities is premised on recognizing and theorizing the kinds of fears and antagonisms that a lived experience of radical difference in urban settings can produce, created a new model of spatial segregation in many cities around the world." Globalization may intensify certain kinds of social polarization, it may cleverly market local specificities, and it may even excite new kinds of resistant differentiations. How to make cities advantages globality?

- **City identity:** The city presents a concentration of nodes where users are informed and transformed through the identity and functionality of a series of layered networks, making each node on the network a potential access/exchange center. Global integration proceeds through digital communication and a homogenizing mass culture, the counterforce is a movement toward fragmentation of places and more individualized choices of identity. Whether based on inherited ethnicity or religion, on group memberships from the past, or on new lifestyle choices formed around leisure pursuits, or an environmental movement. Information exchanges via high-end computer systems within real architectural spaces, both public and private, will become second nature (hybrid & virtual nodes). The systems will need to be implemented on each spatial level of the contemporary city. Information technology and gated communities increase in diversity in purely demographic terms different range of ethnic, religious, and other identity-group, that changing urban communities to accommodate; the respect for autonomous cultural space, enfranchisement in civic life, and the extension of economic opportunity, whether through work, investment, or the social safety net. The global behemoth of firms, groups, territories, and populations that is interconnected and interdependent. The changes in nation-state concept economically make change in the welfare state idea. As tension between system and life world; natural live and civil live\ national role and adopted role\ colonization and national role\ citizen and client. There is struggle between the self and the net (civil society and the outside society). The struggle is consequential. Self-determination, meaning, and identity are challenged by external forces of the Net: globalization, mobility, information, and technology. What is city about?





Figure(1): Real time city micro-morphology.  
Source: Alia2014.



Figure(2): Real time city macro-morphology.  
Source: Alia2014.



### 3. CITY LIVABILITY AND EFFICIENCY AS A WAY OF DIFFERENTIATION BETWEEN CITIES:

(Frey\ 2005); All cities are different and some offer their citizens more advantages than do others. It is the main objective of good urban planning and design to create new advantages or enhance the existing advantages a 'good' city has to offer. The human needs make various demands on the city thus derived an excellent basis for the measurement of the quality of a city by establishing what levels of human needs and aspirations it is able to satisfy.

#### 3.1 City livability:

In order to attain the goal of a livable city, a wide range of social, economic and physical factors must be satisfied, the availability of those factors control city efficiency. The city is not a closed system but is linked to regional, national and international systems that impinge upon the quality of the urban life space. A most useful guide in this enterprise is Kevin Lynch's A Theory of Good City Form (Cambridge, MA, MIT Press, 1981). A 'good' city on the basic level:

1. Provides for all the physical needs of its citizens: a place to live and work, a reasonable income, education and training, transport and the possibility to communicate, access to services and facilities.
2. Offers safety, security and protection, a visually and functionally ordered and controlled environment free of pollution, noise, accidents, crime.
3. Offers, furthermore, a conducive social environment. It is a place where people have their roots and children have their friends; it enables the individual to be part of a community and provides the feeling of belonging to a place, to a territory.
4. Has an appropriate image, a good reputation and prestige; it gives people a sense of confidence and strength, a status and dignity.
5. Offers people a chance to be creative, to shape their personal space and to express themselves; it offers communities the chance to shape their districts and neighborhoods according to their needs and aspirations.
6. Is well designed, aesthetically pleasing, physically image able; a 'good' city is a place of culture and a work of art. It goes without saying that urban design on its own cannot achieve a city that has all these properties, many of which depend upon social and economic conditions which need to be planned for. But design can shape the physical properties of the city and its districts in such a way that they can become the places for the fulfillment of people's wants and needs.

7.

#### 3.2 Livable city and city efficiency:

City efficiency refer to: the performance of the city and its' possibilities to satisfy its citizens their needs and wants. The efficiency can be measuring by five criteria:

- 1) **Goals:** the input and the output, cost and revenues; to achieve the goals at the least cost, and balances the achievement of the goals with one another, if they cannot all be maximized at the same time. This approach used in the research to discuss real time city model; as a utopian concept.
- 2) **Determinate factor:** it can be taken from one direction as social efficiency, economical efficiency, or technological efficiency. Related to our research purpose, this study focused in studying efficiency related to two factor population growth and economical situations, but they act as variables between different cities.

- 3) **The advantages and disadvantages:** comparing to other elements like the human welfare and social advantages; or in comparing to other cities or factors;
- 4) **Related to regional consideration:** comparing with different places, or related to time considering semi place or places in the changing time; and
- 5) **Justice:** a just city distributes benefits among its citizens according to some fair standard.

### 3.3 Measuring efficiency in this paper:

To be more accurate we will use measuring efficiency by determinate fundamental efficiency factors related to the research purpose.

Surveys that determine a city's livability use indicators to rate cities such as:

#### 3.3.1 Cities needs:

Table(1): Pressure on the welfare state, explain the challenges face the planning for human welfare.

**Table(1): Pressure on the welfare state.**

<b>Demographic trends</b>	<ul style="list-style-type: none"> <li>• Increasing numbers of dependent groups (e.g. unemployed people, homeless people, old people, infirm elderly people, single-parent families, disabled people)</li> <li>• Growth of the 'new poverty' through polarization of incomes and large numbers on very low incomes</li> <li>• Feminization of the workforce (e.g. growth of low-paid jobs and increased need for day care)</li> </ul>
<b>Cultural factors</b>	<ul style="list-style-type: none"> <li>• Rising expectations and desire for higher standards</li> <li>• Desire for diversity of provision</li> <li>• Strength of pressure groups (e.g. on behalf of women, disabled people, old people, long-term sick people)</li> <li>• Growth of consumer culture</li> <li>• Increasing cultural pluralism and diversity</li> <li>• Growth of 'New Age' movements (e.g. alternative and complementary medicines)</li> <li>• Tax revolts</li> </ul>
<b>Intellectual/ ideological developments</b>	<ul style="list-style-type: none"> <li>• Growth (rebirth) of New Right ideas</li> <li>• Decline of faith in collective solutions to social problems</li> </ul>
<b>Economic trends</b>	<ul style="list-style-type: none"> <li>• Increasing proportion of the population dependent upon a smaller work force</li> <li>• Inelastic sources of local revenue, 'stagflation' (high unemployment and high inflation)</li> <li>• Increased competition between nations for mobile capital combined with enhanced sensitivity of national economies to capital flows</li> <li>• Desire of transnational corporations for low social overheads</li> </ul>

Source: S. Pinch\1997

In the Second United Nations Conference on Human Settlements\ Habitat II- in April 1996 at Istanbul, Turkey. Popularly called the "City Summit" which is adopted the Habitat Agenda, a global action plan to realize sustainable human settlements. (As the subject of chapter 7 of agenda 21); the Regional Action Plan have become the major guide for countries of the region to improve the quality of life and promote the sustainable development of human settlements. The conference recommendations; the needs of the cities by determinate improvement sides in the program areas which include:

1. Providing adequate shelter for all;
2. Improving human settlements management;
3. Promoting sustainable land-use planning and management;
4. Promoting the integrated provision of environmental infrastructure: water, sanitation, drainage and solid waste management;
5. Promoting sustainable energy and transport systems in human settlements;
6. Promoting human settlements planning and management in disaster-prone areas;
7. Promoting sustainable construction industry activities; and promoting human resource development and capacity-building for human settlements development.

### **3.3.2 The character of urban area efficiency consideration:**

1. Cities capacity in consuming of natural resources and producing of pollution and waste;
2. Availability of services; public and social services: health, education....
3. Good infrastructure; like clean water, energy,....
4. Comfortable transportation system; for local, regional and international mobilizing.
5. Suitable environment; all the factors improve human health, increase its productivity and conserve ecology.
6. Improvement in industry and commerce; the sources of public treasure.
7. Good employment opportunities; as working methods, hours, and income.
8. Development in the physical planning system by:
  - a) New types of building;
  - b) Growth in the land value;
  - c) Growth in the building pattern.

### **3.3.3 City efficiency morphological design consideration:**

1. Degree of containment of development; the city structural and morphological form.
2. Population density relative to land needed; in social, environmental, human health, and economical aspects.
3. Viability of public transport; comfort, accessible, reasonable cost, safety.
4. Dispersal of vehicular traffic; for public and privet transit.
5. Viability of mixed uses; to decrease travel generation and needs of transportation.
6. Access to services and facilities; with the minimum exertion.
7. Access to green open spaces (parks, countryside); for all citizens
8. Environmental conditions (noise, pollution, congestion); to conserving human health.
9. Potential for social mix through variety of housing; to insure social and economical opportunities equitation.
10. Potential for local autonomy; as poor and weak classes, minorities and also combinations.
11. Potential for self-sufficiency; by mixing and generating different production, and economical activities.

12. Degree of adaptability; for all natural and built up environment.
13. Image ability of the city (the physical entity) as a whole; with modernity, heritage and aesthetical aspects
14. Image ability of parts of the city (neighborhoods, districts, towns); with identical and distinguishable characteristics.
15. Sense of place and centrality; insuring unity and networking between morphology and community cells.

The diversity of human needs and tastes frustrates all attempts to provide recipes or instruction manuals for the building of cities. However, we can identify the crucial dimensions of city morphological performance, and specify the many ways in which cities can achieve success along these dimensions. Lynch offers five basic dimensions of city performance:

1. Vitality, fulfils the biological needs of its inhabitants, and provides a safe environment for their activities.
2. Sense, is organized so that its residents can perceive and understand the city's form and function.
3. Fit, with good fit provides the buildings, spaces, and networks required for its residents to pursue their projects successfully.
4. Access, city allows people of all ages and background to gain the activities, resources, services, and information that they need.
5. Control, is arranged so that its citizens have a say in the management of the spaces in which they work and reside.

Efficiency of those factors and Justice between citizens, are consider as criteria tell aspiring city builders where to aim, while acknowledging the diverse ways of achieving good city form.

#### 3.3.4 City accentuation efficiency consideration:

1. Ability to attract the “creative classes”– highly educated and well-paid workers in technology, entertainment, journalism, finance, high-end manufacturing and the arts, who share a common ethos valuing creativity, individuality, difference and merit.
2. Regional effective role in the region and country development;
3. Rural and urban successful association; in movement, services and production aspects;
4. Global presence and glory; for both citizen and nation.

These can achieve by offering:

- (a) Best quality of life;
- (b) Reduce poverty;
- (c) Political stability;
- (d) Economic viability;
- (e) Low crime rates;
- (f) Create a healthy living environment
- (g) Strength the cultural fabric of society.

#### 4. REORIENTATION OF URBAN PLANNING:

- The concept of the city efficiency is changed daily, by the transitions in the civilization. There are global differentiation between communities in: economy, technology, social relation, and life styles. These differentiations create differentiation between world cities.

- City planning, now understood primarily as the making of policy, was incorporated into the: government, architects, landscape architects, and urban designer. Focus on: "humanists planning" with a desire to preserve, or in most cases to replicate traditionally "comfortable" formal values in the environment; a sense of personal identity; and the gentility of life in a small town. At the other end, there are those who believe we face a new kind of reality that requires architectural expression. This reality of: poverty, deprivation, and loss around them (related to the sustainability).
- A more strategic view of the role of the planning system, specifically its contribution to achieving sustainable development. It summarizes other policies to maintain cities like: The need to travel can be reduced by the appropriate location of development and by encouraging forms of development which promote sustainable modes of transport, including public transport, and encourages the maintaining of existing urban densities.
- Planners can help manage the growth of cities, applying tools like zoning and growth management to manage the uses of land. Successful urban planning and maintain the capacity of historic towns to sustain development', considers urban character, local identity, respects heritage, pedestrians, traffic, utilities and natural hazards.
- The creative use of hybrid architectures and media information environments will give contemporary artists new ways to address content. This will engender a new architecture of creation and distribution for artists, defining new intelligent forms and in turn bringing about a paradigm shift in artistic production. Such forms will focus all the potentials of computing in a resonant manner. These intelligent attributes will also bring about alternate forms of entertainment, educational systems, access to information and interpersonal communication.
- Discussion of planning reorientation by discussing nine fundamental factors in making city morphological composition: city zoning, resource leveling, detailed zoning, infrastructure skeleton, land values, the city micro-morphology, zonal growth models, the city macro-morphology, and urban growth boundaries.

#### 4.1 Planning Directions:

Planning reorientation toward city livability discussing by nine fundamental factors in making city morphological composition: city zoning, resource leveling, detailed zoning, infrastructure skeleton, land values, the city micro-morphology, zonal growth models, the city macro-morphology, and urban growth boundaries. Those factors consider as basis of urban plans:

##### 4.1.1 City zoning:

- Reduce urban disorder and the spatial scales of the interurban, the city as region, and the neighborhood. The discipline to that, is search for "common values" and "social solidarity," "territorial belonging" and "identity" .
- Determination the using of the land source within the city, from the start as planning, or defining it recently uses as developing planning is in a diagram plan help in clearing the strategic functional distributing in the city morphology and managing them in near term or to achieve goals for the future.
- The concept of zones refers to a pattern of individual cities at a national scale, within a larger region, or to a pattern of centers within the individual city. The 'polycentric city' has increasingly been promoted as a more feasible alternative to the centralized and monocentric urban development associated with the compact city model.
- Compact city has focused on the negative environ-consequences of a land-consuming and sprawling urban development in terms of, among others, loss of natural and agricultural areas



and a high energy use for transport and in buildings. Against Compaction, the 'green city' as the ideal sustainable urban form, focusing on local self-sufficiency, waste and water management, and closed circuits of substances, have assumed that such 'urban ecological' principles require a relatively low density.

#### 4.1.2 Resource Leveling:

- The relative value of share wealth such as land, capital, savings, or as social capital, health, education facilities, and the internal empowerment, must be ordered and identified.
- For equitation; diversity influences in resources allocation as: The need and the opportunity to share resources; the differences that persist, attitudes and behaviors that allow co-existence, active inclusion, curiosity, and signals of respect for the other; and decisions to cooperate multiple group identities, loyalties and memberships.
- Defined as a legal right to resources, government assistance access is the ability to obtain the use of assets in recovery process to lower situation units; putting in comparison between different alternatives; and the success depend on speed and capabilities. This in Collaborative decision: Because the political and governance structures in most jurisdictions, must be widely supported before they can affect institutions and regions.

#### 4.1.3 Detailed zoning:

- In the city functional zones the access to services and facilities, digital communication infrastructure, and to transport nodes in global and local context, responds to the most basic functional needs of provision and mobility.
- The ways of reducing negative human impact and enhancing ecosystem services: are environment management which is based largely on information gained from earth science, environmental science, and conservation biology. And management of human consumption of resources: this is based largely on information gained from economic.
- The form and shape of the city and the quality of life it offers is a synthesis of all these economic, technological, demographic, and environmental factors.
- Electronic technology addition to design: Intelligent building enclosure; is energy and information mediator by using flexible control strategies between indoor and outdoor.
- Electronic technology addition to planning: the intricate connectivity of the living urban fabric; methods of repairing urban space; an effective way to overlay pedestrian, automotive, and public transports; how to integrate physical connections with electronic connections; the failure of zoning, the role of networks, and network-based urban planning.
- The changing global economy requires manufacturing and service firms in metropolitan areas: to become more flexible in their operations; to use advanced technology to produce high-quality, reasonably priced goods; and to rely on speed-to-market methods of operation.
- They must foster an attractive quality of life that nurtures the cultural, social, and recreational amenities and the healthy environmental conditions that managers and attract high quality workers in new economy enterprises value.

#### 4.1.4 Infrastructure skeleton:

- To remain, or become, economically and environmentally sustainable, cities and their regions must create cutting-edge infrastructures that integrate advanced technologies, communications, and multiple modes of transportation.
- Roadways and vehicles are undergoing evolutionary change to: improve safety; reduce the costs of travel; simplify operations; maximize system capacity; and designed to meet the needs of three stakeholder groups:(system users; system operators; and system providers).



- Advance technology improve the capabilities, supplies and equipments of each type of infrastructure, and create new imaginary environment.

#### 4.1.5 Land values:

- Still more likely is to live and work in central city\ CBD\ metro areas\ capital areas as a central place of services and work and most accessible zone. As a result, they are willing and able to pay a very high land rent value. They maximize the potential of their site by building many stories.
- The importance of the inner city will decline as result of decentralization of living; with a growth of satellite centers from the CBD; and with agglomeration of retail stores. Industry, will be distributed as location economy considering the benefits of the agglomeration. For the housing units the importance of the environment and comfort will replace the importance of travel distance.
- Cities attempt to develop new ways of improving the environmental performance of their older water, waste, energy and transportation infrastructure, very little interest has focused on the latest form of urban infrastructure telematics and telecommunications networks.
- Preferential places for work and live are the places in harmony with nature: environmentally sound, non-polluting and non-destructive of the ecology.

#### 4.1.6 The city micro-morphology:

- The modern metropolis related to different background of migrants characterized by increasing depersonalization of all social relations. This distribute city to different territories of identities, those must be connected to make planning unity and decreasing marginality and segregation.
- The global forces create new context of institutional organizing, the power of the local authorities decreasing and this must be treated by more flexible and controlled zoning and city management.
- Different categories of residents means different needs and abilities, which must be solve by planning.

#### 4.1.7 Zonal growth models:

- A multi-nucleated city (or even city region in which uses concentrated in the mono-core of the compact city) are dispersed into a number of smaller centers forming the nuclei of urban districts or towns or 'villages'. For sustainable city growth: inner cities must be rejuvenated, thus reducing further losses of population and jobs; public transport must be improved both between and within all towns; mixed use must be encouraged in cities, and zoning discouraged; people-intensive activities must be developed around public transport nodes; urban (or regional) greening must be promoted; and infrastructure systems must be promoted in new and existing developments.
- Smart sprawl through a network oriented: starting in orientation of the economical and social network; establishment of a system of network nodes of different sizes at strategic locations throughout the region to provide access to metropolitan area network; transformation of single-function are into mixed-function with network node; creation of plans for adding a mix of functions to single-function districts such that housing, jobs, and services will be integrated; creation of neighborhood transportation zones around the network stations (mixed-vehicle streets catering to low-impact vehicles); and beginning of reclamation of some of the land devoted to high-performance automobiles (such as housing construction on surface-parking lots in retail centers or office parks or reclamation of streets).

#### 4.1.8 The city macro-morphology:

- There are declining significance of traditional borders, and appearance of transnational system of relation between world cities. The meaning and importance of distinctions such as between urban and rural, and center and periphery, are changing.
- Compact city beside the environmental and energy advantages and social benefits help in increasing competes of the cities in the global urban system, by providing good services and infrastructure.

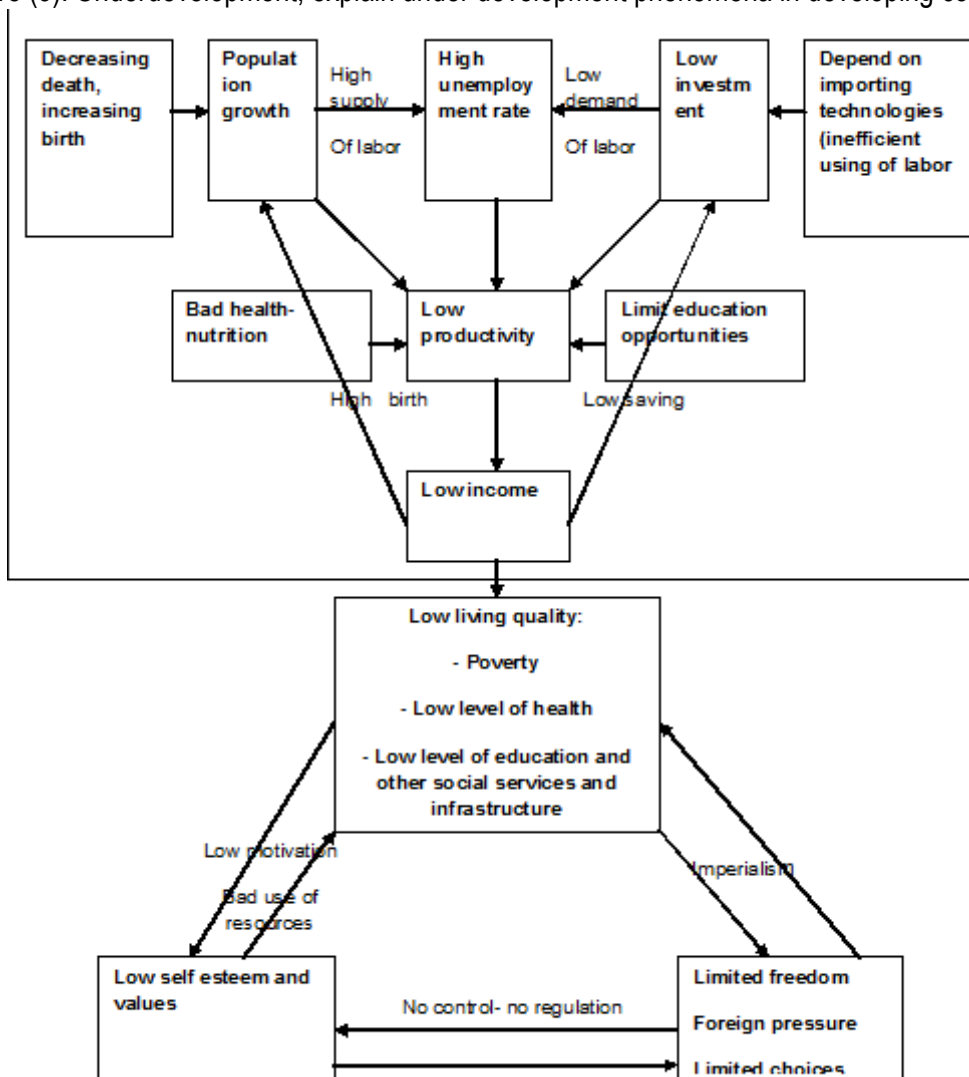
#### 4.1.9 Urban growth boundaries:

- The factors scaling the effects of urban growth in planning are: consideration sustainability in planning; the new urban scale related to the state boundaries; centralization position; and network efficiency.
- People migrate depends on forces that “pull,” as well as those that “push,” them to leave. Pulling factors are: economic density in leading regions of countries; differences in economic opportunity between lagging and leading regions. On the other hand, people are pushed off their land where agriculture is in severe decline, by the pressures of population growth, and where environmental change makes cultivation no longer viable, the lack of adequate public services in rural areas or in economically lagging regions, looking for better jobs, better access to basic public services such as piped water, electricity, and health care. Policymakers have to viewed internal migration— or labor mobility— from lagging to leading regions, or rural to urban areas, as a consequence of failed place- based policies, policies raise barriers to the movement of labor. For the movement spatially sharpest effects include: Progressive income tax policies, the achievement of national minimum standards in basic health and education indicators, and spatially connective policies such as transport and communication improvements physically link lagging and leading regions. Spatially targeted incentives should be policy instruments of last resort, only to be used when factor mobility is weak due to internal divisions from ethnic and linguistic fractionalization.
- The development policies should focus on: building human capital that enables people to become geographically mobile; Investing in basic public services and core infrastructure in lagging regions should be of high priority. Access to these services will directly improve welfare in lagging regions and will reduce the push factors that induce migration; and by overlooking the provision of basic social services in economically lagging regions, policymakers can inadvertently influence the choice to migrate, motivating households to move for reasons other than to exploit economic opportunities.

### 5. DIFFERENTIATION OF THE DEVELOPING COUNTRIES:

Cities come to be known for their place in a global urban hierarchy produced by one single force that has spatially differentiated outcomes. Cities are centered and empowered, or marginalized and dominated. There is now a vast scholarship on gated communities in cities of the First and Third World, cities of the North and of the South, and cities in the West and the East. The mention here that developing countries cities in differ from developed cities.

- Figure (3): Underdevelopment; explain under development phenomena in developing countries.



**Figure (3): Underdevelopment.**  
 Source: Gunaim\2005 (with addible)

### 5.1 Development constraints:

Any development effort planned to exceed defined goals. Goals confront obstacles which may stopped it or slow its progress; this obstacle consider as constraints. The constraint act as a limitation of possibilities. In mathematics, the constraint is a restriction of the feasible solutions in an optimization problem. In the theory of constraints, it is any factor that limits the performance of a system with respect to its goal. There is at least one constraint in any given system.

There is differentiation between limited economy region and the developed regions in the world this related to under development phenomena. Related to this the urban development constraints in LER can distributed to; the physical capacity constraints: "Challenges and Objectives", economical capacity constraints: "Poverty and Capitals", and the political and institutional capacity constraints: "Institutionalization and Partnerships".

**Table(2): Urban Development Constraints in the LER.**

Scaling of urban development constraints		Developing countries urban development constraints	
The physical constraints:	<ul style="list-style-type: none"> <li>• The total area of the country;</li> <li>• The net population density based on arable land;</li> <li>• The infrastructure expenditure and services supplies in the using area percapita</li> </ul>	Challenges and Aspirations:	<ul style="list-style-type: none"> <li>• Basic necessities:               <ul style="list-style-type: none"> <li>- Urban suitable housing;</li> <li>- Basis services for urban areas solution;</li> <li>- Urban Transport Program.</li> </ul> </li> <li>• Dynamic effectiveness:               <ul style="list-style-type: none"> <li>- Sustainability; sustainability of urban areas, and role of cities in sustainable development;</li> <li>- Flexibility.</li> </ul> </li> </ul>
Economical capacity:	<ul style="list-style-type: none"> <li>• The level of GNP percapita income;</li> <li>• The rate of growth of the economy;</li> <li>• The inequities;</li> <li>• Unemployment.</li> </ul>	Poverty and Capitals:	<ul style="list-style-type: none"> <li>• Urban poverty;</li> <li>• Capitals:               <ul style="list-style-type: none"> <li>- Finance;</li> <li>- Manpower;</li> <li>- Technologies.</li> </ul> </li> </ul>
Political and institutional capacity:	<ul style="list-style-type: none"> <li>• The degree of ethnic fragmentation;</li> <li>• The centralized structure of government;</li> <li>• The influence and rationality of decisions;</li> <li>• Public expenditures;</li> <li>• The relative balance between public and private sectors investments.</li> </ul>	Institutionalization and Partnerships:	<ul style="list-style-type: none"> <li>• Decentralization;</li> <li>• Institutionalization;</li> <li>• Monitoring and evaluation mechanisms;</li> <li>• Partnerships:               <ul style="list-style-type: none"> <li>- Local governance</li> <li>- "The right to the city";</li> <li>- Public participation;</li> <li>- Private sectors contribution;</li> <li>- City-to-city cooperation;</li> <li>- International non-governmental organization;</li> <li>- The global campaign.</li> <li>- Rural urban interactions.</li> </ul> </li> </ul>

Source: Alial2007

- All the constraints are linked together and every change (increasing or decreasing) in the role of each one cause change (increasing or decreasing) in the other's roles. Table(2): discuss-The negative effects of the constraints in the urban growth of the LEC-

Table(3): The negative effects of the constraints in the urban growth of the LEC.

The constraints	Causes	horizontal effects(quantity)	Vertical effects(quality)
<b>1.Challenges and Aspirations</b>			
• Basic necessities	▪ Inequitable or shortage in distribution of the basic necessities.	▪ Unbalance polarization causes ineffective spatial distribution. ▪ Inefficient performance.	▪ Poor urban settlements.
• Dynamic Effectiveness	▪ Urban development without ability of dynamicity.	▪ Uncontrolled polarization causes ineffective spatial distribution. ▪ Inefficient performance.	▪ Collapse in available capabilities.
<b>2.Poverty and Capitals</b>			
• Urban Poverty	▪ Increasing the role of the government and partnerships relation in the development.	▪ Inefficient performance.	▪ Human poor quality of life.
• Capitals	▪ UN efficient urban development programs.	▪ Inefficient performance.	▪ Shortage in available capabilities.
<b>3.Institutionalization and Partnerships</b>			
• Decentralization	▪ Inefficient urban development programs.	▪ Ineffective spatial distribution.	▪ Decreasing in available capabilities.
• Institutionalization	▪ Inefficient urban development programs.	▪ Inefficient performance.	▪ Decreasing in available capabilities.
• Monitoring and evaluation mechanisms:	▪ Waste of capitals.	▪ Inefficient performance.	▪ Decreasing vertical growth.
• Partnerships	▪ Inefficient urban development programs.	▪ Inefficient performance.	▪ Decreasing in available capabilities.

Source: Alial 2007.

## 5.2 Relation between urban development constraints and city morphological model efficiency concerns:

Table(4): Relation between urban development constraints and city morphological model efficiency concerns. Discuss the relation between research morphological model of city and urban development constraints. This working relation in two elements of the model: act\ activities, and store\interaction. Activities concern in effect of any constraint in each of them individually and interaction concern in the relation area between different activities.



**Table(4): Relation between urban development constraints and city morphological model efficiency concerns.**

Strategy items	Acts: Activities concerns	Store: Interaction concerns	
Basic necessities	Urban suitable housing. Water supply and water resources management. Drain and drainage networks. Energy supplies and resources managements. Human Basic services (security, health, education and recreation).	Providing adequate shelter for all; with different supplies to cover different demands Promoting the integrated provision of environmental infrastructure: water, sanitation, drainage and solid waste management; Promoting sustainable energy systems in human settlements; Promoting integrated and adequate public services	Good quality, high performance, cover different requirements
	Urban transport.	Promoting sustainable transport systems in human settlements;	
Dynamic Effectiveness	Sustainability.	Enhance city capacity in consuming of natural resources and producing of pollution and waste; Planning for short and long duration	Sustainable good quality living environment, Promoting rational, fixable, and achievable planning decisions
	Flexibility.	Promoting human settlements planning and management in uncertain situations and disaster-prone areas;	
Poverty and Capitals	Alleviating the poverty of money. Alleviating the poverty of access.	Good employment opportunities; support basic necessities, and increase income rates Supporting funding alternatives for individuals	Making abundance of national treasury Resistance urban poverty and increase human welfare
	Alleviating the poverty of power. Capitals\ Finance. Capitals\ Labors. Capitals\ Technologies. Institutionalization.	Democracy, safe, and freedom environment Improvement in economic activities Healthy, strong, and qualification labor Technological development Improving human settlements management; and the distribution of authorities and capitals.	
Institutionalization and Partnerships	Monitoring and evaluation mechanisms. Partnerships.	Methods of follow up implementation and checking goodness and mistakes Benefiting from in and out country bodies and organization associating in the urban development process	Development in the physical planning mechanism, coordination and efficiency

Source: Aial2015

## 6. CONCLUSION:

The paper find that the issues make city disturbance between humanistic livability and rapid transition of civilization, in 21 century are: How to sustain city efficiency?, How to decrease the cost of urbanization?, How to keep and enhance the beauty of present?, How to make public welfare?, How to deal with differences?, How make smart, competitive and fortress cities?, How to make efficient network relations in and within cities?, How to make cities advantages globality?, What is city about?

The indicators and measurement of livability and efficiency as a way of differentiation between cities: can distribute to four factors: first, city needs which include challenges face the planning for human welfare, and determinations of improvement sides in city program areas, second, the character of urban area efficiency consideration, related to the city position and capabilities, third City efficiency morphological planning and design consideration and linked with city performance, and fourth, City accentuation efficiency consideration, related to regional and global position of cities.

The developing countries cities have special position and challenges related to their capabilities and development constraints. The priorities of planning must focus on: First: providing cities essential needs in good quality, high performance, and cover different requirements. Second: sustainable good quality living environment, by promoting rational, fixable, and achievable planning decisions. Third: making abundance of national treasury, and resistance urban poverty and increase human welfare. Fourth: development in the physical planning mechanism, participation, coordination and efficiency.

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## THE NEW SPACE TECHNOLOGIES AS A TOOL FOR THE CONSERVATION OF CULTURAL URBAN HERITAGE: THE COLONIAL CENTER OF SETIF, ALGERIA

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### ABSTRACT

This paper deals with the new research techniques that involve the use of the advanced information and communication technology. This new technologies are made in promoting cultural and architectural heritage. The empirical focus is the historic centre of Setif and the antic city of sitifis, Algeria. We present in this paper a report of our fieldwork in the techniques of the panorama HDR as well as the AGI Photo scan surveys. Our work focuses on the information system (GIS) and other techniques that allow for the documentation and graphic data concerning the cultural and architectural heritage.

The historic French colonial centre of the city of Setif suffered in recent years, very heavy transformations in terms of urban renewal, without control, by a lack of appropriate planning tools and expertise. In this situation we set an aim to document urban and architectural heritage in peril. Indeed inventory and surveying are the first step and most important sustainable conservation of architectural heritage. Conventional methods of survey and inventory are less accurate; we explore in this paper the application of Geomatics techniques as new spatial technologies in cultural and architectural conservation.

**Keywords:** Architectural design, Tri-dimensional Digital Model, Heritage, Conservation Information System, Geographical Information System.

### 1. INTRODUCTION

Contemporary cities in Algeria are particularly affected by a major urbanization phenomenon. This process is a confrontation between a former model, with a patrimonial identity of intrinsic aesthetic and architectural values (the old centers and ancient architectures), on the one hand and a model of modernity through a International style of architecture and urban planning from the main trends of the twentieth century, on the other hand, this paradigmatic situation is at the heart of an identity issue compared to a legacy of the colonial time and another that included references to a more oriental, traditional and Arab-Muslim.

Urban spaces inherited (including the colonial centers) undergo cross and contingent transformations. These changes profoundly alter the image, architecture and identity of these memory locations. Deemed "European, colonial legacy" at the beginning of independence, this gradual "*memorialization*" through a nostalgia and an urbanity that is lost in the new extensions and urbanizations according to the modern model. These urban entities of the colonial period are very often expression of memory places of anthropo-social practices and are reinvested by Muslim population

through ritual actions, festive events such as: national and religious holidays, occasional parties, customs ... It's a paradoxical construction process of the heritage, because this space is done from a European colonial logic and for a population with a Western lifestyle, now it's occupied by the local Algerian population formerly known by "indigenous" and which were excluded from it during colonial time.



View on colonial center of Setif from book: *l'Algérie vu du ciel*  
Author: Yann Arthus-Bertrand

The urban heritage, as we understand it now, is a concept that was articulated and defined in Europe during the nineteenth century. Throughout its history, this concept has gradually widened to tackle the variety of situations that it has today. Currently, not only an ancient building can be part of the heritage: private accommodation, a factory, a street a place or a district may also be considered in the same way as a part of our cultural heritage materials, and therefore be protected and retained. In this context, how then integrates the urban heritage to contemporary urban dynamics? How is it possible today to protect and project the heritage value of the city, in an environment of constant change?

Processing and preserving are in dialectical opposition and complementarily to improve and preserve our memory and identity. The Heritage status can be entered on the facts and opinions. The facts show the insidious and relentless progression of a process of degradation of the assets inherited in Algeria. Deficient of maintenance of the buildings after independence, degradation are multiple factors to start by Lack of consideration towards the still sensitive legacy of XIX and XX century and more fierce land speculation and lack of conservation instruments (legislative tools).

The city of Setif has a colonial historic center (inherited from French colonization of the XIX century), with a regular plan and rectilinear grid of streets and remarkable architecture especially for public buildings such as banks, administrations, theater, etc.

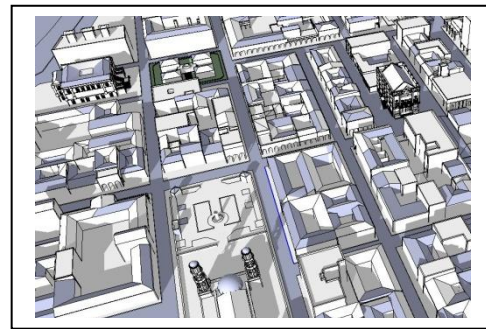
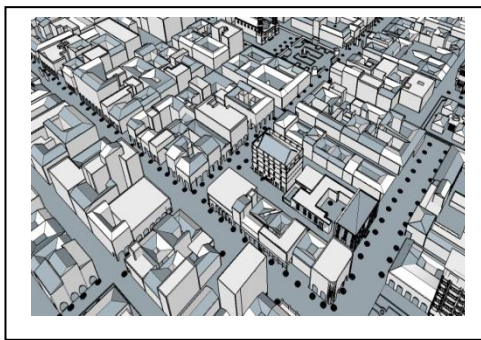




Map of historical center



View of the main avenue



3D model of urban morphology Colonial center

He suffered the last year's heavy transformations in terms of urban renewal. These operations are uncontrolled and above all by a lack of planning instruments and expertise to its regulation. Given this situation, as academics who deal with heritage, we set a goal to take care by documenting of urban and architectural heritage in peril. Indeed we agree that the inventory is the first step and the most important in the conservation of urban heritage. Conventional methods of manual survey, drawing and inventory are long and not very accurate, for that we canvass the use of new technologies in urban conservation. In terms of material, there is an important factor in this methodology is the flexibility and adaptability and to accommodate to technology that is constantly evolving. In recent decades, technology has changed - cameras, software, storage, technical and optical measuring devices and laser.



3D model of urban morphology Colonial center

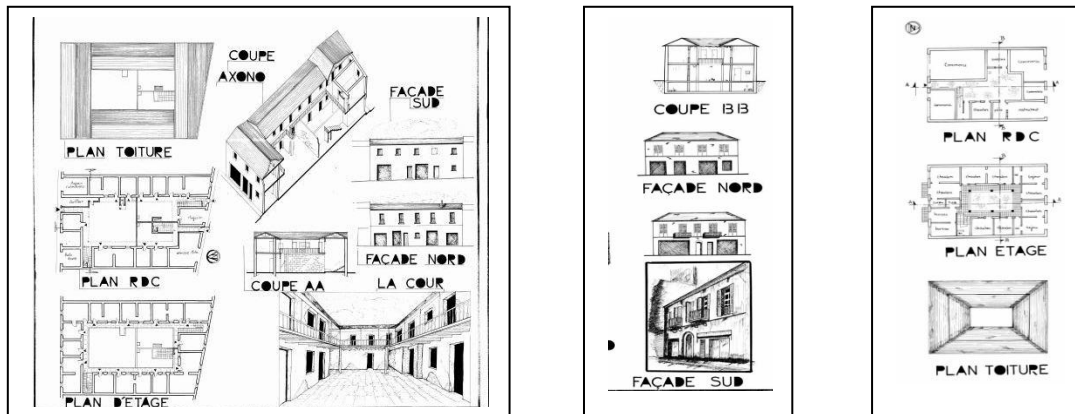
## 2. NEW TECHNIQUES

### 2.1 Benefits of new technology on old

Reviewing the importance of information technology in preserving cultural heritage, this study points out a recent model derived from information technology. The study and the design of the architecture with sustainability development through comprehension of sites are important to architects. This project is an example of the utilization of GIS (Geographical information System) in the preservation of the cultural architectural heritage of the City of Setif. The analysis consists of two aspects, the comparative of the state of the city (virtual reconstruction in the past in its original conception) and the actual state of the city of Setif and its changing tendency.

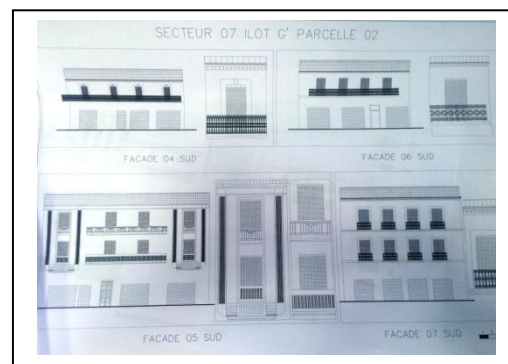
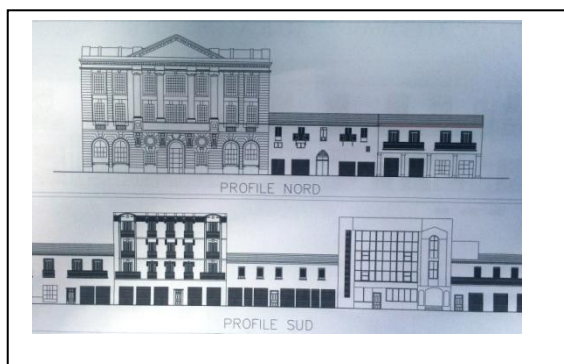
As stated above, the study of the city of Setif regenerates the preservation and the conservation of architectural cultural heritage. Furthermore, constructions are getting decreed and most of the city center of Setif. The new project proposes plan to explore the way to solve this problem and get a better living city environment.

We emphasize that these techniques are complementary to traditional methods and only enrich the documentation of a fragile cultural heritage; in fact the share of domestic records of the former method remains safe until it's replaced by Laser scanning techniques which we shall present in a future.



Traditional method based on manual drawing, work of architecture student's -survey of Colonial Center, housing model of *Harrat* -

The current work focuses to insert the architectural statement drawing, inventory and cataloging of these buildings in an information system intended for the building of heritage value where we will insert all the information previously collected: descriptive text, Photos shifts in drawing and particularly HDR panorama and digital reconstruction of facades. It's a very long process that is underway for years. The ultimate goal is to set up an information system called GIS (geographic information system) applied to urban cultural heritage. Apply scanning techniques by scanning or digitization plans, maps, etc. Set up a database on an urban territory (colonial center of the city of Setif) to use it as a tool to aid design. Learn to query the data for decision support in the urban planning process. This will allow us to prepare a detailed file about the state of the built environment of the colonial center of the city of Setif in order to be able to explore different alternatives, likely to open on responses that can reconcile the observed dynamic renovation and that may make known and contribute to understand and to act on "*heritigization*" processes and/or on the use, transmission and sustainable heritage management.



Method based on Computer Aided drawing, work of architecture student's -survey of Colonial Center -

## 2.2 Overview of technology

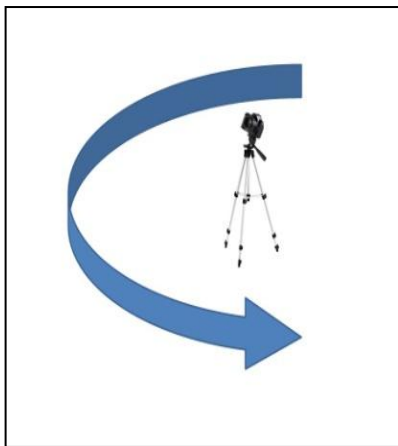
The tools used for the documentation of the heritage are varied and can include complex instruments such as 3D laser scanners, UAVs or drones, satellite imaging and infrared imaging cameras or as simple as the camera of a mobile phone, a pencil and paper. Regarding the technical side, our goal is to develop and popularize the Geomatics techniques and make them available to our Architecture discipline. To do this, we suggest the use of these tools and the training of teachers in



relation to the curriculum and teaching units on the preservation of historic buildings and the heritage-centered approach.

- To carry forward the information system, we proceeded by intermediate steps:
- Digitization of historical maps of the frame and Maps available at different dates.
- Insert a data sheet on the frame information by city block by land and buildings.
- Identification of spaces and historic buildings and characters begin their documentation: Using the HDR panorama, SFM modeling, and laser scanning.

In this work we explained the two techniques (SFM and HDR panorama). The work is done at two different scales: of space (panorama technique) and that of the object (3D modeling). For document the downtown of Setif, we opted for HDR panorama on areas outdoor and urban environments, 3D modeling / scan for architectural objects.



Panorama principle and the result is a virtual site visit

**A- Panorama HDR use:** This tool allows to reproduce portions of the environment in the same way and recreating the prospects of the built environment. This 3D (actually it is 2D) rendering gives an overview of the historic city center. Using other tools, it's possible to move in space and perform virtual tours inside or outside. These applications can be put to use in many other fields. And specialized software helps you organize the views, to link and integrate hotspots are to make real virtual tours. These visits are not only a heritage outreach to the general public but also a very specific work support for specialists.

**B- Photo-modeling and its use:** in fact in many cases, a combination of different techniques could be a useful solution. When an object can be described mainly based structures points or line, digital photogrammetry will be the ideal solution in most cases. Especially when the object has different textures, photogrammetric methods are very helpful. This technique reconstructs the three dimensional object based High-Density digital photographs with high visual acuity, and a faithful rendering and detailed textures.

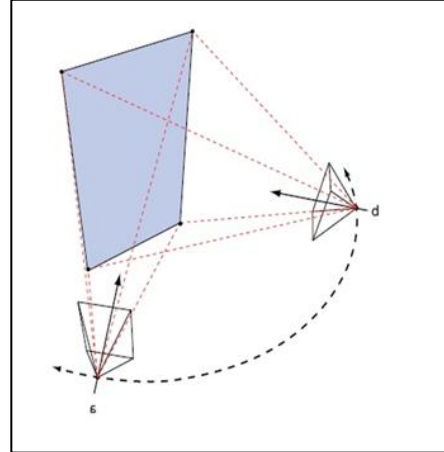


Photo-modeling used on building facade

### 3. INTEREST OF DIGITAL TECHNIQUES FOR HERITAGE BUILDING

The digitization of heritage has three main interests: the study, cataloging and diffusion.

A- Study: This aspect concern mainly 3D scanning and modeling techniques. Indeed, the Panorama HDR is an easy technique to use and requires less resources and working as project achievements in three dimensions. It can be useful as a "copy" that provides a comprehensive view of an element without being on site as Reconstitute spaces and urban environments as well as the small indoor spaces.

The technologies 3D image models have a further interest and numerous research projects and we have conducted fieldwork in scanning and modeling historical sites and objects for documentation purposes and analyzes.

The realization of a 3D model also allows us to view the items in a new form and can be a real added value for the understanding of the object, which can be observed from different angles, very closely or further to have a global view of the environment for with an accuracy that cannot be reached with a naked eyes.



Theater of Setif: Real Photo and 3D object reconstitution

Applications are also very interesting for educational mediation supports. They serve as a portal to the discovery of content: the images themselves (restitution in 3D of an existing building or disappeared contributes to its representation in the minds of individuals and leads to a better



understanding), but also all information and documents that may be related. The interactivity and playfulness of these applications are elements that encourage mediation. The application becomes a key tool for knowledge transfer.

**B-Catalog:** Photography has always been considered a solution for recording the real. It is indeed a remarkable support for studying the surfaces, shapes, textures, proportions, etc. It allows setting the state of a place, a building or any other element, at a given time. Changes technology complements this characteristic: panoramic photography and image models in 3D and have the particularity to offer a more global vision and allow reproducing a perception of space closer to reality. This copy or replenishment and keeps the real element.

**C-diffusion:** Digitization projects are not necessarily launched into a diffusion goal. The data collected may have limited use in the study and conservation. The creation of diffusion devices to the public is a fundamental aspect; however, the panoramic photos in HDR and 3D models can be integrated into the presentations, exhibitions and virtual visits, but especially in our work in the GIS. These devices can have two main objectives:

- Cultural enhancement allows showcase of heritage items, placing them at the heart of attention and to make a new sense.
- The Online broadcasting offers the undeniable advantage of making the information accessible to a wide audience.

#### **4. CONCLUSION**

We try to develop new ideas on the application of digital technologies on the architectural heritage, for the preservation of our heritage. This work is a very promising to be a flagship issue for future years, Algeria has a tremendous historical sites and our challenge is to cover the whole cultural heritage in cataloging and documentation. This practical work promotes the development and application of digital preservation techniques on architectural legacy.

The digital backup settled first as a preventive solution to cope with the threats the cultural might be facing as to complement the support of a heritage for the future generation.

Photogrammetry techniques and digital-modeling propose to initiate a process of upgrading the built heritage through a practice towards the development a knowledge that supports and promotes the thinking process that leads Innovative collaboration between disciplines Geomatics and Architecture.

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## WHY URBAN DESIGN

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### ABSTRACT

Designs of three-dimensional urban places are the subject for urban design. Urban places are designed to fit human needs. One of the measures of the quality of the designed urban places is its liveable characteristics.

Designing urban places according to human needs (behaviors) is one of the most functional objectives of urban design. But in our time human needs, related to urban places, can not be determined easily because of its complex structure. It does not matter in which level the design is going to be done.

P. Geddes suggests that human behavior is divided into four groups; acts, facts, dreams and thoughts, and says man's behavior can not be understood fully unless simple practical life, simple mental life, full inner life and full effective life can be understood.

Geddes' Thinking machine explains full behavior of human as well as its all type of activities. This mechanism may enable a basic design method for liveable urban place. When the urban places are designed according to basic human needs and activities then those spaces could be formed as liveable cities. On the other hand, if an urban place is not used, it means that it is not designed according to human needs (activities), and it is not liveable anymore.

Liveable urban places (cities) could be created by understanding the whole needs and behaviors of human. Thinking machine of Geddes could be one of the tools for the solution of the problem of our time.

**Keywords:** full effective life, urban activities, thinking machine, urban places

### INTRODUCTION

In the last five decades, many of the scholars who are working on urban design area have had several definitions of the urban design. But each of them is slightly different than the others in terms of the subject dealt.

However, the definitions can be grouped under the headings of which subject dealt; a- physical aspects of the urban space, b- social aspects of the urban space, and c- combination of these aspects.

Krier, Sitte and others, (Krier, R. 1991, Sitte, C. 1992) analyzed the physical aspects of the urban spaces and investigated them from the pure physical point of view. While, Ghel, J 1995, 1989 Harvey, D. analyzed the social aspects of the urban spaces from the human actions (behavior) point of view. On the other hand, Lynch, K1981, and Alexander, C. 1979 investigated the urban spaces from both points of view.

Urban design, mainly, deals with the creation of urban spaces and places that serve the human (public) needs and activities. But in the literature there are many different definitions of urban design.

For example, urban design is the process of making better places for people than would otherwise be produced, (Carmona and others, 2003). Jon Lang (1994) points out that, in the late 1960s, the term 'urban design' replaced 'civic design' as the name of the field. Kevin Lynch, also, states that it is thought to be a branch of architecture.

However, some other scholars also, explain the urban design according to the subjects dealt. Thus, urban design should be explained according to what it does rather than what it means.

Urban design, simply, does places for people. It includes the way places work and matters such as community safety, as well as how they look. It concerns the connections between people and places, movement and urban form, nature and the built fabric, and the processes for ensuring liveable villages, towns and cities.

At the same time, urban design is a key to create sustainable developments and the conditions for a flourishing economic life, for social progress and for the prudent use of natural resources.

Urban design achieves these tasks with the other disciplines such as architecture, landscape architecture, urban planning, civil engineering, law, and real estate, as well as, other disciplines in the field of natural and social sciences.

Urban design is the generally accepted name for the process of giving physical design direction to urban growth, conservation and change (Barnett 1982).

Urban design involves the creation of urban spaces and places to meet the high standards of visual quality, liveability and functional efficiency.

One of the main problems in the design process of urban design is the determination of man's (human) behavior, his urban activities and translation of them into the urban built form (spaces and places).

In the early times of the field of urban design there were some methods dealing with determination of the human behavior and urban activities. In the 1960s and early 1970s these methods were divided into two groups as inductive and deductive approaches. Prescriptive thinking, perceptual, social and psychological values are investigated in the inductive approach where as emphasizing mechanistic thinking and scientific method are explored in deductive approach.

Chronologically, Chapin, Ghel, Fortlage/Phillips and Perin investigated different methods in this matter up to 1970s. They, mostly, concentrated on the determination of the urban activities of man (human).

Chapin, F.S divides urban activity systems as behavioral patterns of individuals, families, institutions, and firms. Where, Ghel J, intends to show how physical environment affects human behavior or how human behavior changes in response to the physical environment.

Fortlage and Phillips developed a method called ecosystem planning. The method is the combination of the System Theory and Analogy of the Biological systems. However systems theory tends to abstract human ecosystems from their social context.

Perin, C. introduces the idea of ‘Behavioral circuits’ and calls it ‘Anthropological Ergonomics’. In her theory, human activity patterns are explained in terms of ‘behavior settings’ and ‘resources’.

In the works of Chapin, Ghel, Phillips and Perin, man’s (human) activities and behaviors are determined according to simple practical life of man. According to them the basic and daily behaviors of man enable to create only the basic urban places and spaces in the towns.

Geddes, (1854-1932) who was one of the scholars worked in the fields of sociology, biology, human ecology and town planning, suggested a human activity and behavior system that was more comprehensive than the others.

The ‘Thinking Machine’ (figure 1) developed by Geddes, is a kind of complex matrix, which fully explains man’s behavioral patterns and his relationships with the environment. The thinking machine could determine all sorts of human urban activities and behaviors in different levels of human needs.

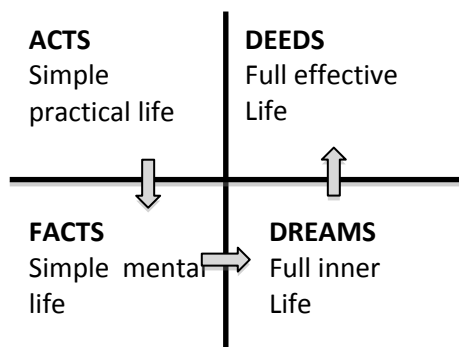


Figure1. Thinking machine of Geddes’

The design quality of urban places/spaces could be measured according to the compatibility of the urban places/spaces with the human needs and activities in terms of physical, sensible and mental measures. The thinking machine grasps the all possible activities and behaviors of *full effective life of man*. ‘By responding to a clear occupier demand that also helps to attract investment (design),’ is one of the key ways in which better quality design could add the value to development (urban places), (Carmona and others, 2003).

## METHODOLOGY

The methodology of this work is interpretive. More specifically, it depends on the development of the literature works in the field of urban activities and behaviors. Geddes’s work was found to explore for the creation of the urban places and spaces of liveable cities.

Design of the better urban places/spaces mostly depends on the determination of the man’s urban activities and the definition of the convenient built form for these activities.

P. Geddes suggests that human behavior is divided into four groups; acts, facts, dreams and thought and says man’s behavior can not be understood fully unless simple practical life, simple mental life, full inner life and full effective life are be understood (figure 2,3-4-5).



<b>place</b>	p-w	p-f
w-p	<b>work</b>	w-f
f-p	f-w	<b>folk</b>

Figure2-Simple practical life

f-s	f-e	<b>feeling</b>
e-s	<b>experience</b>	e-f
<b>sense</b>	s-e	s-f

Figure3-Simple mental life

<b>emotion</b>	e- i	e- i
i- e	<b>ideation</b>	i- i
i-e	i- i	<b>imagery</b>

Figure 4-Full inner life

a-ep	a-s	<b>achievement</b>
s-ep	<b>synergy</b>	s-a
<b>Etho-polity</b>	Ep-s	Ep-a

Figure5-Full effective life

The first chart (acts) shows the main needs of man and importance of their relationships for his life. The second chart (facts) explains the mental life of man in terms of sense, experience, feelings and their correlations. Man’s thoughts are formed from the relationships between his practical life and mental life by using his senses, his experiences and his feelings.

The third chart (dreams) explains the full inner life of man. The chart related to the previous one shows that man’s practical life cannot be fully understood without taking his inner life into account. The last (deeds) chart is a description of full effective life of man. The chart deals with the achievement of man in his objective life according to his subjective experiences (dreams, thoughts and imaginations).

It could be said that the analysis of man’s activities that define the spatial design of the urban space, is a whole process; it may only be understood as a unity.

Shortly, the thinking machine of Geddes (figure 1,2-3-4-5), that is a two-way matrix (for example work- place, place- work), enables us to grasp all type of behaviours and activities of man. This means that spatial design of urban spaces that are going to be designed according to these activities and behaviours respects all the type of human activities.

Urban design, currently, deals with the creation of urban spaces on the level of *acts*, *facts* and *dreams* stages of the thinking machine, but liveable urban spaces may not be designed unless the *full effective life of man (Deeds)* is understood.

The paper argues that for a proper analysis and design of urban spaces, that is needed for liveable cities, there is a need for combination of understanding of the *full effective life of man* and the *related physical setting* of the spaces. Shortly, the partial or single point of view analysis and design cannot provide a complete understanding of urban spaces. So in this case, it is hard to create liveable cities that are going to be sustainable.

## CONCLUSION

As it is earlier stated that one of the main purposes of the urban design is to design convenient public places for general public uses. For this purpose, many urban design techniques have been developed during the last five decades.

In our time human needs and behaviors are changing very quickly. Especially when the cities become more populated, the distribution and accessibility to the resources become more difficult, people who live in these cities are not satisfied from their life or these cities become more unliveable for them.

The definition of human behavior and the human urban activities was one of the urban design methods. The method depends on determination of human urban activities and behaviors and creation of the compatible urban places for those activities.

Thinking machine of Geddes enables us a comprehensive tool to determine the urban activities of *the full effective life of man*. These urban activities represent all type of needs of man such as practical, social, physiological and mental in our time. Urban places created according to these urban activities, may be more compatible than the other urban places developed.

Thus, if all the possible human needs could be defined (in terms of urban activities and behaviors point of view), the urban places and spaces required will easily be built. But, the changing human need is still the main problem for liveable cities.

However, it could be said that, liveable cities of tomorrow may be created depending on the compressive determination of the human (full effective life of man) needs in the urban areas.

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## A SURVEY ON CHILDREN PLAYGROUNDS SAFETY, PUBLIC SATISFACTION AND FINDING NEW DESIGN IDEAS FOR MALAYSIAN CHILDREN PLAYGROUNDS

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### ABSTRACT

This paper is a sequel quantitative survey derived from the recent studies on public children playgrounds in Malaysia. The aim of this survey was to focus on the aspects of safety and design of the playgrounds and the survey is required because the local public playgrounds are mostly in unsatisfactory conditions. The authors have observed around one hundred playgrounds in a qualitative mode and analysed the returned questionnaires from 172 respondents. These samples are derived from a non-probability sampling technique and the respondents had been selected opportunely because, in Malaysia, the public children playgrounds in housing areas are mostly identical. This study investigates the problems of children playgrounds from the aspects of safety and design. The respondents' perceptions were analysed descriptively and some findings from our earlier qualitative surveys are brought in to support the discussion. There are a lot of public children playgrounds in Malaysia and majority of the respondents convey their dissatisfaction towards the safety conditions. Our earlier studies revealed that only newly built playgrounds were in satisfactory conditions. After some time or particularly for the aging playgrounds, their conditions would be less than satisfactory. This problem correlates with the aspect of inefficient playground management and poor maintenance. These playgrounds eventually, offer less of excitement and safety, but instead create more hazards and pose potential risks to children safety. Even though, this paper does not cover all the problems found in Malaysian children playgrounds, it adequately deals with the general problems Malaysian playgrounds faced. Some new ideas and concepts to upgrade the playground safety conditions that were accepted by the majority of respondents should be made as the cause to improve our public children playgrounds for the future.

**Keywords:** satisfaction, playground survey, safety, equipment design.

## 1. LITERATURE REVIEW: AN INTRODUCTION OF PLAYGROUND SAFETY AND DESIGN

An interesting topic such as a children playground can easily attract the public, including parents and scholars. However, this topic has rarely been studied in Malaysia, especially under the subtopics of playground design and safety (Md Saaid & Hassan, 2014A). The children playgrounds in general can give plenty of benefits (Mani , Hosseini & Abdullah, 2012; Jansson & Persson, 2010; Amouzegar, Naeini & Jafari , 2010), but, when the playground conditions were not good, they would create many problems for the children and could become their source of unintentional injuries (NPPS, 2006; Blair, 2003).

Normal wear, heavy usage, environmental factors and vandalism take a toll on playgrounds and produce hazards in the end (White, 2012). All inadmissible risks on the playgrounds should be eliminated. The playground owners should consider the children excitement and enhance the playground's playability to the fullest (Bachvarov et al., 2008; Moore et al., 2006). These statements emphasise the importance of proper design and safety of existing playgrounds. The children playgrounds are supposed to be a place for children to play safely (Leung & Mahadev, 2011), however, they can also cause injury, hospitalization and death (Uskun et al., 2008; Bernardo et al., 2001; Bond & Peck, 1993; Chalmers & Langley, 1990). Statistics on playground-related injuries are significant in many countries. In New Zealand alone, about 7400 children of less than 15 years old seek treatment at hospitals' emergency departments annually (Chalmers et al., 1996). The A&E (accident and emergency) departments have recorded more than 8,000 cases in Ontario and 28,500 children with playground-related injuries from all across Canada annually (Fiissel et al., 2010). Emergency hospital departments in the United States had recorded the highest cases of playground-related injuries of more than 200,000 cases in one year (US CPSC, 2010). Howard et al. (2009) reported a total of 213,700 victims with injuries caused by the playground equipment.

Malaysia on the other hand still does not use any systematic database to record the children injuries that happened on public playgrounds. Nevertheless, this does not mean that our playgrounds are safe and pose no threat to children. It is estimated that about one thousand cases of playground-related injuries occur in Malaysia every month (Md Zain & Ismail Mokhtar, 2012). Severe accidents in children playgrounds happen rarely, but, when it does, even fatal outcomes could be possible (Yeen, 2014, May 1). Many children accidents that happened on playgrounds were considered by parents as minor injuries and often went unreported (Mack, Hudson & Thompson, 1997). Lately, there is greater public awareness across the nation. People start to voice their concern and call for an upgrade in playground quality as much as to demand for better playground safety (Bernama, 2013, October 22). There are several more write-ups on playground safety produced by local researchers such as Mohd Latfi and Abdul Karim (2010), Zainal (2015, 4 May) and, Md Saaid and Hassan (2015; 2014A; 2014B). This study is important because it is crucial for local playgrounds to improve, especially on the aspects of design and safety. Any efforts to increase the free play or the fun of design in the playgrounds must be balanced with concerns for safety (Nixon et al., 2003; Laforest et al., 2001; Mott et al., 1997).

## 2. METHODOLOGY

The public regards children playgrounds as a common facility normally placed in open spaces or public recreational areas. This facility is typically found in housing areas in Malaysia in compliance with housing development laws but is often considered insignificant. Considering the common availability of this facility, the authors decided to use the convenience sampling technique. The convenience samples could be categorised as a type of non-probability sampling. This is the easiest

sampling technique, where the parent of any child with some knowledge and experience about their neighbourhood playgrounds are eligible to take part in the survey. The researcher can select his own samples freely without having to use any mathematical formula (Warren, 2011).

The main survey was carried out via two mediums, namely the internet and conventional survey. The authors invited their friends to take part in answering the online questionnaire. However, while revising the survey questionnaire at one stage, the authors decided to suspend the survey because many items looked unreliable and respondents were struggling to understand and give sensible answers. They found the items tough and time consuming to answer. Consequently, the authors simplified the items in the questionnaire and administered it via a conventional medium. Respondents were sourced from the researchers' environments as well as the general public for a better representation of the local society. This convenience technique is known as the self-selected respondents technique (Wretman, 2010). Generally, the authors would conduct a descriptive preliminary analysis to see the respondents' tendency in their item answering polarity. Next, several correlations and cross-tabulation analyses were carried out to see if there was any significant relationship between the research variables.

The surveys have managed to get 172 valid respondents and 34.8% or 60 respondents came from the internet survey. Although this is neither a big size nor a typical sample size as it was normally proposed by Krejcie and Morgan (1970) or Jacobs (1999), the valid respondents or the sample size used in this survey is proven acceptable. The proof is given by a statistical software known as the *G\*Power 3* (Faul et al., 2007). The power value of the estimated sample size can be calculated based on the given input parameters. To get a valid sample size, the value or the actual power should produce a minimum of 0.8; the more, the better (Ramayah, 2014). The non-probability samples will be useful enough if the researchers are confident in fulfilling their goals (Latham, 2007). Using the *G\*Power 3* the authors have selected the a priori power analysis to compute the required sample size. It would be an efficient method to control the statistical power before a study is actually conducted (Faul et al., 2007). Hawkins et al. (2000) and Schroeder et al. (2006) used six numbers of predictors in their surveys. By using the same number of predictors, the a priori power analysis eventually proposed 146 respondents. With a sample of that size, the main survey would obtain a very significant power value of 0.95. This value indicates the highest value and the smallest allowable value to give a good sample size is just 0.8 (Ramayah, 2014). The next chapter will try to analyse the meaning of safety and satisfaction as perceived by the respondents.

### 3. RESULTS AND ANALYSES

A total of 189 respondents participated in both surveys. However, 17 returned questionnaires had to be omitted either because of incompleteness or critically inconsistent answers in major items. For the remaining items, the Cronbach's alpha was measured at 0.79, but the overall average correlation of items did not mean much. The authors closely analysed each variable or individual data to see if there were any connection with other factors.

#### 3.1 Playground Safety:

Above 87% of the respondents agreed that accidents can happen at their neighbourhood playgrounds due to broken equipment, inappropriate materials and inadequate safety measures. A majority of the respondents perceived their playgrounds as dangerous places for their children to play. This resulted in a negative correlation with the respondents' satisfaction. Out of a total of 172 valid



respondents, only 22.65% of them were satisfied with the condition of their playgrounds' surface. The playground surfaces in Malaysia are mostly made of rubberised materials such as poured-in-place rubber and rubber tiles (Md Saaid & Hassan, 2014A). The equipment safety related items are shown in *Table 1* and they were generated from exploratory factor analysis.

Nearly all respondents agreed the monkey bars should not be more than 2.1m in height. Similar studies on the technical aspects of the monkey bars were also carried out by other playground researchers such as Waltzman et al. (1999); Loder (2008); Mahadev, Soon & Lam, (2004). Sibert et al. (1999) proposed the idea of rope climbing frames to replace all the monkey bars equipment in public playgrounds in Cardiff, Wales. In Malaysia, although the technical safety aspects of children playgrounds were not mandatorily implemented, public awareness on playground safety has escalated as can be seen in the strong supporting percentages for the need in equipment safety items (*Table 1*).

Equipment Safety Items	Mean	Mode	Standard Deviation	Supporting Percentage
1- Monkey bars not more than 2.1m	4.33	4	0.509	98.2
2- Replace with Rope climbing frames	4.07	4	0.581	88.4
3- Adequate safety surface	4.52	5	0.520	99.1
4- Playground surfacing of 6"	4.51	5	0.520	99.1

Table 1: Descriptive statistics for equipment safety



Figure 1: Playground equipment requiring revision

An example of the monkey bars and the rope climbing frame shown in the *Figure 1* above are taken from two different playgrounds that were inspected in Jitra and Putrajaya respectively (Md Saaid & Hassan, 2015). Regardless of the location of the playground, the playground owners in Malaysia have not conducted any studies either on the aspect of design ergonomics or equipment age-appropriateness. For instance, if a young child falls when negotiating with the monkey bars, there is still a risk of injury despite the safety surface provided underneath the equipment because the equipment is inappropriate for his age. In playgrounds where rope climbing frames replace monkey

bars, risks of accidents can still exist if the design fails to take into account safety measures and the surface underneath is not suitable. Furthermore, rope climbing frames may not be appropriate for a vertical climb for younger children.

		<b>4) A good playground surface should have a 6" floor padding underneath it</b>
<b>3) Adequate surface is required under and around all equipment</b>	Pearson Correlation	0.617*
	Significant (2-tailed)	0.000
	N	112

Note: The correlation marked with an asterisk (\*) was significant at  $p < 0.05$  (2-tailed)

Table 2: Playground surface correlation analysis

The support received from the respondents for adequate safety surface was overwhelming. The last two items have formed a positive correlation with each other (Table 2). A very strong 99.1% of the respondents agreed on the importance of safety surface and the proposed requirement of a six-inch thick floor padding underneath all playground equipment (Table 1). These analyses indicated the respondents' desire for better quality playgrounds to ensure their children's safety while playing with the equipment.

### 3.2 Public Satisfaction:

The authors decided to focus on public satisfaction in the following five items (S1-S5 in Figure 2). These items represent the respondents' perceptions towards their neighbourhood playgrounds. To support the results, the analysis also looked into some demographic profiles of the respondents. Although the discussion here is descriptive based, the authors believed it should be sufficient to meet the aims of this study which are to explain the lack of safety, identify public dissatisfaction, and suggest ideas to improve the quality of public children playgrounds in Malaysia. Over 55% of the respondents perceived their playgrounds to be far below the safety standards of an excellent children playground mostly practised in developed countries (S1). These respondents were regular visitors to their respective neighbourhood playgrounds, making at least one visit or several visits in a week with their children.

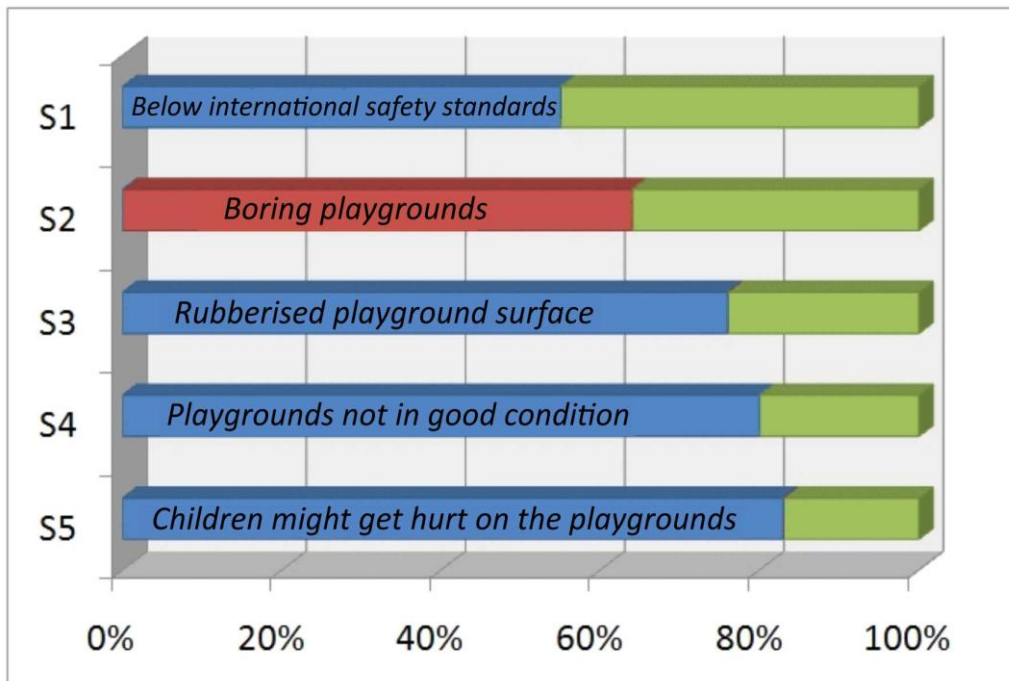


Figure 2: Respondents' satisfaction towards their playgrounds

About 63% of the respondents thought their playgrounds were simply boring (S2). The playground providers in Malaysia rarely design playgrounds that are creative and take into consideration the different needs of children in general. For example, active children find the slow motion movement offered by the common contemporary spring-seesaws boring (Figure 3). The problem lies in the safety precaution which has made it too rigid and too difficult to move up and down. The old conventional fulcrum seesaw is arguably more fun than this modern one. The children in the Figure 3 did not seem to really enjoy playing on the seesaws.



Figure 3: Some children did not appear to enjoy playing on the spring-seesaws

Seventy-two respondents described their children as highly physically active and 58% in this group also described the playgrounds in their areas as boring and unimaginative. Around 75% of the respondents were Malays and 51% of them voiced their dissatisfaction with their playgrounds. Although the Malays constitute the dominant group in this survey, the researchers believe that responses from other ethnic groups are unlikely to differ much.

For the S3; 76% of the respondents chose the rubberised material as the most appropriate safety surface. Another 20% of the respondents wanted their children to enjoy playing on a sand surface because it brought back their childhood memories. About 57% of the respondents who had chosen the rubberised surface pointed out that the playgrounds in their neighbourhoods could accommodate around 11 to 35 children at any one time. This suggests the average size of neighbourhood playgrounds can be considered as small to medium in size.

Item number 4 is the conclusion item for this survey (S4 in Figure 2); however, the gender of the respondents and their children did not play a significant role in providing the 80.4% responses which perceived their playgrounds as not in good condition. Nearly 50% of Male respondents surpassed the 29% of the female respondents have lamented their dissatisfaction with the playground conditions. The male dominance over female is already expected because the percentage of male respondents in this survey is 60%. More than 45% of the respondents are in the 35 to 44 years old age group. The respondents in this group have children age between 2 to 12 years old. They have become the most critical group probably because they are more likely to have children frequenting their neighbourhood playgrounds and are clearly not satisfied with the playground conditions. Despite Malaysia not having a systematic record to show current figures and the seriousness of playground-related injuries, over 83% of the respondents have voiced their anxiety about their children's safety at the playgrounds (S5 in Figure 2). This is proof of a high parental concern for children's safety at the playgrounds. However, responses from older parents with older children (above 12 years old) indicate less anxiety about their children's safety at the playgrounds.

### 3.3 Finding New Design Ideas:

All suggestions to promote new playground designs registered an encouraging reception from the respondents. Over 95% of them fully supported the idea of space segregation where the main playground is divided into several designated spaces specifically toddlers, school-age children between 5 to 12 years old and also a playspace for youths known as the adventure playground. Even though this idea is widely practised in playgrounds in developed countries, in Malaysia this is almost absent because it is not a mandatory requirement. Only new children playgrounds in big cities such as in Kuala Lumpur and Putrajaya have practised the age-appropriate design concept, but in some of them, the play structures are not labeled as if to assume that parents already know which equipment is suitable and safe for their children. When there is no signage or proper guidelines for equipment use, there will be a tendency for misuse that could lead to faulty equipment and injury. As a smarter solution, this segregation concept should be implemented for all children playgrounds in this country.

Malaysian playground owners and their designers could come up with more creative playgrounds of unique forms and beautiful structures. More than 96.5% of the respondents indicated their eagerness for this suggestion. The following *Figure 4* is a sketch by the main author of Rasmus Klump playground at Tivoli, Copenhagen, Denmark. This playground is one of the most creative children playground projects, designed and built by the Monstrum, an award-winning playground specialist in Denmark (Monstrum, 2014). Unlike our neighbourhood children playgrounds in Malaysia where most of them shared common designs and similar characteristics, the playgrounds by Monstrum architects were designed to inspire and excite the users. One of their important tasks is to explore the children's world and to produce the very unique children playground designs of different shapes, forms and themes.



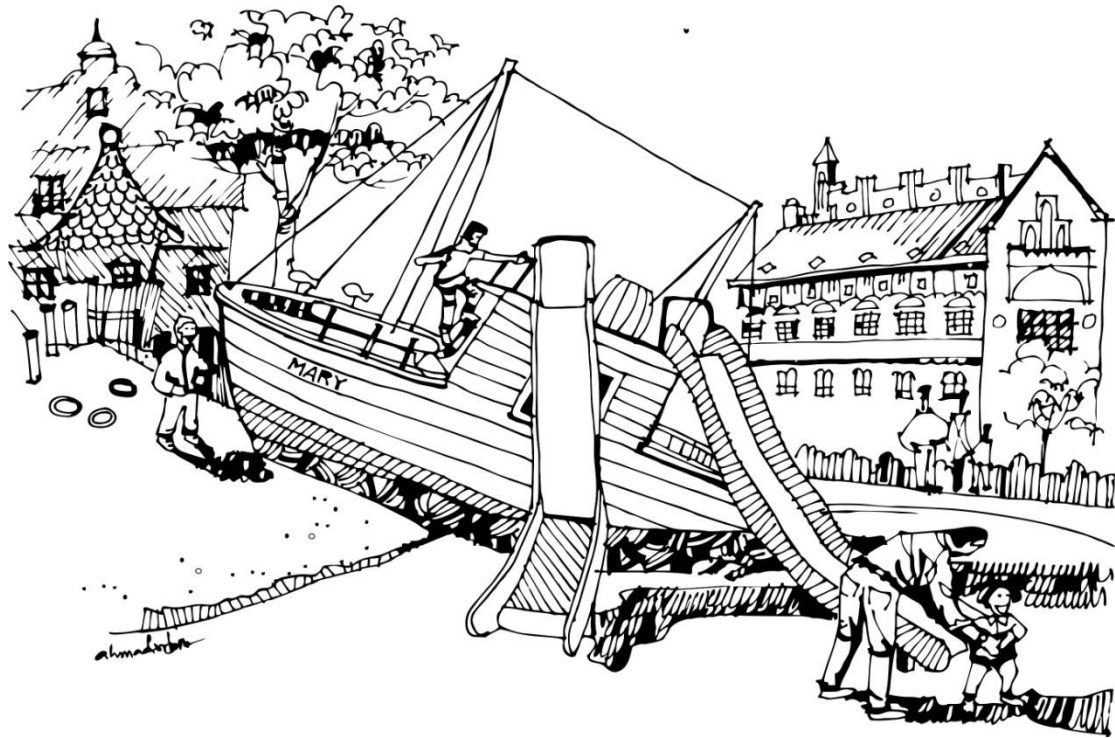


Figure 4: Rasmus Klump Land; designed and built by Monstrum

The respondents were excited about the idea of refinement of traditional games in the new concept playgrounds. For example, we can use the idea of a “gasing” or the Malay traditional spinning top, this traditional equipment can be redesigned to carry children as it spins functioning like a ‘merry-go-round’, but in the form of a “gasing”. We can also reinvent the ‘teng-teng’ or ‘ketingting’. This traditional game often played by girls requires nine square boxes which could be painted on the playground floor (Figure 5)

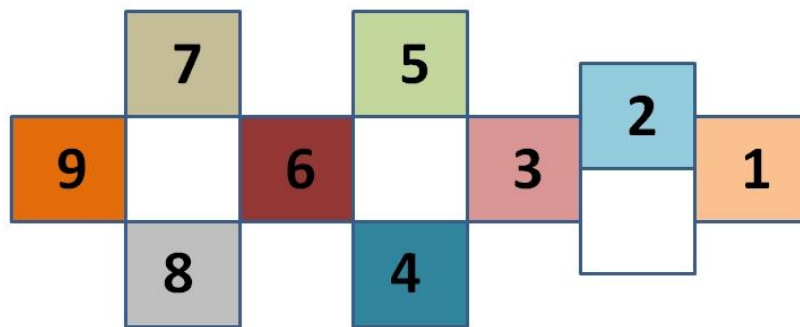


Figure 5: The ‘teng-teng’ boxes which can be drawn as a floor pattern

This game is fun but requires some energy to do the jumping. A few children will take turns to jump into the boxes while skipping on one leg. The rules of play should be displayed on the playground notice board together with safety procedures. Notice boards should display the types of equipment available in the playground and how to use them safely as well as the target age group. Information on how traditional games are played will help the children to learn and be proud of their heritage.

#### 4. CONCLUSION

It might be impossible to build a children playground that is perfect, without any defect, and excellent in everything including its safety and design. The next most important thing is the process of maintaining the playground after the project is completed. Without a proper maintenance programme, even the best quality playground will soon deteriorate. However, according to the findings of this survey, our children's playgrounds need to be more responsive to their local environment with greater safety designs to excite children and provide an avenue to help them develop physical well-being, creativity and quality play. The right playgrounds for the children must meet their target age group, in other words age-appropriate. We cannot assume that any playground will do for the children and can be used anywhere or at any time.



Figure 6: A girl climbing on a slide

A boring playground will invite the more imaginative child to invent out-of-ordinary and perhaps unsafe manoeuvres such as climbing on the external slide tube heightening the risks of injury (Figure 6), instead of sliding down safely. Young children of high physical competence will try to hang and swing on the monkey bars structure, even though this equipment is not designed for their age group. Doing something unusual may give them a huge satisfaction, but at their age, they are incapable of assessing the risks of potential injuries.

Figure 7 shows qualitative evidence. The main researcher came across two victims who had sustained arm fractures due to monkey-bar mishaps during his process of conducting the qualitative research survey on children playgrounds in several cities in Malaysia (Md Saaid & Hassan, 2014B). Playground injuries could be attributed to a number of factors which are interrelated to one another. Generally, the safety of the playgrounds must be improved, especially on their impact absorbing surfaces. The majority of respondents in this survey have selected the rubber based materials as the most suitable safety surface. Compared to other types of playground surfacing materials, this material is hard-wearing and easy to maintain.

However, the playground owners should not compromise their designs and safety of the playground surface by putting a mere four pieces of rubber tiles and assume that children will only fall onto that small area. This sort of practice is common in Malaysian playgrounds, two pictures of this unsafe practice can be seen in Figure 7. The design of the surface should meet international standards on playground safety practices because these guidelines are developed based on contemporary studies on minimising playground-related injuries.



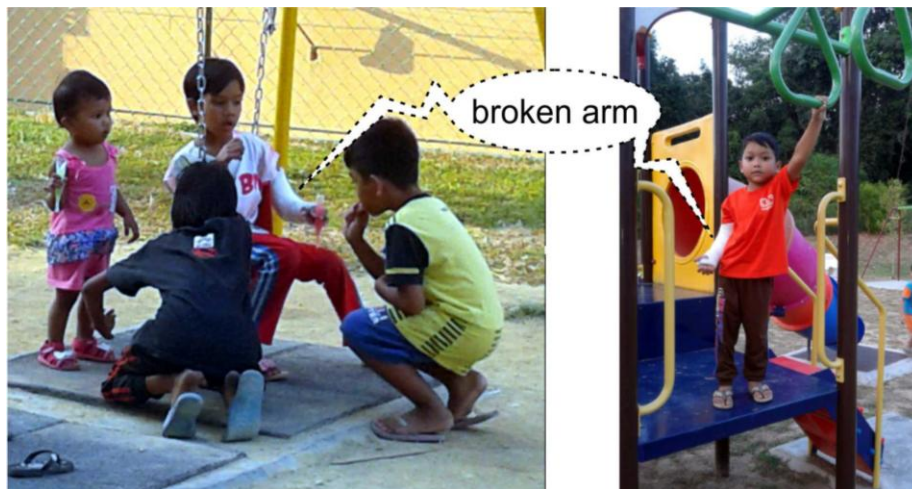


Figure 7: Two children with broken arms

In summary, the majority of respondents were not satisfied with the general conditions of the neighbourhood playgrounds. They described their children's playgrounds as boring facilities which were not designed to be age and gender specific. This group made up two-thirds of the total respondents surveyed and resided in a range of housing types except the serviced condominium. The public children playgrounds in terrace, semi-D, bungalow, apartment housing areas were mostly ungated and freely accessible to the public. Therefore, these playgrounds were frequently in use and this contributed to equipment problems as a result of heavy usage, vandalism and climate factors. The playground owners must remember that to maintain the excellent playground conditions, there must be a comprehensive maintenance programme in force.

The age of the respondents does not make a significant difference in this survey although a majority of them were around 24 to 55 years old. About one-third of the respondents were clearly dissatisfied with the conditions of their playgrounds such as the surface, equipment-type and maintenance. Half of the respondents simply thought the conditions and design of their playgrounds were just average. To sum up, all existing public children playgrounds in Malaysia, especially in housing areas need to be revitalised to improve their safety, designs and public satisfaction.

## 5. RECOMMENDATION FOR FURTHER RESEARCH

Another aim of this research survey is to be a catalyst to spur more children playground studies in the Malaysian context as this area offers a huge potential for improvement. The scenario of children playgrounds in Malaysia can become the base for more in-depth study either through qualitative or quantitative research investigations. The scope of analysis can be widened to examine the inferential conditions between the aspect of design and safety for all children playgrounds. In a bigger scale, future studies can also individualise their survey components analyse them through inferential statistics.

The quantitative survey of convenience sampling is much easier and faster compared to the qualitative survey that require more time, patience and other resources to decode the data. Future research can also use online questionnaire, but the contents of items need to be simplified because the online respondents are often reluctant to spend time in answering items that require thinking. Further studies on playground equipment and public feedback will be crucial in improving the safety standards in our existing playgrounds. In other words, more research under this topic is necessary to inspire the revitalisation of children playgrounds in Malaysia.

## 6. ACKNOWLEDGEMENT

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## LIVABLE HERITAGE STREET AND VISUAL POLLUTION IN GEORGETOWN/ PENANG

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### ABSTRACT

One of the most important issues of the architectural and urban design studies, is the analysis and evaluation of the visual and aesthetic aspects in the heritage streets. Every heritage street has its own visual identity, which appears clearly on its facades, street furniture and ground details. A planned treatment of the visual and aesthetic characteristics of the design elements of the street leads to achieve multiple kinds of benefits; such as clean and pollution-free environment, psychological comfort, tourism attraction, economical income, in addition to preserve the heritage features of the street itself. This study aims to view the current visual problems in the streets of Georgetown world heritage site, through studying the visual elements and relationships of the street facade and related issues, and the negative elements and factors that harms the livability in the heritage streets of Georgetown/ Penang, and finally; to suggest some solutions to sustain the heritage value of them.

**Key words:** Livable, street, Heritage, visual, pollution, Georgetown.

### INTRODUCTION

Visual comfort in the surrounding environment is very important to people. Thus, doctors and psychologists explain reactions caused by viewing a "negative view", which lead to Adrenaline excretion, and that causes stomach acidity and raises the heartbeat rate, then, Irritability. On the other hand, a "positive view" will cause Cortisone excretion, which reduces the pain in the human body generally, then gives comfort feelings (Al-Hussien, 1999).

Georgetown, with building history of more than 200 years, considered a living record of multi-cultural heritage of people, their traditions, religions, and architecture. The site is located on the north eastern cape of Pulau Pinang, where the first colonizing British ships had landed in the year 1786, and established a trade base between China, India, and the archipelago (Nasution, 1997).

UNESCO declaration of Georgetown as a world heritage site in 2008, was a pivotal point in this area, giving more importance and focusing on it, and making it a much desirable destination for tourists. Moreover, The area of WHS in Georgetown has a significant character, the main reason is that it has about 10,000 pre-war buildings, most of them are the elegant style of two-story buildings of shophouses (Mui, Meng, Yusof, & Fern, 2008), attached to each other and forming a continuous special street



facade. Thus, it has a massive impact on the people living within it. In return, people must treat this area with complete awareness and responsibility.

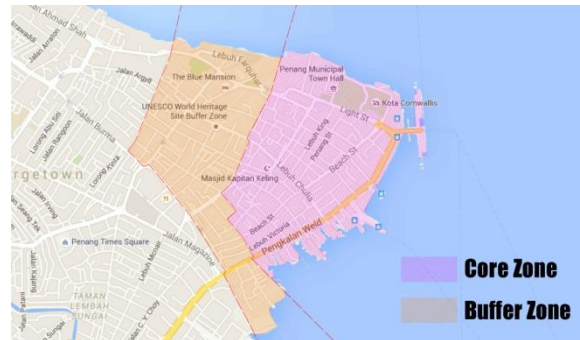


Figure 1: Location of Georgetown within Penang Island Figure 2 : Georgetown World Heritage Site

## PROBLEM STATEMENT

Georgetown heritage streets have witnessed a massive urban change in its visual structure, which lead to visual pollution affected its livability features. The danger of visual pollution lies basically in its connections with losing aesthetic sense, and proliferation of ugliness and thus making it an acceptable state of the community. Moreover, This area, due to its heritage value, has a special importance, and if its heritage character faded because visual pollution, it would lose its vitality, and eventually, livability. That lead the area to be useless as it is, and will be changed necessarily.

## LITERATURE REVIEW

Visual pollution: This term refers to all types of visual distortion caused by architectural or planning mistakes, in additional to some cases which are considered negative aspects themselves, and bad elements in their environment. All that occurs for many reasons; economical, social and cultural. (Khalid, 2009). It's also described as any human work that is hurting sight, and unnatural, contrasting with the other surrounding elements, as a result; it is polluting the visual environment (Eid, 2009). While (Idlebie, 2008) considered the visual pollution as the distortion on any view that human eye looks at it, with the feeling of psychological discomfort. Also describes it as a sort of lack in the artistic taste, or aesthetic image's fade of the surroundings. Visual pollution or distortion, might be happened as a result of existing varieties of building styles, which leads to form the feelings of psychological or aesthetic unbalancing (Eskeef, 1997). Also commercial ads is mentioned in the studies as a main reason for visual pollution (Ahmed & Nawar, 2013).

Visual pollution aspects: Studies show a number of visual pollution types in the visual environment of the streets, some of these samples are (Reyes, 2003) (Zbadi, 1997):

1. Bad architectural planning for some buildings, in the aspect of their building spaces or architectural properties, as different proportions, heights, colors, building materials, rhythms,... etc.
2. Street furniture like street lights and their cables and other related installations, which unlikely to integrate visually with the street's architectural styles of the surrounding buildings.
3. Trash bins and other related objects that related to waste materials.
4. Bizarre pigments and colors used in painting existing buildings.
5. Building services installations on the building's facade, which include: mechanical, electrical, and plumbing installations.
6. Neglected old buildings and ruins in between other well maintained buildings.
7. Commercial advertisement panels in their various shapes, colors, sizes, and positions on the building facade.

## METHODOLOGY

The study uses a mixed method based on surveying then in-depth visual analysis depending on graphical presentation of the design principles and the factors causing the visual problems. The sample street taken for this study is Chulia street. It is one of the major streets in the area, established in the first stages of the city, in the time of Captain Francis Light. Due to the Chulia street length, it contains many sections with a lot of buildings, and thus; a lot of visual problems. In addition to what mentioned, it has a multiple attraction; shops, restaurants, coffee shops, hotels,... Etc. , which made the street a vital place and the perfect destination for tourists. To make it easy for accumulation, drawing and analyzing process, one side of the street has been divided into 8 sections (parts) separated by empty spaces of sub-streets along it, as it appears in Figure -3- :



Figure -3- : Chulia street sections

After determining the problems that cause the visual pollution, a survey upon the case study area made to pick samples, which are the parts of the street facade. These collected firstly by taking photos to street side, 1-3 buildings in each photo to avoid perspective distortions. Some lens corrections made on photos to maintain flat state (by using Lightroom 5.7 software to correct the 3<sup>rd</sup> vanishing point perspective), in order to merge the photos later in one long panoramic picture for the whole street section. After that, any photo editing software can be used to merge individual facade photos, as in Figure -4-

Part	Picture
Part 1	
Part 2	
Parts 3 & 4	
Parts 5 & 6	
Part 7	

Figure -4 : Chulia street parts facade combined pictures

In order to analyze the street facade, a method will be needed. Based on the method used for the procedure (Bentley, 1985) (Lintern, 2015):

1. Skyline (in the aspect of street elevation): it is the upper line that separates buildings from the space above them.
2. Vertical rhythms: which is represented by any vertical lines created by repeated objects, building joints and surface differences.
3. Horizontal rhythms: any horizontal continuous visual lines in the streets, including horizontally repetitive architectural elements, joints between floors, ornamental patterns,... Etc.

The most important question in this paper, is how the visual pollution occurs? In other words, how the visual problem aspects impact the street visual characteristics? To answer this question; a checklist matrix in table form, is prepared, to link every type of visual problem causes with the visual characteristic that been affected by it, and the magnitude of the impact for each problem. Whereas the rows represent the visual feature of the street, and the columns are for the problems. A scale from 0 to 3 is adopted to illustrate to impact amount, where 0 stands for no impact, 1 for minor impact, 2 for obvious reflect, and rising till 3 which is for fully affected. As shown in table -1-








Table -1-: checklist matrix. Visual features (Rows), Visual problems causes (Columns)







Visual Aspect	Advertisement Panels	Building Service Installments	General Change in Style, Color and Materials	Street Furniture
Skyline				
Vertical Rhythms				
Horizontal Rhythms				

## ANALYSIS

To clarify the visual features and problems, a separate graphic has been illustrated, and focused on that aspect individually, then with all problems, all visual features, and finally, all visual problems and features mixed together in one graph. For each part of Chulia street side elevation, a table is prepared to illustrate visual aspects, begins with original picture for that most part, without any analysis drawings on it. A sample for part -1- is shown in table -2-:

Table -2-: Visual analysis for part-1-, Chulia street, George Town

Aspect	Detail	Picture
Original Picture	Chulia Street side elevation Part -1-	
Visual Problems	Advertisement Panels	
	Building Service Installments	
	General Change in Style, Color and Materials	
	Street Furniture and trash bins and other elements	

	All problems	
Visual Features	Skyline	
	Vertical Rhythms	
	Horizontal Rhythms	
	All Visual Features	
All Analysis		

After the observation on the graphical analysis, it will be possible to determine the impact value of each visual problem on each aspect for any part of the street facade. For example, table -3- shows the values of variables (on the previously mentioned scale) in part -1- of the street facade:

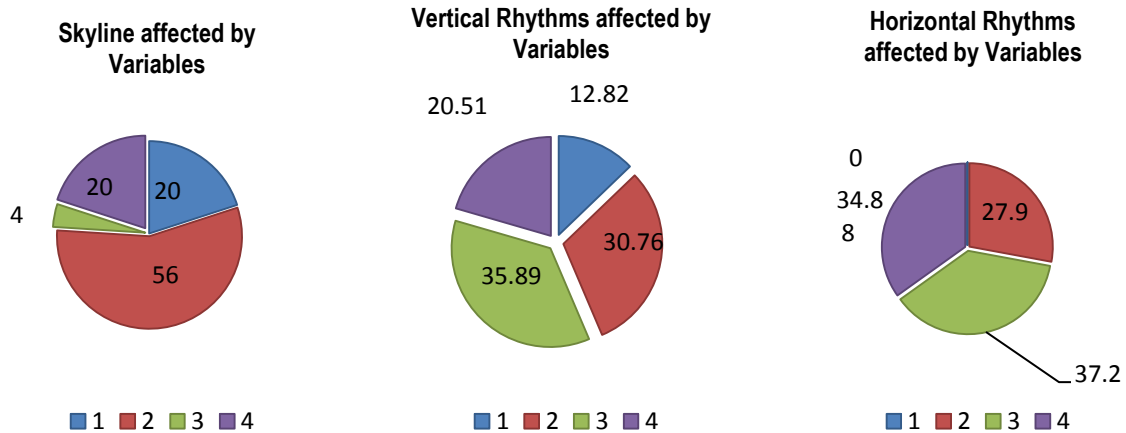
Table -3-: checklist matrix applied on part -1- of the Chulia street elevation

Visual Aspect	Advertisement Panels	Building Service Installments	General Change in Style, Color and Materials	Street Furniture
Skyline	1	0	2	1
Vertical Rhythms	3	2	2	1
Horizontal Rhythms	2	2	2	0

Finally, next graphs show the percentage of the impact value for each variable on each aspect as an average for all street parts (Whereas 1 stands for Street Furniture, 2 General



Change in Style, Color and Materials, 3 Building Service Installments, and 4 for Advertisement Panels):



## RESULTS DISCUSSION

From the results shown before, a several notes can be extracted: As the skyline affected mostly by the change in building style, due to modern construction approaches, which lead to raise the new buildings higher than the heritage original structures. While the commercial ads and street furniture came secondly, because they occasionally reach the building top line. Building service installments have an unnoticeable effect on the skyline, because they exist almost between floor levels.

As related to the vertical rhythms, the most effective variable is the building service installments, which come with a little advance on the second variable, the style changing and other related subjects. Commercial ads come thirdly with noticeable ratio, while street furniture and related elements lined lastly, for just few lamp posts located from distant spans.

Finally, the horizontal rhythms affected mostly by building service installments, with their all power lines in every place and direction. Secondly, with no mentionable difference, advertisement panels has a significant impact, due to their numbers, area covered by them, and mostly horizontal direction. Building style change, in all its phases, also has its obvious influence, for many reasons; as the different floor heights, unusual joints between floors, and the change in openings distribution. On the other hand, street furniture has unmentionable presence.

## CONCLUSION

As a matter of fact, the new additions to the heritage street, are not integrated with the existing old buildings, when related to visual aspects. Every time stage has its own heritage, architectural styles, and the methods of meeting human needs are different from time to another, whereas these methods have no harm on the building style built at the same time. As an example, the study shows minimum impact from what's considered visual pollution causes, on the street parts that contains a high ratio of modern style buildings, but the existence of those buildings themselves meant to be visual pollution, according to the changing they are causing in the street character. This unique heritage character is what makes this area a desirable place, which returns the benefits upon the people who are living in this place, the issue they must be aware about it.

Accelerating new technology has a negative impact on heritage values, not because the technology itself, but the misuse of it. Although human needs are pivotal, but the issues resulted from their influence, can be treated in a smart approaches to avoid destroying history. Laws must be more

strict when it matters in dealing with the old building, regardless whether the building is belong to public or private individuals.

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## GENTRIFICATION AND URBAN REVITALIZATION A STUDY OF THE OLD HARBOR AREA OF ALEXANDRIA

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### ABSTRACT

Harbor development has passed through different phases in history, starting at the end of the 19th century with the rapid development in shipping technologies which resulted in turning harbor areas into a lace of huge industrial activities. In the mid of the 20th century demands of post-industrial ecological cities resulted in moving all industrial activities to outer city zones leaving behind old industrial structures and warehouses underutilized and in prime locations. In 1960s the wave of harbor revitalization started causing the development of those areas thus the increase in property and rent values which has led to gentrification. Alexandria city in 2015 is on the verge of revitalization of its old harbor area, an area in prime location directly adjacent to the old city center yet completely underutilized. With the new visions for the revitalization of Alexandria harbor area, how should it be looked at in terms of gentrification?

The paper studies gentrification in general, and then focuses on harbor areas specifically, mostly through international literature and case studies. The paper then focuses on the Egyptian experience shedding light on areas of relevance that are related to revitalization and it's social impact. The old harbor area of Alexandria is taken as a case study, exploring the predicted impact of future revitalization project on the surrounding area and presenting some recommendation that takes in consideration social justice.

### 1. INTRODUCTION

Harbor cities have gone through different phases of development, especially due to harbor technologies which has left huge areas around the harbor underutilized and considered a good potential for investment and development. This kind of development that has started in the united states and gone to Europe then all the way to Australia have been accompanied by the gentrification of those harbor areas; the replacement of poor original inhabitants by middle or upper class people. Sometimes, gentrification was considered a social sin (Duany, 2000).

The term was sometimes avoided and replaced by terms like " urban renaissance, urban regeneration and urban sustainability (Lees et all, 2008), other terminologies were also used especially when those changes are planned as "urban renewal" or "urban revival" and "urban development" providing much more positive than negative effects on inhabitants of the areas (Blumer and Schuldt, 2014).And in others times, there were doubts about the actual extent of gentrification and the severity of the displacement threat (Hening, 1980).

The first part of the paper studies gentrification in general, and then focuses on harbor areas specifically mostly through international literature and case studies. The second part of the paper focuses on the Egyptian experience shedding light on areas of relevance in the Egyptian context that are related to development in general and gentrification in specific.

## 1.1 Definitions

Gentrification comes from the old English word gentry meaning the wellborn and well-bred people, the upper or ruling class; aristocracy, (in England) the class below the nobility, especially those owning large tracts of land referred to as landed gentry.

But the word gentrification was first coined in 1964 by a British sociologist -Ruth Glass- when referring to the alterations she observed in the social structure and housing markets in certain areas of inner London. Glass observed; "One by one, many of the working class quarters have been invaded by the middle class - upper and lower ... Once this process of 'gentrification' starts in a district it goes on rapidly until all or most of the working class occupiers are displaced and the whole social character of the district is changed" (Glass, 1964, p.xvii).

Gentrification is a general term for the arrival of wealthier people in an existing urban district, a related increase in rents and property values, and changes in the district's character and culture. The term is often used negatively, suggesting the displacement of poor communities by rich outsiders.

The term 'gentrification' is one of the most political terms in urban studies, implying by definition, class-based displacement. (Lees et al, 2008). "Gentrification is the process...by which poor and working-class neighborhoods in the inner city are refurbished by an influx of private capital and middle-class homebuyers and renters....a dramatic yet unpredicted reversal of what most twentieth-century urban theories had been predicting as the fate of the central and inner-city"(Smith 1996: 30).

Merriam-Webster Dictionary (2011) defines Gentrification as –“the process of renewal and rebuilding accompanying the influx of middle-class or affluent people into deteriorating areas that often displaces poorer residents.”

## 1.2 Literature review

Although gentrification was researched by many urban social scientist from many disciplines–geographers, sociologist, anthropologist, housing economists, and political scientists-but until 2007 there was never a textbook (Lees et al, 2008). In 2008 the first text book about gentrification which carried the same title was published. Publishers of the book clearly stated that they are by all means against gentrification. They presented in their book a number of arguments to stimulate critical thinking by their readers.

Cynthia Myntti simply classified gentrification through history into two categories, The first which was observed by Ruth Glass in 1960 especially in London and North Americas cities, where young artists and professionals sought low-rent in architecturally sound yet deteriorated areas in city centers, while the second category is observed by the geographer Loretta lees in global cities like London and New York where intense investments by super-rich financier were injected , not in renovation of old buildings but by fancy new-build premises, Ras Beirut conforms more, I would argue, to the new global model of real estate investing in London or New York, rather than the historical examples of urban pioneers investing their sweat equity in rundown center city buildings.( Myntti, 2013)

Chris Hamnett (1991) when explaining the prominence of gentrification in contemporary urban geographical literatue clearly states "it represents one of key theoretical and ideological battlegrounds in urban geography, and indeed in human geography as a whole, between the liberal humanists who stress the key role of choice, culture, consumption and consumer demand, and the structural Marxists who stress the role of capital, class, production and supply" (Hamnett, 1991, p. 174)

Nakisha Fouch( Fouch, 2012)in her thesis has classified the theories of gentrification into four phases, through 1980s, post 1980s, post-recession and recent gentrifications.

## 2. HARBOUR DEVELOPMENT AND GENTRIFICATION

Harbor development has passed through different phases in history, starting at the end of the 19th century with the rapid industrialization and development in shipping technologies which resulted in turning harbor areas into a lace of huge industrial activities. In the mid of the 20th century demands of post-industrial ecological cities and technological improvements resulted in moving all industrial activities from city centers to outer city zones leaving behind old industrial structures and warehouses underutilized and in prime locations. In 1960s the wave of harbor revitalization started causing the development of those areas thus the increase in property and rent values which has led to gentrification. (Butuner, 2006)

## 3. THEORIES OF GENTRIFICATION

The gentrification has clearly relied on the interplay between the large and small investments in relation to land market. Smith's theories during the 1980s, the production-side and consumption-side theories, relies on the uneven development between inner city and suburbs and its connection to gentrification (smith, 1986).

Big Investors seek opportunities for high return on their investment and so seek areas with low land values in the suburbs leaving the city center to deteriorate thus leading to the decline of land value in the city center, this is when small investors come to invest in property in the city center, taking the opportunity of the low land and housing values.

And there comes the rent gap theory by Neil smith, that is, the difference between "the actual capitalized ground rent (land value) of a plot of land given its present use and the potential ground rent that might be gleaned under a 'higher and better' use" (Smith 1987a: 462).

In the early 1990s there was a recession in the united states where homeowners were burdened owning negative equity housing stock. This is when the theory of de-gentrification was produced by Larry Bourne which was soon denied by Smith when gentrification picked up after the recession (Fouch, 2012).

Gentrification challenges the assumption of Alonso's 'structural' theory of the urban land market that the preference for space and low densities are far more important than accessibility to the central city (Hamnett, 1991). This is simply because the poor are involved with small parcels of land and any change is not compared to the amount of money spend on commuting. (Alonso, 1960).

Recent gentrification theories focus on the relation between gentrification and urban policy where gentrification became a tool for social mixing. (Fouch, 2012).

## 4. DIFFERENT PERSPECTIVES OF GENTRIFICATION

Gentrification has been looked at in two completely opposite perspectives; positively and negatively.

### 4.1 In a negative perspective

It is looked at as an induced displacement - the process in which the poor, minorities, the elderly and the moderate income working class may gradually be squeezed out of their neighborhoods as a result of the social and economic pressures that gentrification sparks (Hering, 1980). When gentrification happens in areas where conservation controls or development guidelines are poorly applied, these areas are destroyed and lose their authenticity and integrity due to improvements that are not guided (Pimonsathean, 2002)



## 4.2 In the positive perspective

The implied idea that gentrification is induced and controllable is quite false except for few exceptions and gentrification should be good news in case of the prevalence of poverty, where it is considered the rising tide that lifts all ships. (Duany, 2000). It is because of spontaneous gentrification that now Georgetown, Beacon Hill, Charleston, Santa Fe, or Nob Hill is where they are now (Duany, 2000). Gentrification slows or reverses inner city middle class population loss and housing decay. (Hamnett, 1991)

Spokesmen for the poor call gentrification the timeless urban cycle of a free society organically adjusting its habitat (Duany, 2000).

Some residence of the gentrified areas may actually gain, owners who will receive better prices for their homes or those who remain will get an upgrade in their quality of life (Duany, 2000).

Gentrification can be looked at as how much productive capital returns to the area from the suburbs". (Smith, 1979). It can be looked at in the sense of services provided, the closure of the infrastructure used by poor people for their everyday life (Blumer and Schuldt, 2014)

Gentrification can also be looked at in the sense of built environment improvements; the physical condition of the building, its elevation and interior spaces. (Pimonsathean, 2002)

British, American, and the Netherlands' policy justifies gentrification by assuming that the benefits of gentrification will trickle down to the lower and working classes due to socially mix neighborhoods (lees, 2008 page xxiii)

## 5. PHASES OF GENTRIFICATION

It is clear through different analyses that gentrification comes into phases or waves, and although these phases have been titled differently from different views but at the end they almost coincide, Duany's three waves of gentrification fits with Holm's 4 phases of gentrification as seen in figure 1.

The first phase that holms suggested and that is the existence of a suited area with building stock logically is the wave that precedes Duany's waves. Duany defined the waves by the amount of risk taken by each group, so his first phase, the risk oblivious are the pioneers in holms phase two where they are the discoverer of the potential of the place although it is in its run down status, then comes the risk aware who move in when buildings are renovated and rents are high and here they resemble the phase three in holm's analysis the last wave by Duany is the risk Adverse, where rich people come with big investment to the area due to its unique location or other potentials and resembles the fourth phase in holms vision. (Blumer and Schuldt, 2014), (Duany, 2000).



Figure 1: phases of gentrification. ((Blumer and Schuldt, 2014), (Duany, 2000)) –graphic created by author.

## 6. GENTRIFICATION AND HARBOR DEVELOPMENT IN INTERNATIONAL EXPERIENCE

The three examples presented here are quite different in regards to gentrification from success of gentrification to midway to failure of gentrification:

Baltimore harbor development is a pioneer case in gentrification, before its development it was a crumbling and dangerous wasteland, and after 10 years it faced the contrast between the waterside jewel of promenades and shopping pavilions high end development and the still existing drug dealers, machine-guns and children play 'Dare' in the elevator shafts, leaping from one immobilized cabin to another (Usborne,1993). And now after more than 40 years of continuous development it is now considered a major attraction in the US and a source of pride and identity for the region.

Hamburg had an interesting incident concerning development and gentrification. After billions of dollars' worth of new development has risen in recent years in a waterfront district known as Hafen City (Harbor City) along the banks of the Elbe River. Gentrification has happened; Middle class replaced poor immigrants who were forced to leave due to the rise of rent. The city of Hamburg had sold most of its city-owned vacant buildings in a run-down district to a Dutch developer who planned to raze the district and build high-rise towers, and this led to the protest of artists and journalists who began to occupy vacant buildings in Hamburg neighborhoods targeted for new investment. They promoted a "Right to the City" movement.(Gallagher, 2014)

Marseille, the largest port serving as an economic and immigrant gateway to the France, encouraged a Euroméditerranée urban regeneration project, starting in 1995 and expanded to new plots of land in 2007 to cover 483 hectares of unused industrial land but in this case gentrification failed, due to the cultural division between the two social classes considered, each had his own vision. The upper middle class felt ignored and did not accept the image of the city with the traditional inhabitants of the city center, and the image and collective memory of the place being inhabited by the poor, and on the other hand the poor had a different vision related more to consumption (Grzegorzcyk, 2012).

## 7. CASE STUDY MINET-EL-BASAL- ALEX ANDRIA

Before zooming in the case study, understanding the bigger image of the country is very important as it definitely effect the case study. Most of Egypt's population, 85 million people, live s Egyptian land formed by the valley and the delta of the Nile, and in spite of the efforts of the government to extend on the desert lands, Egyptians are reluctant to move, as most of the population especially living in big cities as Cairo and Alexandria rely on second and even third jobs as means for income generation (Sims, 2014) so it is quite important is to be living in urban areas especially areas near the city center.

Old Harbor areas were usually areas connected to the old city center, and now they are part of it. And so when developing the harbor area, the old city center with its old buildings are considered as the area surrounding it.

The poor live near the center, on expensive land, and the rich on the periphery, on cheap land (Alonso, 1960).Although Alonso was reflecting to American cities, but the same paradox applies to current Egyptian cities. David Sims in his book Understanding Cairo, analyzed the labour market in Egypt in general and showed how the informal economy constitute a huge percentage, in comparison to the formal economy (Sims, 2010).Thus the poor depend on informal income that is generated from their being near the city center, especially in areas that has urban traffic. An informal employment can be either people working in small enterprise or working for oneself, such as street vendors (Sims, 2010) a phenomenon that is invading the Egyptian cities- especially after the 2011 Egyptian revolution due to the economic crisis and the disappearance of law enforcement during the past couple of years. And

hence, a large percentage of the poor population stay in the areas which are surrounding the city center for living where multiple informal jobs can be offered, besides avoiding commuting expenses.

Since this paper is exploring the effect of development of old harbor areas, that means that most of the surrounding houses and buildings are quite old and probably follow the old rental law. And especially that the case study that the paper is focusing on – Minet-El-Basal area – is almost connected to the old city center, thus the building it encompasses is quite old.

When studying the laws that govern those buildings, we would be faced by different scenarios. Old residential buildings that are rented under the old rent law number 49 for year 1977, article 29 which states that, the landlord has no right to evacuate the rented apartment from the tenants, and that even if the tenant dies his wife, children or parents continue the rent contract and any other relative under the third degree can continue the rent after the original tenant has died providing that he has lived for a year in the house with the tenants before his death or departure. And this is a major obstacle in the development process as the developer has to make deals with all the tenants and the landlords to be able to free the buildings. And if the tenants and landlords realize the scope of development that is on its way to the area, they will be demanding a higher compensation, which will make it more difficult for developers.

The other scenario is residential buildings that are under the new rent law, and this law is manageable as it is limited in time.

The third scenario is old non-residential buildings which are under the old rent law, this case is simpler, as on the issuing of the Presidential Decree 237/1997, amending the executive regulations of Law 6/1997 and Article 29 of Law 49/1997 which states that the contract of tenancy shall discontinue in favor of any of the successors or partners if the lessee quits the premises, it also shall not continue in favor of the partners if the lessee dies. If the lessee dies each of the other lessees with him shall continue to have the right of remaining in the premises. And besides this right the contract of tenancy shall continue in favor of the one fulfilling two requirements, namely he shall be a successor to the deceased and shall be wife or husband of lessee, or relative

by affinity of the 1<sup>st</sup> and 2<sup>nd</sup> and the contract of tenancy shall not continue except for one time in favor of the beneficiaries from the successors of the original lessee. This decree is very crucial in the case of Harbor area development as it deals with the commercial and other non-residential activities and their development to with the new harbor activities. This has a direct effect on the gentrification of the area.

The fourth scenario is with the non-residential activities which follow the new rent law, and these are with limited time contract and can be easily adaptable in case of development of area.

In 2008 HSUE( Sims et Al, 2008),it is clear that Old Law Rents represent a very small proportion of tenure forms in most regions, but are significant in the two large metropolises, Greater Cairo and Alexandria. The median rent for Old Renters is LE 30 per month whereas the median rent for New Renters is roughly LE 200 per month – over six times the median Old Rent.

A number of examples had happened lately with the investor facing a lot of problems to evacuate the old tenants, Ramlet Bolakis a clear example where gentrification is happening due to force eviction of actual poor residence who are occupying land of high value on the Nile in Cairo, they are forced to leave the area after the luxurious Nile City Towers were erected. On 20 June, the Cairo Governorate issued a controversial directive authorizing police to evict the district's low-income residents( Ahram.org,2012).

Maspero triangle, occupying a central location overlooking the Nile in central Cairo, is another case, According to locals; the dispute over the land goes back several decades. After Nasser's 1952 revolution and the nationalization some foreign owners of the land grant the land to their servants through endowment to avoid having their lands taken by the government. The descendants of these servants are today's residents of the triangle. Many of the families have been living on the land since well before Nasser's time, the Prime Minister is discussing a proposed plan to develop slums in

downtown Cairo, Minister of Urban Development Laila Iskander asserted there will not be "a forced eviction" for any resident in the area. Upgrading the area will be through collaboration between the government and residents, the minister said..(egyptindependent.com,2014) Failing to provide a proof of ownership, the triangle's residents continued to face threats of eviction (Ahram.org, 2014).



Figure 2: Ramlet Bolak (source: Egyptindependent.com)

In Egypt, especially when upgrading areas for tourism, the focus is always on the image of the place with no consideration for the actual inhabitants and the impact of this development on their life. (Jeannet and Schuemperlin, 2010)

The state exerts effort to beautify rather than upgrading, the process of upgrading, especially if involving tourism mainly focus on the image of the place rather than the upgrading of inhabitants, sometimes to the extent on adding European touch which is not suitable for the living style of the actual inhabitants which are supposed to be the main motor of development. This is quite obvious in the upgrading project for the core of Cairo where the highest concentration of Islamic monuments. (Jeannet and Schuemperlin, 2010)

Safeguards policies of the World Bank were revised to maximize the positive impacts of Bank projects, and minimize the potential harm to the environment and communities that may arise from such projects. One of the recommendations of Egyptian Civil Society Organizations Pertaining to the World Bank Social and Environmental Safeguard Policies is that those policies should contribute towards – not hinder - the overarching goal of the World Bank, which is to reduce poverty (world bank.org, 2013)

Minet-El-Basal is a district in Alexandria to its west, overlooking the western harbor and comprises a number of old industrial warehouses that once served in the cotton export process- now listed as a heritage area in Alexandria Governorate- and located in its premises the old cotton exchange building which was once an import node in Alexandria. The decline of the cotton industry in Egypt along with the changing techniques of fabrication, shipping and handling of goods in addition to the changing trends in industry and shift from heavy industries to the growing service industry such as telecommunications made a considerable number of the industrial buildings of Alexandria obsolete. (Aref, 2008)





Figure 3: photos of the warehouses of Minet El Basal Area taken by Author.

The words Minet-El-Basal in Arabic means the port of onions, where it took its name as an export port for onions at one time in history. Now the existing warehouses are either empty or underutilized as storage areas. The area is Uniquely located, it is directly connect to the old city center of Alexandria and the its central business district, along being in close proximity to the main touristic attraction in Alexandria, the old archeological site of the famous Alexandria Library, Pompey pillar and Kom-El-Shokafa catacomb.

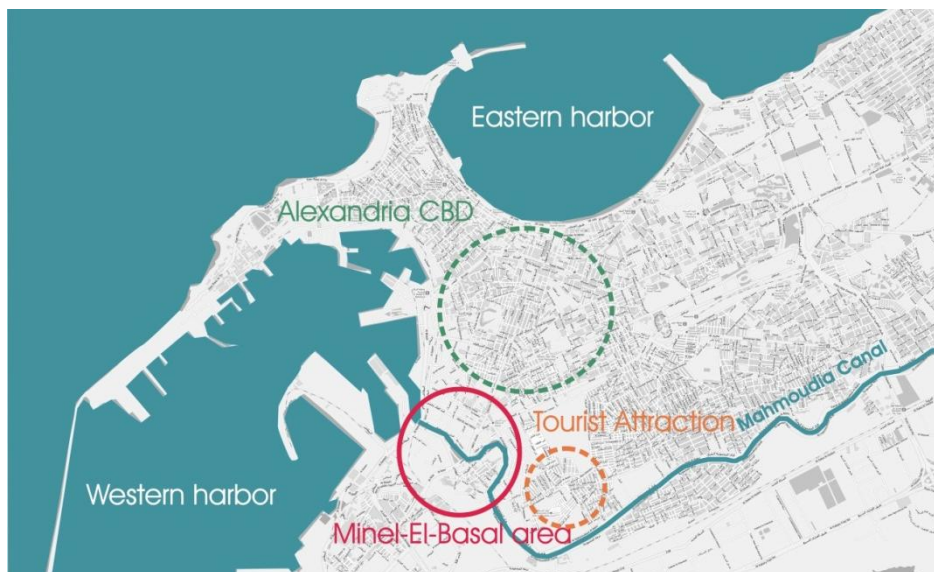


Figure 4: Map of Alexandria Showing case study area in relation to Alexandria CBD and tourist attractions—graphic created by author.

Passes through the area, the Mahmoudia canal, which was first dug when Alexander the great wanted fresh water from the Nile to reach the city he ordered to be constructed, bearing his name, Alexandria. It was re-dug during Mohamed Ali's era when Alexandria was flourishing as the main port of Egypt and the gate that connected it to Europe.

Alexandria has witnessed development in its periphery, a number of gated communities taking investors outside of the city, and leaving the old city center to deteriorate and decline. Looking at the gentrification phases mentioned above, it is clear that the city center with the area of Minet-El-Basal has buildings which are almost empty available and underused. Alexandria city center is also witnessing a number of residents who are going back and occupying old buildings, not necessary Minet-El Basal, but



the concept of returning to the city center is starting to be obvious, along with small investors who are starting to invest in cafes and restaurants in the city center.

The area has great potential for major development, which if took place will undergo gentrification. Also surrounding the area of warehouses are poor residential areas that could use the money coming from the gentrification process.

Ownership in the area of warehouses is mainly either private investors, or the national company for building assets.

## 8. CONCLUSION

Gentrification can be either through the awareness of upper middle of the potential and authenticity of living in architecturally unique context of city center or by enforced large development.

Although it is difficult to predict what will happen after development in respect to gentrification, but understanding the area, its pattern of life and socio-economic aspect of its inhabitants, in addition to understanding the urban dynamics of the country makes predictions closer to reality.

Top down approach in development; huge investment projects leads to the eviction of the original inhabitants. A mixture of top down and bottom up approaches is needed to ensure the social mixture.

Egypt haven't experienced the phases of gentrification mentioned above in the paper, but with the upcoming opportunities of big investments in areas like Minet el Basal rings bells that this subject has to be tackled, especially that prior to this date no studies have been made to assess the impact of such projects on existing residence.

Interdisciplinary studies should start take place including disciplines like Urban planning, urban geography, sociology, urban economy, in addition to insuring the participation of different stake holders, as local governments and NGOs, local municipalities, investors etc.

The harbor area of Minet-El-Basal, in short, present a new challenge to critical observers inside and outside the academy, and thus it should be taken as research topic in different disciplines and the effect of any development should be carefully researched first, and different scenarios can be suggested with different plans of actions accordingly.

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## PUNCHING SHEAR STRENGTHENING OF RC FLAT PLATE WITH FERROCEMENT DROP PANEL

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### ABSTRACT

Punching shear strengthening of reinforced concrete (RC) flat plate by adding drop panel around supported column is studied in this work. Ferro-cement is chosen as a strengthening material. Specimens with and without shear connector between slab and strengthening material were tested to study about composite action between existing concrete and ferro-cement materials. The results show significant improvement of punching shear strength of RC flat plate specimen strengthened by ferro-cement with shear connector. Fully composite action between slab and strengthening materials is achieved by providing adequate shear connector between existing concrete and ferro-cement materials. Slightly improvement of punching shear strength of strengthened specimen without shear connector and delamination of strengthening materials from slab at high load level (before failure load) were found from the experiment.

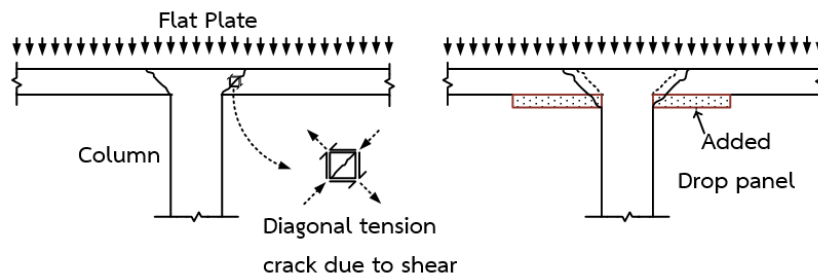
**Keywords:** Ferro-cement; shear connector; composite action; strengthening material.

### 1. INTRODUCTION

Punching shear around supported column is one of the main factors in the design of reinforced or prestressed concrete flat plate. Adequate shear strength must be designed to prevent brittle failure without warning of slab as shown by Figure 1a. Shear strength of slab can be improved by adding drop panel (see Figure 1b), shear reinforcement (stirrup), shear head (cross steel I beam placed on the joint between slab and column). If clearance between floor to floor is not limited so adding of drop panel is the most simple and economy. Punching shear strengthening of slab is needed due to inadequate shear strength (poor design) or the increase of service load of existing flat plate structure.

Advantages of ferro-cement are high ductility, reduction number of crack and crack width, high deformation capacity, improve impact resistance and toughness, good fire resistance, low permeability, low cost of maintenance and high strength to weight ratio.

In this work, shear strengthening by adding ferro-cement as a drop panel of slab is studied. Shear connector between slab and ferro-cement is the key parameter in the study of composite action of two materials. Experiment is performed to study about shear behaviors, strength and failure mode of flat plate under static loading of test specimen.



(a) Flat plate (b) Flat plate with drop panel  
Figure 1 Punching shear failure of flat plate

## 2. LITERATURE REVIEW

Even originated in French in 1840 (Wikipedia, 2015), ferro-cement has been more popularly used in this decade. For example, a study of Sirimontree *et al.* (2015) focused on strengthening of reinforced concrete column via ferrocement jacketing. The study results gave significantly improvement of strength and ductility of strengthened column over the reference column without strengthening.

Mansur and Ong (1987) studied shear behavior of ferrocement reinforced with welded wire mesh by performing flexural tests on simply supported rectangular beams under two symmetrical point loads. Mansur and Ong (1991) studied shear strength of 28 simply supported ferrocement I-beams under two symmetrical point loads with parameters as span-to-depth ratio, compressive strength of the mortar, and amount of longitudinal and transverse reinforcement. The study found good agreement between theoretical predictions and experimental results.

Paramasivam and Tan (1993) investigated punching shear strength of ferrocement by testing fifteen square slabs. Test results were compared with predictions given by codes of practice and previous works.

Mansur *et al.* (2001) studied punching shear strength of simply supported ferrocement slabs. The test was conducted on 31 square ferrocement slabs. The study found that punching shear failure critical perimeter was located at a distance of  $1.5h$  from the edge of the loading plate. The study also gave a predicted mathematical model for predicting the punching shear strength of ferrocement.

Binici and Bayrak (2003) studied punching shear strengthening of reinforced concrete flat plates using carbon fiber reinforced polymers (CFRP) by installing CFRP strips in the vertical direction as shear reinforcement around the concentrated load area in a specified pattern. However, CFRP is expensive compared to ferrocement technique that employs only wire mess and mortar. Thus, it leads to this study that no previous literatures report this kind of study.

## 3. EXPERIMENTAL STUDIES

Total five test specimens are produced as shown by Figure 2. Four specimens have the same size of 1200mm x 1200mm x 150mm slab with 150mm x 150mm column. The 5th specimen has a size of 1200mm x1200mm x200mm slab with 150mm x 150mm column. Adequate flexural reinforcement for slab and column is provided for all specimens as can be given in Figure 2.

The 1st test specimen is used as a reference specimen while the 2nd and 3rd specimens the thickness of slab is added by 50mm thick ferro-cement with and without shear connector respectively. The 4th specimen is added by 50mm thick concrete with shear connector. Descriptions of all test specimens are summarized in Table 1. Shear connectors or dowels are embedded in concrete slab by drilling and insert 9 mm diameter round bar (RB) into the drilled hole, see Figures 2 and 3. Strength of concrete, mortar and steel used in the test specimens are summarized in Tables 2 and 3. Test set up can be expressed by diagram in Figure 4. Load and deformation data, deflection and strain, are read by data logger.

Table 1 Descriptions of test specimens

No	Specimen ID	Descriptions
1	S150-R	Reference specimen : 150 mm thick slab
2	S150-F50	150 mm thick slab + 50 mm thick ferro-cement without shear connector
3	S150-F50-SC	150 mm thick slab + 50mm thick ferro-cement + RB9 @ 150mm (Shear connector)
4	S150-C50-SC	150 mm thick slab + 50mm thick concrete + RB9 @ 150mm (Shear connector)
5	S200	200 mm thick slab



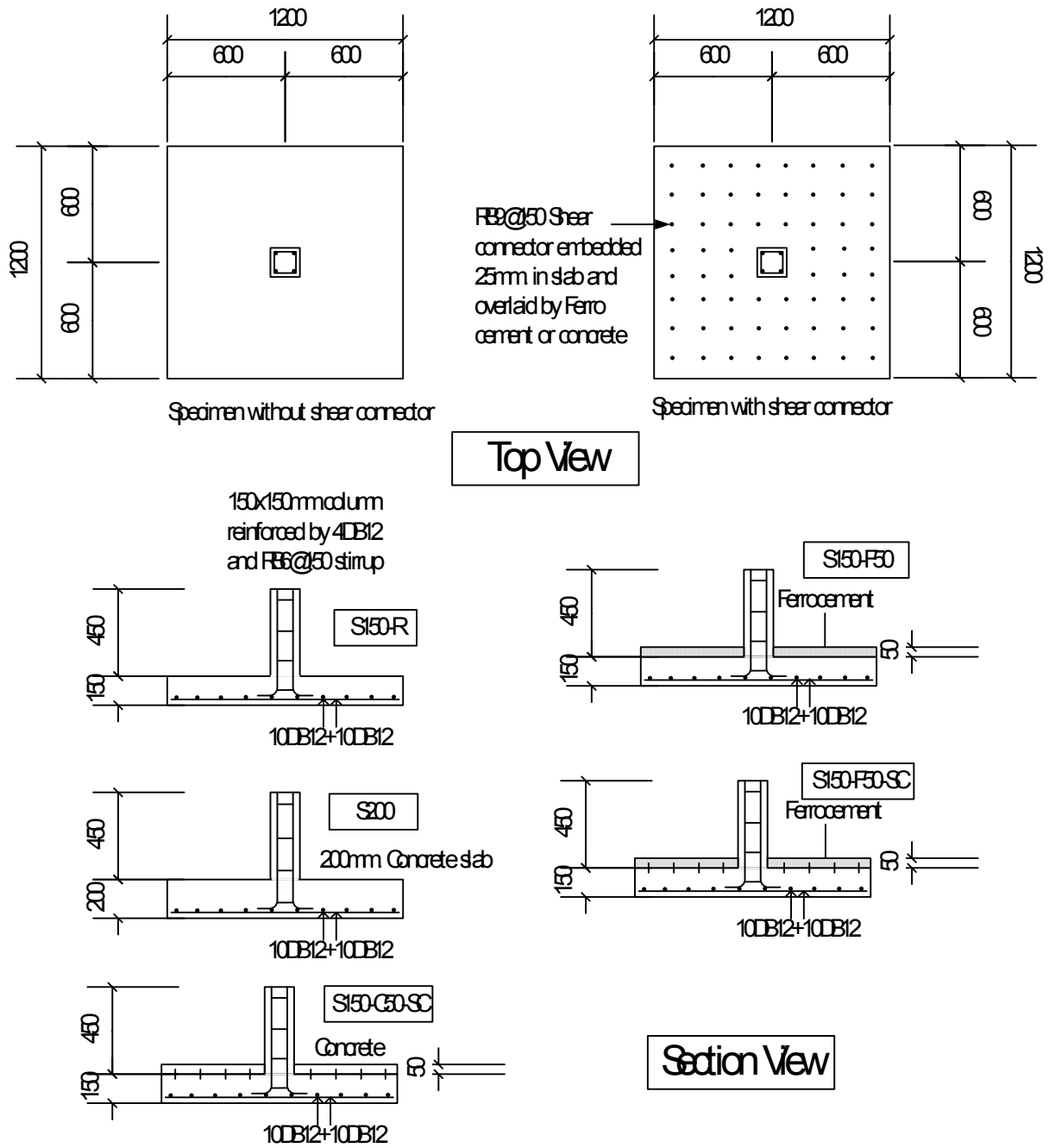


Figure 2: Details of all test specimens.

Table 2: Average compressive strengths of concrete and mortar (MPa).

Average compressive strengths (MPa)			
Concrete Slab	Concrete column	Concrete for strengthening	Mortar used in ferro-cement
22.5	29.4	34.7	35.9

Table 3: Average lab test tensile strengths of reinforcing steels (MPa).

Tensile strength	RB6 Steel Grade SR24	RB9 Steel Grade SR24	DB12 Steel Grade SD30
Yield Strength	389	397	437
Ultimate Strength	546	552	516

Ferro-cement consists of mortar and small rectangular grid wire mesh. Mortar compose of ordinary Portland cement, water and sand. Water: cement ratio (w/c) and sand : cement ratio (by weight) are 0.5 and 2 respectively. Wire mesh used in ferro-cement is double layers of rectangular shape galvanized steel wires of diameter 0.55mm, spaced at 12.5 mm centre to centre.



Figure 3 Preparation of test specimens

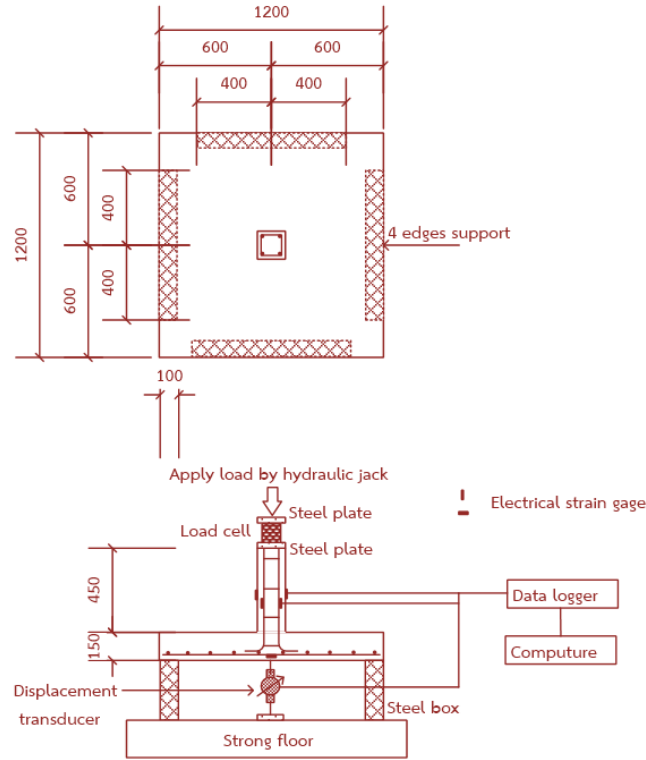


Figure 4: Test set up

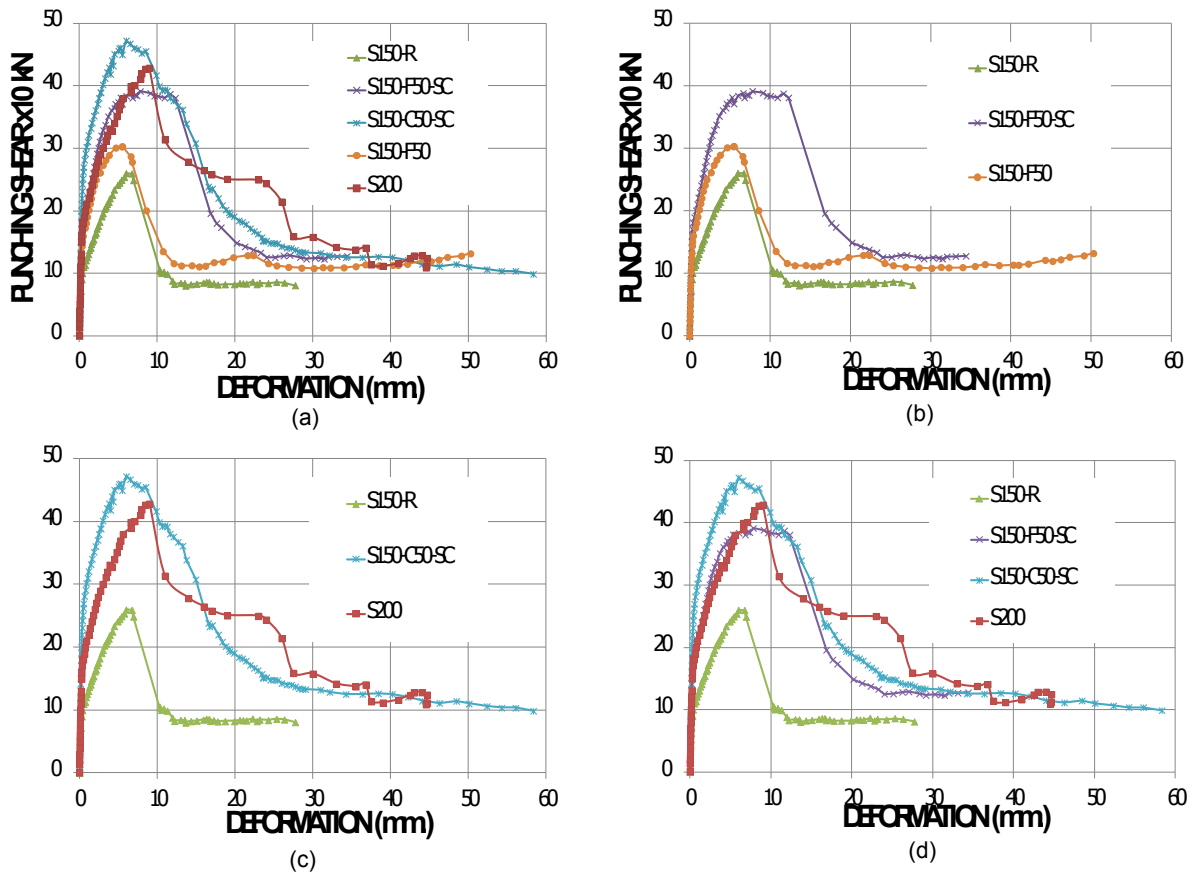


Figure 5: Load-deformation relationship

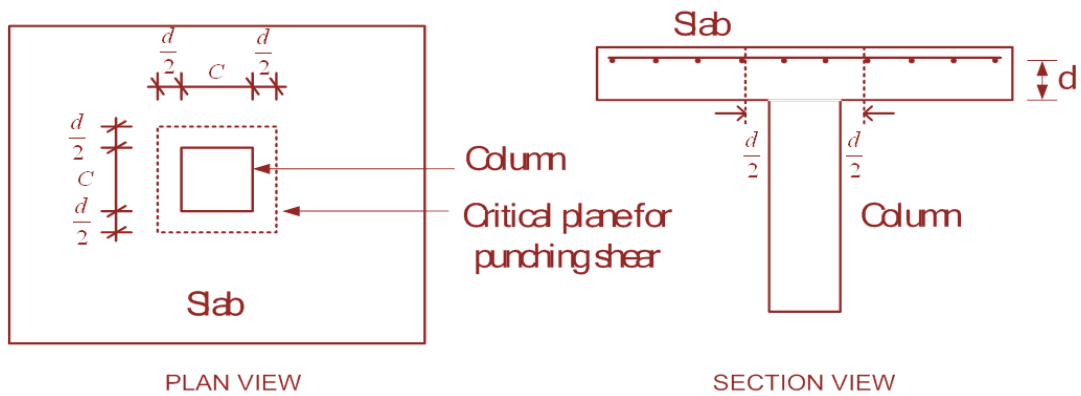


Figure 6: Critical plane for punching shear strength calculation

#### 4. RESULTS AND DISCUSSIONS

Load-deformation relationship of all test specimens is shown in Figure 5a. The comparisons of load-deformation relationship between reference specimen and slab strengthened by adding ferro-cement with and without shear connector is shown by Figure 5b. Figure 5c compares load-deformation relationship between reference specimen and slab strengthened by adding concrete with and without shear connector and 200mm thick slab monolithically cast. The comparisons of load-deformation relationship between reference specimen and slab strengthened by ferro-cement and slab strengthened by concrete with shear connector and 200mm slab cast monolithically is shown by Figure 5d.

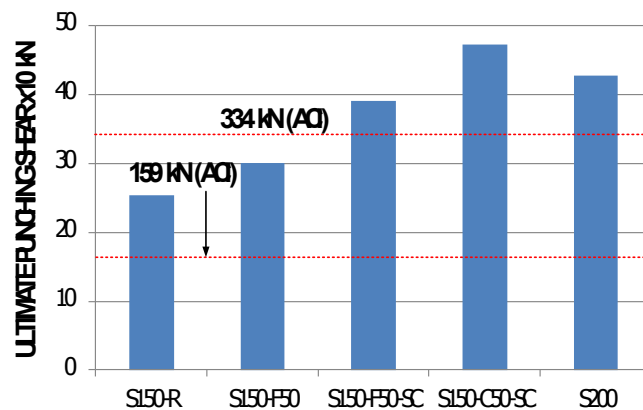


Figure 7: Ultimate punching shear strength of test specimens



(a) Punching shear failure of slab (bottom view) (b) Delamination of strengthened material for specimen without shear connector

Figure 8: Failure mode of test specimen

Calculation of punching shear strength can be done by equation (1) as given by ACI (American Concrete Institute), see Figure 6. The comparisons of ultimate punching shear strength of all test specimens can be expressed by Figure 7.

$$V_p = 0.33\sqrt{f'_c}b_o d \quad (N) \quad (1)$$

Where

$$b_o = 4(C + d)d$$

$b_o$  = Perimeter of critical plane for punching shear (mm.)

$C$  = Width of column (mm.)

$d$  = Effective depth of slab (mm.)

$f'_c$  = Concrete compressive strength (MPa)

It can be seen that significantly increase of shear strength can be achieved by adding ferro-cement with shear connector. Slightly increased shear strength is found in specimen strengthened by ferro-cement without shear connector. The delamination of ferro-cement from existing slab is found at high load level before failure load as seen in Figure 8.

Shear strength of specimen strengthened by ferro-cement with shear connector is slightly lower than S200 and S150-F50-SC specimens, but not significantly. Prediction of punching shear strength by Equation (1) for reference slab and strengthened slab with shear connector is less than test results.

From this test data series, it can be said that strength of slab strengthened by ferro-cement with shear connector is equivalent to slab cast monolithically and slab strengthened by concrete with shear connector.

## 5. CONCLUSION

Punching shear strength of reinforced concrete flat slab strengthen by ferro-cement, mortar plus galvanized steel rectangular shape wire mesh, with and without mechanical shear connector are studied by experiment. Fully composite action and shear strength equivalent to slab cast monolithically can be expected for specimen strengthen by ferro-cement or concrete with adequate mechanical shear connector. Punching shear strength of slab with additional ferro-cement or concrete with shear connector can be expected to be equivalent to slab cast monolithically. Delamination of ferro-cement of strengthened slab without shear connector can be observed at high load level before ultimate load.

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## THE TRIAL FOR TROPICALLY ADOPTED LOW ENERGY HOUSES: STUDIES AT THE TRIPLE GREEN MOCK-UP BUILDING PARK AT BRITISH MALAYSIAN INSTITUTE / KUALA LUMPUR

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### ABSTRACT

How to make homes livable and reduce CO<sub>2</sub> respectively operational costs at the same time? How can we gain a practical understanding what green residential buildings which are energy-efficient on well can achieve to reduce the tropical heat compared to red, orange and yellow buildings along the rainbow scale?

Whereas the common architectural R-, U- and g-values produce in general scores, and other than simulation programs real temperature, this paper focuses on how to translate those values into everyday life knowledge. In a longitudinal study the concern here is on energy and cost reduction together with the well-being of the occupants inside. Hence, the author will also pursue the question what happens to our building as a heat shield during typical weather conditions. These questions can neither be answered by the architectural values nor by building simulation, because they just provide snapshots. Our path is to perform a life-lab view with actual weather and daytime conditions. If we want to bring down the temperature, with a sufficient impact on the humidity, this information could be very helpful to design smart systems to master the cooling demand especially during heat peak hours, when the weather outside is simply too hot to provide thermal comfort 24/7. In continuation of this approach, this paper is an attempt to open the door for comprehending the thermal logic of modern buildings in the tropics and creating awareness how to cool them. After comparing the four buildings, a “secret” formula could be derived, stating how cold any of the scrutinised parameters have to be in order to sustain an acceptable indoor temperature set-point for tropical residential housing.

**Keywords:** CO<sub>2</sub> emission; energy efficiency; passive house; green building

### 1. INTRODUCTION

Green Buildings and those which are “green” PLUS “energy efficient” are not necessarily the same. The distinction to be green can be anything related to its colour, label and certification, whereas the add-on term “energy-efficient” states that the building has to comply just with certain standards in terms of its CO<sub>2</sub> and other gases emissions. Triple Green implies energy efficiency because two more factors thermal comfort and affordability will be looked at positively correlating when we allow a tropical redefinition of the comfort standards.

The research project which as a first step charts red and greener residential buildings in terms of CO<sub>2</sub> and indoor air quality is still ongoing. It was initiated by an interdisciplinary team of

Building Technology, Electrical Engineering, Air conditioning and Business experts about 'The Making of a Proto-Tropical Passive and Low-Energy House'. It included the construction and experiment of 3 green & energy efficient demo houses and one control house. Sponsored by companies and shareholders, the life lab of 3m<sup>2</sup> each were dedicated to complete on overall project, research started with the final construction of two buildings built in 2013 and the inducement of experiments. The pilot phase (02/2015-05/2015) to tested green and energy efficient alternatives compared to an open air system in the control room that invites uncontrollable heat, air pollution, noise, mosquitoes and other insects as creeping animals as well entering any time through the open windows and air gaps. Based on the conceptual framework laid out again below, the team's target was and still is to devise an easy-to-implement strategy (tool kit) to investigate the viability of the air-tight low-cost passive house principle in a tropical country. The industrial standards of the future could utilize the results gained from the triple green mock-up building park. As our project is to find out which building envelope, glazing or roof is the comparatively best heat protector, any future building may be constructed with the material of the best candidate bearing in mind cost implications. This major objective is to see how the system consisting of different passive modules works in terms of thermal comfort, healthy indoor conditions and construction costs. Furthermore, if passive elements are not enough, how much electricity will be needed to cool the building into the upper end of an individualized thermal comfort zone banding. If electricity is required, how can it be as energy efficient as possible considering also the switching costs for the usage of renewable energies. In the end, the industrial building standards (IBS) of Malaysia's residential area building can be defined in close cooperation with one of our sponsors which is the country's CIDB (Construction Industrial Development Board).

## 2. LITERATURE REVIEW AND GREEN BUILDING CANDIDATES

The optimal design strategy for a tropical passive house reaches back to the past. The study of the traditional Malay house shows that indigenous architects of the past already used passive design strategies in order to get comfortable temperature and humidity level for the inhabitants (Wahab, 2011). However, in a time of more unpredictable high temperatures due to global warming and the influx of dangerous species of animals, it is questionable whether or not the open air principle can bring about healthy indoor air at all time (Malik, 2009).

According to European standards, an Energy House in its most radical form is a completely different sort of Passive house. The concept was developed by Passive Haus Institut of Dr. Wolfgang Feist at the TU Darmstadt 1978 who had learnt the principles of passivation from an American guru in Utah. In a European definition, a passive house is "a building with such a low heating / cooling demand, resulting in the fact that coolness can be implemented just by the supply of a ventilation system" (Krause, 2010: 9).

Before any energy for cooling is put into it, this house provides all possible synergies between a) insulation, b) density and c) internal passive energy supply gains. Hence, thermal comfort, saving, CO<sub>2</sub> and costs at the same time are yielded primarily by proper passivation, and - only once the building is airtight - by electrical active elements. Hence, optimal affordable low-energy construction methods for new and modified renovated buildings have reduced heating energy losses to a minimum by using efficient thermal insulation (Passivhaus Institut Feist, 2007).

\*last page

Indeed, Unlike standard concrete and bricks buildings, the tropically adopted airtight passive house allows no longer gaps and cracks that used to let the cooled indoor air escape and fresh air

enter the building in an uncontrolled manner. Indeed, with neatly insulated walls, ceilings, roof and the windows closed during the influx of the “hot” weather outside, there is almost no more air circulation between indoors and outdoors – the building is airtight creating its own climate at reasonable price, low costs and at optimum thermal comfort.

The first type of tropical passive house for residential areas resembles the European role model, as it is virtually silent in terms of electricity consumption. However, its openness, which is completely different as it, causes major problems for Thermal Comfort especially during the day and for known mosquito protection especially during the night time. Our idea is to test whether not only the first, but both elements can make the tropical passive house real. So the formula equates into

- A) Close the indoor environment up (air-tight)
- B) Be as silent and passive as you can

If active cooling is still required, choose energy-efficient solutions especially over the click of the air conditioner on within. Basically, air conditioners still have an important place in the system, and even more might be sold, but the operation is rather a substitute at some times, however, they are not longer the main driver of producing coolness. It is a win-win situation for all cooling providers, buyers, and occupants and of course, a trigger to reduce global warming in everyone’s home.

There is no tropically adapted air-tight residential passive house except one role model in Malacca. Hence, the experiments started with the ruling paradigm i.e. setting up non-air-tight buildings that were passivated step-by-step to experiment their advantages over the tropical open air residential passive house.

These are the 3 experimental green low-energy / future passive houses plus 1 different “red” control building:

1. **Wooden-Wool cemented wall material (M1)** is a product which in its early days was imported from Germany and marketed in Malaysia about 15 years ago. Young and easily grown trees are used and combined with cement rendering this material impermeable for the termites to go in and enable high fire resistivity. Conversely to insulation fibre boards, wooden-wool material is considered to be even load-bearing. Hence, upper ceilings and even roofs can be fitted with wooden-wool cemented material, and it is possible to insulate the floor efficiently as well with its 50 mm layer type. These walls are easy to install, but altogether including labour costs 50% more expensive than the common bricks material, Trees need to be regularly planted and chopped every five to seven years which might be questioned of being “not so green” by opponents in the market.



Figure 1: Wood-wool cemented wall construction board

2. **Lightweight Reinforced Aerogated Concrete/ “AAC” Blocks (M2):** there are at least six suppliers to be found in the local market providing different mixtures of -less insulating- concrete and -better insulating- lightweight material (e.g. a combination of polystyrene, fly ash and/or recycled paper) . Therefore, being lighter and 30% cheaper than conventional walls AAC is used in a growing number of building constructions. By its producers, lightweight concrete is mainly recommended for the wall finishing. It is engineered as highly fire resistant and thermally insulating. The producers sell the material as a “Green Product” as more than 20% originated from recycled content and the density of AAC concrete is much lower due to its air hollows. Its construction permits only 78% of common bricks’ costs. Due to its light-weight features, depending on their physical strength, AAC is not applicable for most load-bearing parts including ceilings.



Figure 2: Lightweight Materials – here Combined Block with Polysterene (a)  
and full block Application in a Smart Cool Home ® (b)

These two materials M1, M2 all originated in Europe, were able to take a certain foothold on the Malaysian building market , after some time of market penetration nowadays they are assembled locally.



3. **Double Layer Clay Cavity Bricks (M3)**: Clay as the first fully natural material has been used for walls in millions of low-cost houses not only around the tropical belt, At first sight, in Malaysia this material seems to be restricted to quite high-priced clay tiles on the roof. But at a closer look, this is not at all true. As a second note, several producers can be found within an association in Selangor and Johor accompanied by quite professional information on the website. Interestingly, beside normal applications, this material is rarely marketed in the shape of **double** layers with air cavity gap. However, as it has to go through the CO<sub>2</sub>-triggering burning process of clay bricks, and unlike the natural abundant river clay material, it is uncertain if the environmental costs can still retain a green label in term of its footprint.



Figure 3: Virgin clay material and burnt clay brick stones at BMI

Among all competitors, due to the doubtful layer principle clay providers can claim to having the best heat prevention rate, so far if we take the anyhow low costs of RM 0.28 in West Perak per piece (U-value =5.6) and build a second layer, including plaster and the finishing the U-value will be as low as 0.88. However, in open air condition, the temperature yielded is astonishingly much lower than comparatively expected with M1 and M2. As its tradition has two layers and an air buffer, according to a Malaysian website the time lag is 7-8 hours before the heat wave from outside dissipates through the wall. Only a small proportion of heat striking a west-facing cavity brick wall passes. Most of the heat is reflected and some is absorbed, allowing less than one percent ( $5-6 \text{ W/m}^2$ ) to penetrate the wall. This can be compared to the massive  $120\text{W/m}^2$  measured to enter through a shaded north-facing window.

The contradicting argument that we tested below is the following. Based on a heavy thermal mass, it probably can withstand the daily heat for a longer period of time, but it takes the same time to unload the heat. When the cooler evening rolls in it takes this material longer to cool down. During a heat wave with minimum night time outside temperatures not far below or most even entering the thermal comfort zone the unloading process cannot be successful. Only additional cooling in combination with further insulation would help them.

4. **Sand Bricks House. M4** is the envisaged control house embodying all elements of a conventional residential house standard (figure 4). We will to compare our green and energy efficient buildings with the following elements of the M4 standard building clearly marked in red:

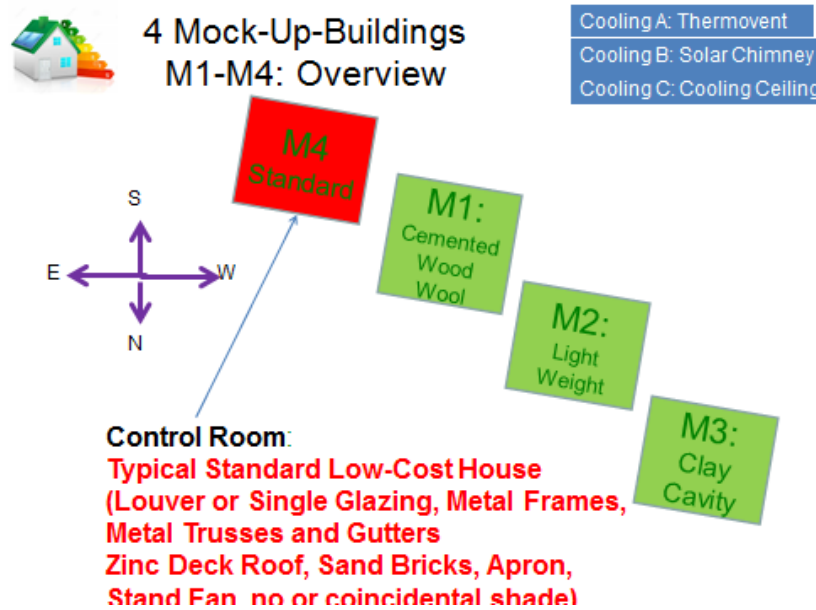


Figure 4 : 4 Mock-Up Buildings Overview

### 3. METHODOLOGY

3.1. The mission of this project was to build a **real-time and weather data base** for actual thermal comfort and electricity required to cool the building further. We called in 106 +35 students to perform the measurements during 54 + 20 days via their assignments. These are the parameters that are going to be measured, here with only 1 and 2 performed in the initial stage of passive cooling (02-05/2015):

1. Temperature (indoor and outdoor)
2. Humidity
3. Indoor CO<sub>2</sub> and CO (with alarm or time switch into ventilation mode)

At the 2nd stage (09-12/2015), with active elements of mechanical cross ventilation and cooling walls in comparison with A/C in place, the following parameters will be measured:

1. Energy consumption / CO<sub>2</sub>
2. Haze: Anti Pollution Index indoor – outdoor (API)
3. Velocity fan or throughput m<sup>3</sup> air/h
4. Precipitation (for rain water harvesting)
5. Photovoltaic (general solar radiation and solar yield p.h./p.d./p.m./p.a., comparison produced – bought in p.m./p.a.)

3.2. **Thermal Comfort** defined in this study is different from the conventional conception valid for the Northern hemisphere. Herein, the inside temperature for offices should be 21.1°C (Thermal Comfort chapter, Fundamentals volume of the ASHRAE Handbook 2005). Of course, in a cold country every °C that has not to be heated can save tremendously money and might therefore be kept at its low end.

This is completely the other way round in a tropical country. Australia is a good example for, standard: winter 21C, summer 26C.

Abdul Rahman (1995) in his ground-breaking study found that the most comfortable indoor temperature in Malaysia (tropical region) for residential areas ranges from 25.5-28°C. The new policy by the Malaysian government requested all state-owned buildings to set the temperature not lower than 24°C with private buildings to follow since 2011.

A study conducted by UTM concluded that the range between 26.1 and even 28.6°C. is optimum for residential houses in tropical countries even for adopted people from Northern countries (Ahmad et al., 2007).

**3.3.** These are the **3 steps** our own research has started off with upon the completion of the four tested building:

1) Preliminary studies:

- Studies for the building frame have been conducted by the establishment of a typical residential house (Hairie, 2013).
- Studies for building ventilation have been carried out by Siti Zaleha, 2013).
- Green Building Awareness Study in the Klang Valley determining the buying power of occupants which like to venture into greening their buildings (Wagner, 2014)

2) Field Experiments (DoE):

The research team tests all the different elements in terms of thermal comfort (e.g. temperature, humidity), operational costs and return of investment. Through every step of several experiments along the milestone chart, we will especially test occupants' satisfaction day/night (measured every 30 minutes). As only temperature and humidity are automatised, the researchers performed the work on the spot during night time as well.

Since the driving force is to work on heat peak conditions, we focus on sunny / typical overcast days and removed rainy periods for future analyses. In addition, we also measured the thermographic profile to determine the critical areas sucking the heat. At a later stage perhaps we will use a professional blower-door test to compare the air-tightness of the buildings.

This project uses data loggers (RHT) which allow ambient temperature and relative humidity data being downloaded in Excel. In lack of a meteorologic station, all other equipment (lux-meter, surface temperature pistol, thermographic camera) had to be measured manually.

Two more measurements will be taken, CO<sub>2</sub>-emission of used electrical devices and incurred costs (operational costs and estimated predicted return of investment if based on M4 an owner decides to venture into green energy efficient building instead).

3) Analysis:

Statistical analysis will be performed below with the tool Minitab ®. As for 6-Sigma-DMIAC-projects, the result will be presented together with recommended improvement measures and controlling tools to reduce the average temperature and its deviation to run against thermal discomfort. Especially, what the requirement of tropical adaptation is concerned, the team cooperates trans-disciplinary with one institution inside the University of Kuala Lumpur who have done ample experimental and prototype work with air chilling blowing systems.

The collected data will be analyzed and compared to Green Building standard (e.g. iBS Green Building, Greenmark RADAR or LEED Index and tropically adopted energy performance certificate (TEPC)) and the ASHRAE 55 for thermal comfort.

Apart from the building envelopes, everything else can be alternated, such as the roof, the windows, the doors and the shading devices. That comes out of our generic research model, at best expelling the sun's impact by airtightness with only the surrounding heat preventing parameters of the envelope being responsible for the temperature of the indoor temperature.

1. New Independent Variables (after weather outside is now defined as interfering variable):

Building envelopes M1, M2, M3, M4

X1 Wall

X2 Roof

X3 Windows

X4 Floor

2. Moderating Variables (September 2015 onwards):

Z1: Green Cooling (Ventilation, Cooling Wall or Ceiling)

Z2: Dehumidification

Z3 : Air Condition

Z1 + Z2

Z1 + Z3

Z2 + Z3

Z1 + Z2 + Z3

Different compared to an open house, the weather condition is now no more the main independent variable. As in an airtight house freely intruding air is expelled. The climate can only *indirectly* intrude. However, as there will be an impact on the new independent variables above, we expect there is still some impact, especially onto unshaded windows and the longer lasting hot weather conditions take, the higher the impact.

Dependent Variables :

Y1 : Temperature

Y2 : Humidity

Y3: Thermal Comfort (subjective)

In stage 3 we analyse and generate the report including further improvements and a monitoring system.

### 3.4. Description of DoE – Design of Experiments

All the experiments we have conducted with the assistance of 94 plus 32 Business students and 12 Electrical Engineering students were divided into different set ups following this legend for each building:

1. Basic DoEs

- O open windows
- C closed windows

2. DoEs due to alternations
  - S** shutter (M1,2,3)
  - at** airtight (with insulated ceiling below the ventilated attic with insulated roof PLUS insulated floor and door)
  - Ce** ceiling (gypsum board below the typically insulated attic)

After we had started with **O**(pen)/**O**(pen), **O**(pen)/**C**(losed) and **C**(losed)/**C**(losed) in the M1 and M2 building comparing with the conventional M4 building In February, end of March 2015 all four buildings including M3 were operational. We also tried to measure the impact of **S**(hutters) in conjunction with **O** or **C**, which was jeopardised as our contractor repeatedly failed to construct and repair the soon fallen shutter boards during the period under observation. The hypothethised greenest and most energy efficient building which is airtight (**at**) could only be measured during 7 days 27/04-05/05/2015 as our semester ended. The latest 2<sup>nd</sup> set of 27 days data, a fully-fledged generated comparison of all four buildings between 28/07 and 20/08/15 still needs to be edited and analysed.

1. Internal comparisons within each building

Building	DoE	Number of Days	Hereby days with rainy parts (to be removed as ivV for the analysis)
M1	O	15	
M1	C	24	
M1	SC		
M2	O	18	
M2	C	18	
M2	SC		
M3	O		
M3 AT	C		
M3 AT	SC	18	
M4	O	15	
M4	C	21	
M4	Ce	3	

Table 1: Internal comparisons within the 4 mock-up buildings

2. “bivariate” comparisons between two buildings

DoE	M1	M2	M4
O	15	14	21
C	24	18	21

Table 2: Variability of bivariate comparisons between the buildings



3. Multivariate comparisons between 3 or all 4 buildings

Comparison	O-O Number of Days	C-C Number of Days	
M1-M2	5 – 6	8 – 6	
M2-M4	6 – 5	6 – 4	
M1-M4	5 – 5	8 – 4	

Table 3: Variability of multivariate comparisons between the buildings

Out of these minimum 4 days data after the removal of “illegal” data entries (weather and unjustifiable spikes due to measurement errors) the 4 to 5 most appropriate reference days were selected for the analyses.

a) Selection of Most Common Parameters for the Analyses

After measuring different DoEs, we assigned C-C-C-O as the most likely standard DoE to the selected 4 days measurement AT of the building comparisons to measure the 5 main parameters derived above to determine their contribution towards the indoor climate generation. We chose M1, M2 and M3 as typically closed and M4 open. As M1 and M2 yield similar data, M3 generated AT data from beginning. We could then identify the effect of the air as trigger to heat the building especially during HPH:

	M1 C	M2 C	M3 C AT	M4 O
Walls				
Windows				
Roof				
Floors				
Ambient				
RH				

Figure: Average surface temperature of 5 comparable days with removal of rain data entries (IKMAL)

The same set-up will be theory-generating after the 3 buildings according to the idea of the passive house with the expulsion of daytime air are made airtight. CAT will then not stand for “window closed” and S not for “radiation completely reduced by the shading effect of the shutter boards. Only then the answer can be given, whether and in how far airtightness can be a driver of a tropically adapted low-energy house of the future.

The main statistical standard analyses performed consisted of the following values:

Distribution: Boxplot and fitted line Histogram to show overall trends and determine basic average and deviation values

Time Series Plot: Run Chart to show the development and interaction of parameters during days and sequences of days

Normality test: as preparation for 4.

Quality Test (Determination of the Sigma Level Thermal Comfort at 28.6 C max.)

Selected Correlations and Regressions (like Surface Temperatures of enclosing Parameters on Ambient temperature and RH)

Others, e.g. Hypothesis Testing (Sample T-test, ANOVA)

The weather conditions during the dry season allowed us in part to conduct the experiments throughout sunny/cloudy days. (Unfortunately, it turned out that the former consistent clear dry season is not possible to find due to the apparent climate change forcing us to neutralise data with the interference of heavy rain).

The difficulty to motivate researchers for measurements was overcome by setting one assignment for students to gain data for 54 days during 02-05/2015. This was necessary as the weather during monsoon season will hamper the team to perform a longitudinal study based on so-called HPHs (heat peak hours).

#### 4. RESULTS

At the same time, on this building must the coolest is also our first testing ground for complete airtightness established 03/2015. The temperature 27.9° C at the HPH compared to around 31-32° C of M1 and M2 and was shifted at a low level the following M4 where the reading was 34° C.

We could perform the first ground-breaking experiments comparing walls, roof and windows the three building with M4. We will provide a glimpse of the results in a nutshell for all four main parameters and then conclude in 5. What kind of material in which strength we need to make the building as “sun-bullet-proof” and energy-efficient as possible. That means we will show how to maximize passive elements to reduce or even avoid any CO<sub>2</sub>-triggering activation.

##### 4.1. Overall

Starting out with similar temperature every morning before the sunrise, the airtight building M3 is on average about colder the red conventional building M4, and during the heat peak hours.: The following figure also demonstrates by the blue pyramid area the cooling demand of the cooler M3 building in case the ambient temperature exceeds the tropical thermal comfort of 28.6 C (brown line):

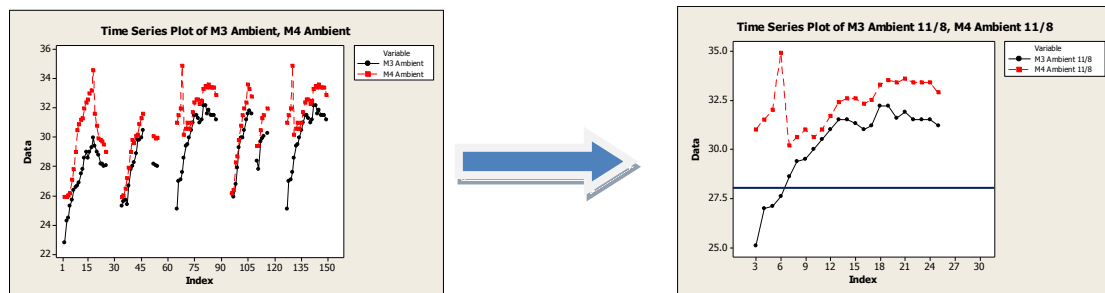


Figure 5: Unstacked run-chart ambient temperature M3-M4 typical day

This figure shows by the example of two building M3 and M4 that the temperature differential along five reference days within 150 data entries taken every 30 minutes along 5 reference days is significant. The average temperatures of M1 is just 1.2C lower than M2 and 1.3 C lower than M4 respectively, the reason for the 3 C lower temperature of M1 during typical sunny cloudy afternoons compared to previous studies could be the no-more radiating roof which had been replaced in the 2nd batch of experiments. Charts like these will indeed trigger consequences in terms of recommendations how to optimize the building of tropical low energy houses with new industrial standards and designs.

## 4.2. Roof:

If not insulated, the roof is the most vulnerable part for most single and double storey buildings as it is often fully exposed to the sun with then temperatures of > 50 C.

In our comparison, we use

M1: White Honeycomb Roof (Cemented Wood wool and Fibre), wooden trusses (only non-radiant days!)

M2: White METAL ROOF, wooden trusses

M3: White METAL ROOF with STRYFOAM INSULATION, wooden trusses

M4: Dark-Blue ZINK ROOF & METAL Trusses

All the roofs are ventilated, whereas the heat effects of a conventional. More insulated roof still needs to be tested.

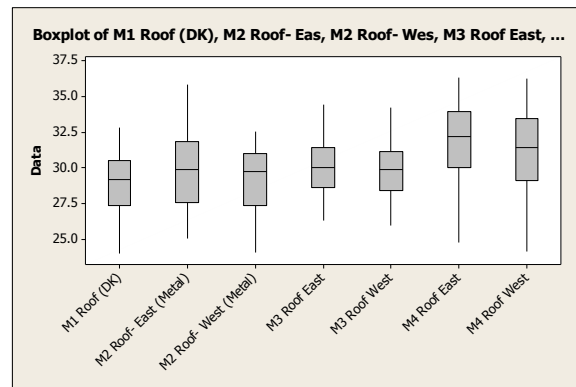


Figure 7: Boxplot and Run chart during 5 Days comparison with CCCO

Whereas the best roof M1 showed a range of 30 C – 33 C and a reasonably low standard deviation over the daytime, the conventional M4 reacted extremely especially during direct sunshine (30-47 C within the standard deviation range and up to 61 C).

## 4.3. Windows:

The three windows boxplotted in the following depiction M1, M2, M3 and M4 do not look very different in terms of heat intake during our 5 days comparison average ...C between ...C. The results would mean that neither uPVC frames nor lowE single glazing alone can bring down the temperature. As we compared the same lowE glazes in M1 and M2, it seems that the higher range and standard deviation of M2 might be due to the interactive effect of the wall or the roof (as mentioned above).

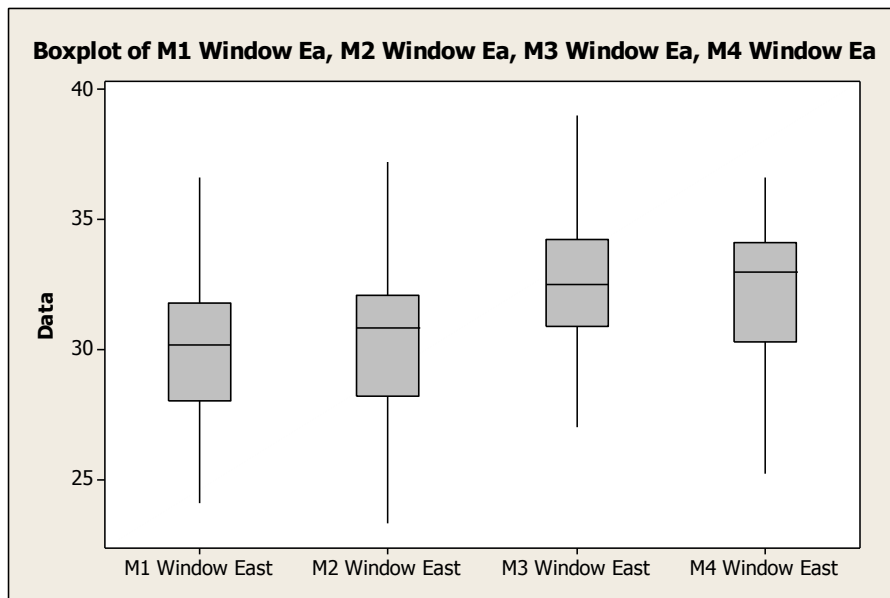


Figure 8: Boxplot comparison of East windows (most sunlit)

However, as the time series plot reveals is that the M1 window with a few spikes was sometimes measured when sunlit. Removing those spikes and verification by re-measurements would be able to shed light on how cool the M1 building envelope is.

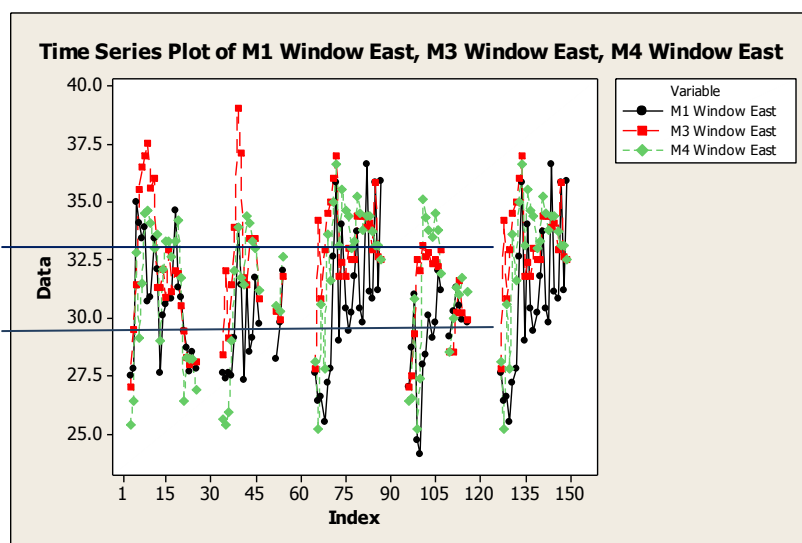


Figure 9: Time series plot of East windows in a 5 days comparison with stable sunny cloudy weather conditions

Conversely, it is firm to say that the uPVC frames echo the values, as the heat intake via conductivity is only maximum 37°C compared with those 54 °C of an aluminum frame,

### 3 Days Heat Comparison Frames and Window Panes

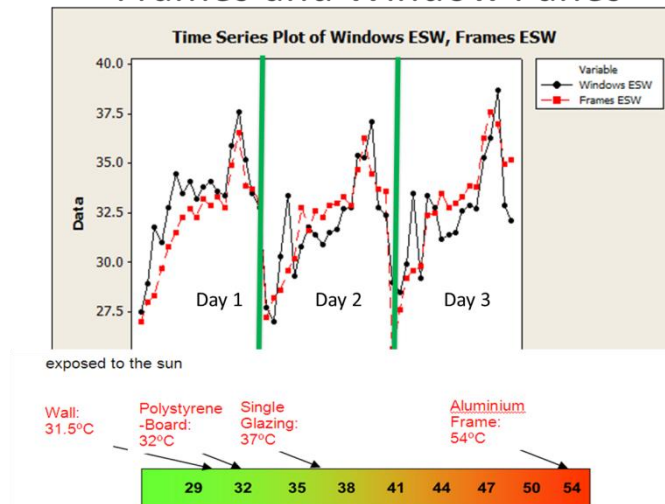


Figure 10: Run chart 3 Days Heat Comparison Frames and Window Panes

## 5. CONCLUSIONS AND OUTLOOK

During our longitudinal study, there is proven record that the green parameters of the 2 residential green mini-buildings scrutinized above cannot reduce the ambient temperature like found in a “red” building significantly. The M1-building is at least able to keep the ambient temperature 1.2°C below the conventional M4 building during a hot afternoon which resulted in a temperature of 30.59°C on 5 typical sunny to overcast tropical Malaysian days. However, this is still 2 °C above the adopted maximum tropical thermal comfort standard of 28.6 °C.

Due to the interference of warm and hot air from the non-shaded area outside, this result is not firm enough to prove the effects of the systems components walls, roof, windows, door and floor. It is likely that the final trial can only be made by airtightness where all the insulating system components play together in one.

Hence, different all the further elements of “moderating” passive and active building technology as mentioned in “methodology” will be elaborated in the ongoing and upcoming research. It will be merged to create a sustainable system following the directives of triple green (Wagner, 2015). Unlike standard concrete and bricks residential buildings (that the M4 in its original state stands for), the tropically adopted airtight passive or at least low-energy house no longer allows gaps and cracks that used to let the cooled indoor air escape and fresh air enter the building in an uncontrolled manner. Neatly insulated walls, ceilings, roof and the windows closed during the influx of the “hot” weather outside, there is almost no more air circulation between indoors and outdoors – the building is airtight. Fitted with CO<sub>2</sub> alarm, it might be able to create its own climate at a reasonable price and - to our expectation – it could be just slightly above the upper level of allowable thermal comfort. The consequence would be an immense energy saving achieving better indoor air quality and no more entry of pollutants and animals. When almost complete air-tightness is ever achieved, following modern commercial high rises, our team has to prove one step at a time how advantageous this practice is for



residential area building standards in the smallest plot which is the shape of the three mock-up buildings.

In stage 1 a few retrofitting measures have to be made to protect the building envelope against the heat of the sun (passivation by e.g. roof and windows coating). That means before we put in any electricity (activation), we needed to insulate the building frame. Subsequently, in stage 2 we will conduct the following experiments and amend the research design continuously as needed.

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## SUSTAINABLE FORM TYPE AND NATURAL BIOMIMICRY

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### ABSTRACT

Literature review showed that sustainability is a phenomenon which had been studied in different disciplines, particularly in architecture. These studies showed that the aim of architectural sustainability is the integration between buildings and environment. Literature review mentioned the role of nature biomimicry strategy in the generating of sustainable form, whose characters effects on the building efficiency and provide comfort to its users, but this had not been studied in practice. The research problem was, not taking into consideration the designers use some organic forms found in nature in architectural projects as one of the sustainability strategies. The research hypothesis was (The organic sustainable architectural form is varied in its relation with site topography and context, also it is varied in its relation with the materials used, the energy resources, the techniques used in its formal and technological treatment. Finally it is varied in its resistance to the natural conditions). The research findings were that, all types of the organic forms had been used in the composition of sustainable form except the plant form. The organic form had biomimicry the context rather than the topography. The solar energy was the more energy used, the aim of its using was heat gain. The formal composition was the main formal treatment, while the solar cells were the main technological one. The aim of these treatments was the sustainable organic form resistant to the natural conditions, such as heat, windstorm, and floods.

**Keywords:** Natural Biomimicry, Sustainable Form Design, Organic Form.

### 1.0 SUSTAINABILITY

The idea of sustainability is beginning of the seventies, appeared where multiple terms of sustainable design, green design, environmental design, eco-design, involving all of these terms on the fundamental goal is to take into consideration in the design of any building influence the amount of output from the building on the natural environment (Al-Homoud, 2000). Sustainability means the integration of natural systems with human patterns of giving continuity and uniqueness of the place-making (Katz, 1994). Sustainability also refers to the exploitation of natural resources in a way which does not reduce the usefulness of renewable and future generations. To protect the stock of expendable natural resources as cooling, water and living organisms (Wrid, 1992). Sustainability include development processes that depend on themselves and on the potential generated by itself, and use the resources Somehow to lead to resource consumption or depleting resources, as they represent a reasonable investment for the potential of nature and then placed in the correct position (Paehlke, 2001).

Class environmental researcher (David W. Orr) sustainability into two groups (environmental sustainability and technological sustainability), and although they possess similar goals, but the way to achieve these goals vary.

Environmental sustainability means maintaining and protecting natural capital, which includes the environmental systems and services with waste treatment and climate regulation, food production and soil formation and consumption of resources as little as possible (Goodland, 1995). The technological sustainability refers to technology that achieve sustainability in one of methods of modulating resources into useful artifacts, with The integration of science and design humanitarian prospects and the creativity of designers to find a future designs (Ray-Jones, 2000, Zawdie, 2002).

## 2.0 SUSTAINABILITY STRATEGIES

Sustainability study Searching at all instead of the parts that are components of the ecosystem, as it confirms the concept of sustainability on relations Instead of the component parts of the environment, which combines natural and human communities and between sustainability and culture, and includes five strategies are as follows (Sassi, 2006):

- 2-1 Biomimicry in design
- 2-2 diversity in design processes
- 2-3 to maintain the totalitarian point of view
- 2-4 The use of self-systems in the self- adaptation operations
- 2-5 thinking within the local scale

## 3.0 STRATEGY BIOMIMICRY OF NATURE

It means the concept of imitation in general build and re-installation, as based on the appearance and the essence in order to create a product of a good architecture. It also means re-installing and building the form of the original source for the production of creative works and authentic (Tuncbas, 2006).

Nature biomimicry strategy consists of several methods based on natural forms and concepts and principles that formed, and structural systems which they are located, and designers deal with nature in different ways starting from the systems to the future trends of ecosystems and methods of self- adaptation (Yeang, 1995). Nature biomimicry can be defined, that the human deal with nature in various ways starting from the systems to the future Trends ecosystems and methods of self- adaptation, with regard to nature as a source of metaphor, and the exploitation of all Sources of solar and wind energy materials and metals.

## 4.0 Concept of Form

Form comes multiple formats including shape, image, style and structure, so the form is a heterogeneous structure in which the number of elements perceived is linked by the suitable relationships for realizing personal characteristics of the mind that produced, And those relationships are the (construction and composition, arranging and organization) (Ching, 2014).

All definitions included which dealt form two main sides essence and appearance, has explained the proposals of Aristotle in the fact that the first side (form is material thing) down to the proposals in Aosowski (that form is only the material).

Pointed each of (Schulz and Klein and Bearsle and Beecher) to that form is the phenomenon of sensory system of relations between the parts of the lines, surfaces and colors.

## 5.0 FORM IN NATURE

### 5.1 Forms perceived sensory:

Include forms of living and non-living nature, natural scientists have noted that Form influenced by the development of a continuous dynamic operation, Because the organism cannot live alone, it is within the environment it affects and affected by it (Mc Harg, 1965).

#### 5.1.1 Forms living Nature:

Include all of the forms that are organic nature as forms of plants and animals, where Albiogin defines as organic form The interact outcome of the internal and external forces and when the impact forces up to a state of balance, form is integrated and Internal and external contradictions in the case of balance (Whyte, 1968).

##### A. Form in Plant:

(Whyte) showed that what distinguishes organic forms is a growing phenomenon. The appearance of Form of the plant expresses the state of balance between the total constituent powers (Whyte, 1968). One of the important factors to adapt the plant to the environment as well as the growth factor is a clear Independence of the constituent parts of the plant, Where that part of the plant may not affect the deduction, it also cut some parts the ability to grow to become like plant Original.

##### B. Form in Animal:

Form in an animal is more complicated than in the plant, animal form can not be traced back to the primitive pattern specified. The form of the animal can be classified into three main of the concepts are, disappearances and denies and appearances (Whyte, 1968). These three aspects represent the relationship between the form of animal and the environment.

The relationship the form by animal take two levels:

First: in parts (form in the same animal).

Second: In whole (form in animal and the environment).

#### 5.1.2 Form Non-Living Nature:

Formations forms of non-living nature and Constitute a rich source of thinkers and designers throughout the ages, where reveal the richness and beauty of the forms non-living compound in the mechanism of the same nature. It is also there forms ice crystals and the amazing diversity in their patterns, all based on the hexagon, where, according to a study (W.A.Bently) entitled (Snow Crystals) to multiple types of floc snow. And often inspired designers ideas of floc snow index (Arslan, 2014). As well as looking at the forms of the mountains or the desert sands, the Form in the top be small loads and be a small horizontal section, and at the bottom, where large loads have a large horizontal section, then be meted forces in all parts of the Form balanced, equivalent thethe form of pyramid.

### 5.2 Nature Forms Perceived Mentally:

It includes all forms intangible nature, which be realized by the mind such as laws of nature and phenomena, and the myths and legends and religious beliefs and Almathologia which represents a

group of special interpretation of the universe and the nature and the mysteries of life and death among a specific people by the embodiment of the meanings and the forces of nature and life events stories (Arslan, 2014).

## 6.0 SUSTAINABLE AND NATURE

Draws the concept of sustainability towards of nature in the late twentieth century, where he recognizes that this concept of civilization integral components of the natural world, and that nature should remain or perpetuated if human societies would like to stay. This was reflected, bringing to design sustainable design makes the idea of integration between human civilization and the natural science foundation to create a diverse architectural productions (Edwards, 2001).

## 7.0 SUSTAINABLE DESIGN AND NATURE

Studies emphasized that when you design a sustainable building, it must look to nature as a metaphor for the problem and make designer To get to the ideal case, which means that buildings must be doubled their systems and benefit from their waste and generate own energy And grow to get to aesthetic structures integrated over time, which means that the designer can take the forms of nature as forms previous And metaphor in order to be allowed to nature to show itself in the design and bringing it to the external surfaces through taking forms different, as forms of flowers and birds and feel of materials and the capacity in which accompanies natural light and natural ventilation, and reflect in buildings (Edwards, 2001, Arslan, 2014). Means design with nature to exploit all the assets and resources of nature, including energy, water, land and metals, and that the systems of nature are systems that must be compounded by the building.

## 8.0 SUSTAINABLE ARCHITECTURE AND NATURE

To make Nature is the road that follows the production of architecture interact with it, there are five important strategies must be taken into consideration are: (Edwards, 2001, Yeang, 1995)

### 8.1 Learning from Nature

Nature has models and internal systems can be used in the design of buildings and that's what put (LAN Mc Harg) in his book of the same name (Learning from Nature), which was released a year (1970), where the environmental design is an attempt to put these systems within the balances of linear functional used and which is required in the design. The way in which interconnect to the life cycle allows the buildings to take natural systems property, Learning from Nature works to encourage interaction between Resource such as energy, water and materials used in the structure or waste such as pollution and the resulting posed building abroad (Edwards, 2001, Van der Ryn, 2008).

### 8.2 Using Natural Models for Learning

All the structures used in buildings, taken from nature have been subject to experiment, where the forms and constructions and formations and used materials in the nature are continuous and endless (Edwards, 2001).



### 8.3 Making Natural Explicit

In this strategy an architect brings the nature to the vision field, whether at inside or outside, or directly in used Structure, where the nature is the source of audio and visual comfort.

Pointed Richard Rogers repeatedly to paragraph (**Making Nature Explicit**) in all projects designed by, and also in the planning of city, he used frequently plants as a layer during modified environmental business, and it was cooling, through energy conservation (Edwards, 2001, Van der Ryn, 2008).

### 8.4 Using Natural for Ecological Accounting

The all environmental evaluation systems have an ecological base (environmental) so ,because of the regional warming pressure has become the subject of energy is dominant in this direction. The buildings were treated as a home depending on this trend by both Building Research Establishment & Assessment Method. And that everything, whether water, or material or energy resource, which is the measured value depending on the rarity or the effects of the damage resulting from it (Edwards, 2001, Yeang, 1995).

### 8.5 Every Species is a Designer

Nature aimed to teach and explain the idea that all living organisms practice on All options design and by modern methods, For a period not far all the options were specific genetically can an ant to build a practical pattern of the nest (ant house), but the obvious image is that in nature all the parties are contributing to the design of all (Edwards, 2001, Van der Ryn, 2008). In all cases, every living organism of the species is busy to access to the richness, complexity and beauty in itself.

## METHODOLOGY

The selection of the group of organic forms projects, a four projects characterized by adopting a strategy simulation of nature in the creation of sustainable architectural projects. These projects were adopted as samples to practice study.

Create and prepare special questionnaire help to detect contrast between organic forms. A Case Study on the projects selected according to the questionnaire form. Verification of the hypotheses tested statistically.

### Method of collecting information

The information collected for these variables based on the information form, as the form includes primary and secondary vocabulary relating to form biomimicry and the topography of the site and context, and determine which of these variables has been made after reviewing the research samples that have been identified by the researcher. The questionnaire distributed to 25 architects.

Data treatment: the data processing method based on mathematical analysis by finding duplicates and extraction percentages of sustainable forms of variants using the desktop program Ready (Excel).

## The Results

The practical study indicated that to use all organic forms except plant form, the following percentages: where ellipse form by (22.22%), followed by each of the Conical and the Oval elliptical and spherical and parabola and animal both by (11.11%), and the forms dynamic by (22.22%). The

plant form was by (zero%). The form mimics the context of the site (50%), mimics topography are streamlined by (37.5%), and Hierarchy by (12.5%). The results indicate that the highest rate was for the wood material by (37.5%), followed by stone material (25%) and then each of sand and glass and soil by (12.5%).

For manufactured materials were the highest rate of concrete material (21.06%), followed by plaster (15.80%), then plywood and steel both by (10.53%).

As for the aim of the exploited energy sources is to achieve heat gain and natural ventilation both by (21.44%), followed by energy saving and thermal insulation both by (14.28%), It also varied the formal treatments that used to benefit from the sun as an energy source, where the highest percentage of formal composition is (26.64%), followed by efficient orientation (19.98%). The formal treatments that have been used for the adoption of wind as an energy source, where the highest percentage of efficient orientation, then the walls wavy both by (28.58%).

The results showed that the technological treatments used to benefit from the wind as an energy source was for ventilation through windows by (60%), followed by self-systems (40%). As for Technological treatments to exploit water as a source of energy, was the highest rate Pipeline by (40%).

## CONCLUSIONS

Varied organic forms used, where the form is an ellipse more forms compared to the commonly used other forms, as it was more commonly used animal form of plant form.

- Research emphasized that the organic form mimics the context of both the location and topography.
- The focus was on wood and natural stone material and concrete, plaster, plywood, steel and insulating materials as materials Industrial. As for the remanufactured material it has been focusing on insulating materials and cellulose and plastic and recycled aluminum.
- The designer focused on each of the solar energy, water and wind as resources of energy, and the goal is to save energy and heat gain and thermal insulation, ventilation and water recycling.
- In terms of formal treatments that are exploitation solar energy, it has been the formal composition is the highest then the efficient Orientation with landfill building underground to other formal treatments.
- Designer relied on solar cells as a treatment technology for the exploitation of the sun as an energy resource.
- For formal treatment, which exploited the wind as an energy source was the highest percentage of the efficient orientation and then treated the walls in different ways.
- For treatment technology for the exploitation of wind as an energy resource, the designer emphasized the location of the windows in the right direction, With the use of self systems.
- The research emphasized on organic form that resists all natural conditions as heavy rains, hurricanes, floods.

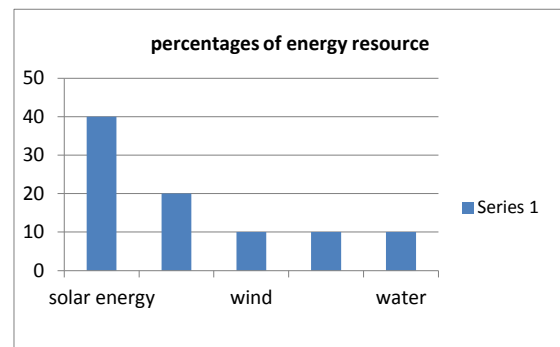
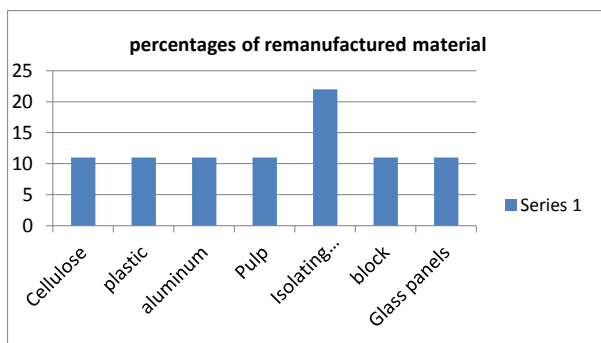
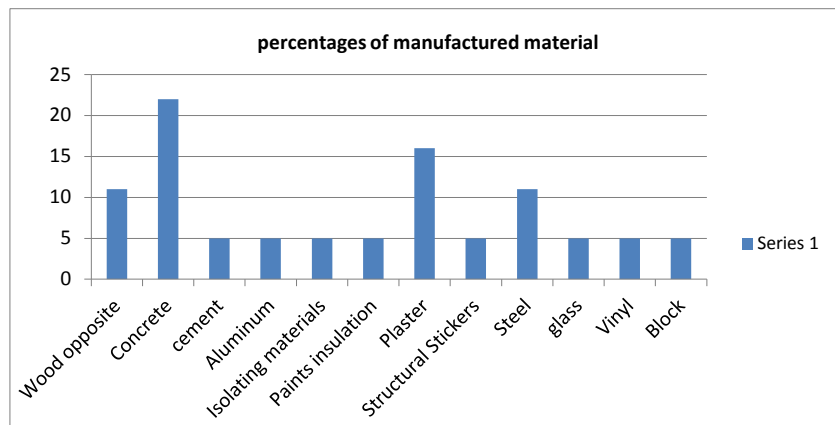
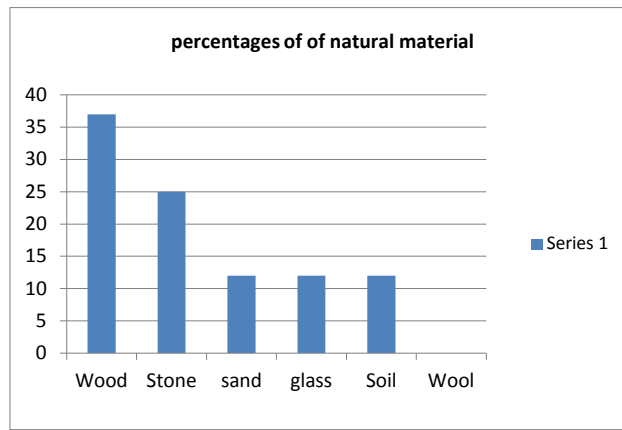
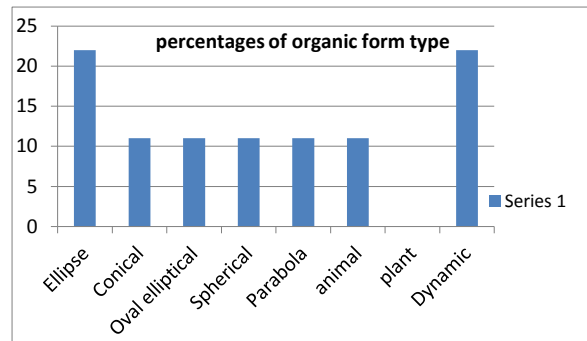
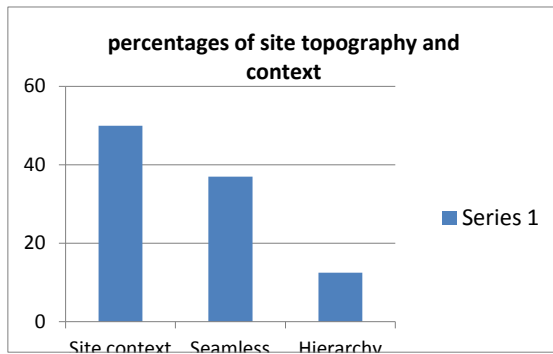
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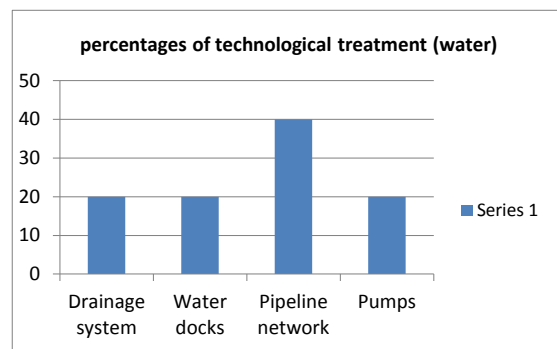
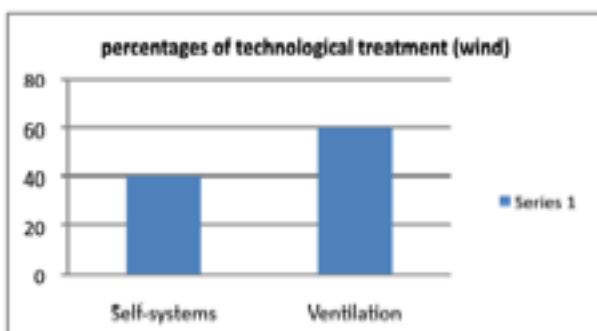
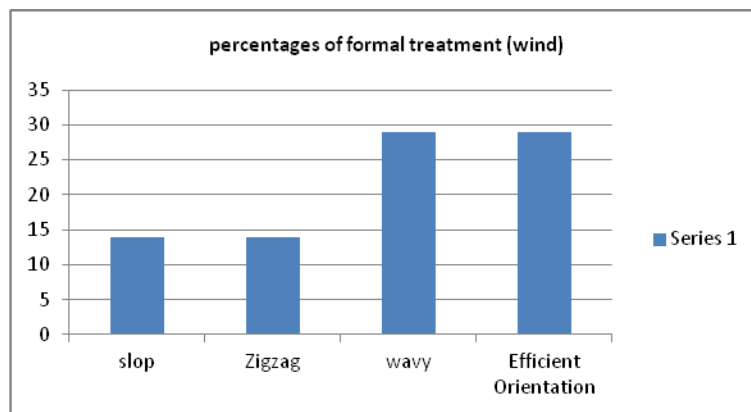
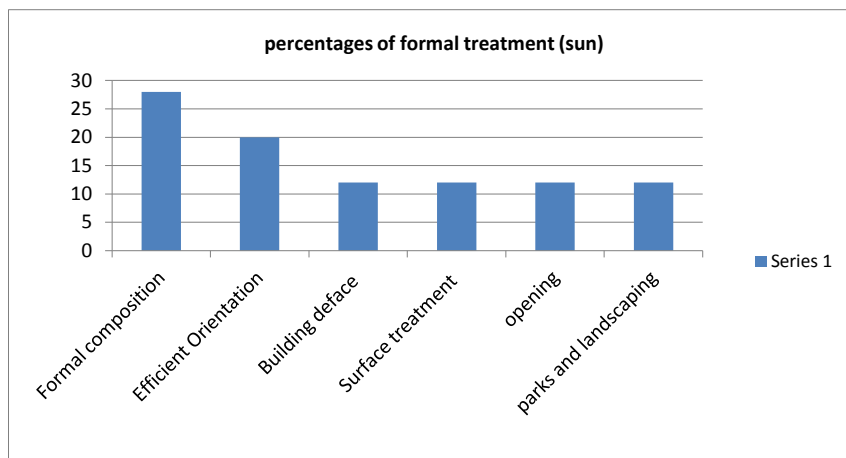
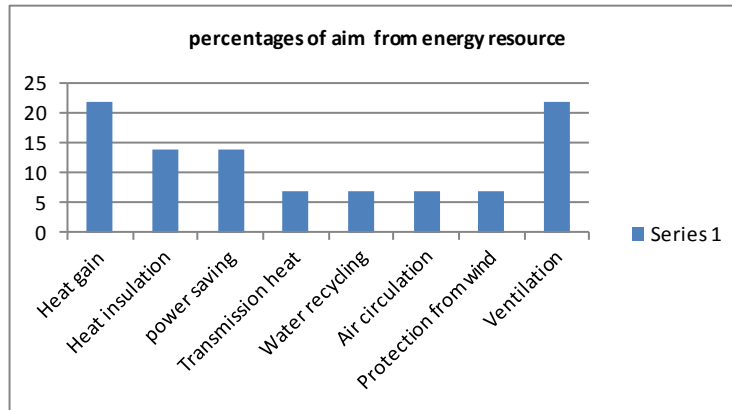
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TABLE (1) Questionnaire

Factors	Possible values				
Organic form type	Seamless	Dynamic	plant	animal	
	Conical	Spherical	Ellipse	Parabola	
	Oval	Oval elliptical			
Site topography and context	Seamless	Hierarchy		Site context	
Materials used	Natural material	Wood	Stone	Soil	
		Marble glass	Wool	Hemp	
	Manufactured material	Wood opposite cement	Plastic	Concrete	
		Plaster	Steel	Aluminum	
		Vinyl	glass	Structural Stickers	
		Block cement	Isolating materials		
	Remanufactured material	Paints insulation			
		Cellulose	plastic		
		aluminum	Pulp		
		Isolating materials	block		
The energy resources	Glass panels				
	solar energy	wind	Waterfalls		
The aim from energy resources	Rainwater	water			
	power saving	Heat insulation	Heat gain		
A formal treatment (sun)	Transmission heat	Ventilation	Protection from wind		
	Air circulation	Water recycling			
Technological treatment (sun)	Efficient Orientation	Building deface underground			
	adoption of the Formal composition	Surface treatment materials available locally			
	The use of parks and landscaping	Using formal methods for opening			
A formal treatment (wind)	Smart Glass	Solar cells			
	Computer systems	Double ceilings			
Technological treatment (wind)	Double walls				
	Efficient Orientation	A formal treatment /Zigzag			
A formal treatment (water)	A formal treatment /wavy	A formal treatment /slop			
	Windmills	Self-systems			
Technological treatment (water)	Ventilation				
	Waterfalls				
Resistance to the natural conditions	Water docks	Drainage system			
	Pipeline network	Pumps			
Resistance to the natural conditions	Heavy rains	Windstorm			
	floods	Fires			
	Earthquakes				







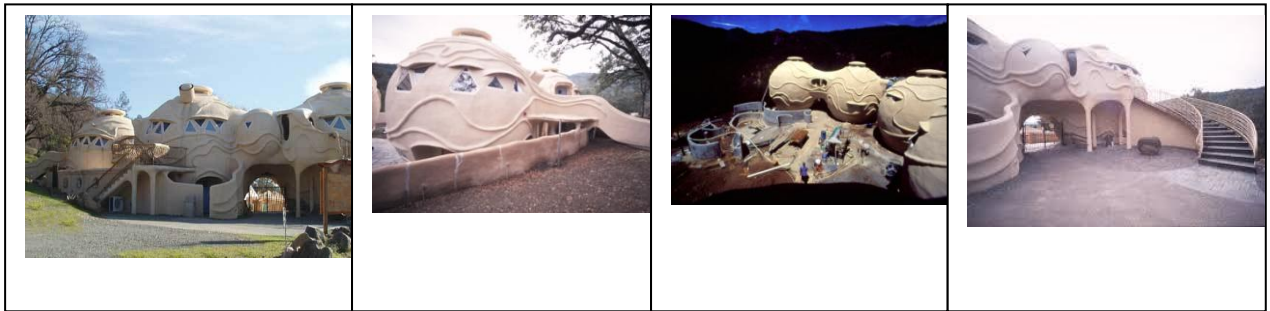
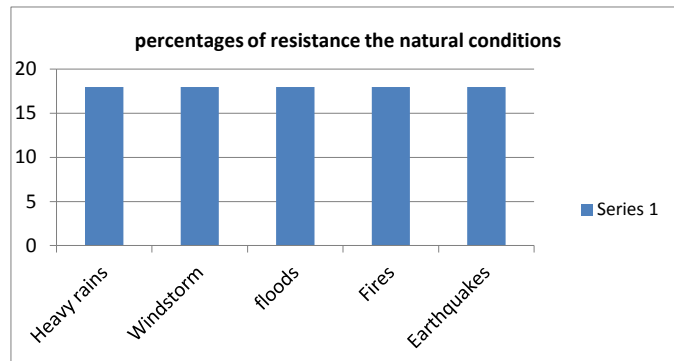


Figure (1) Project The Watsu School of Harbin spring

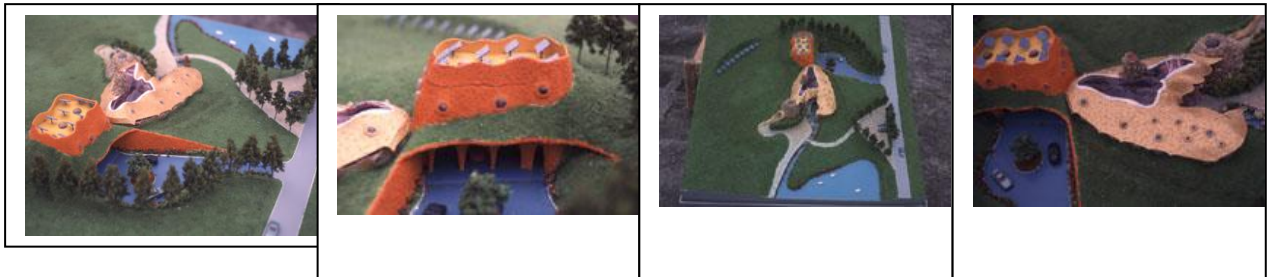


Figure (2) Project Venterra



Figure (3) Project Tsui House

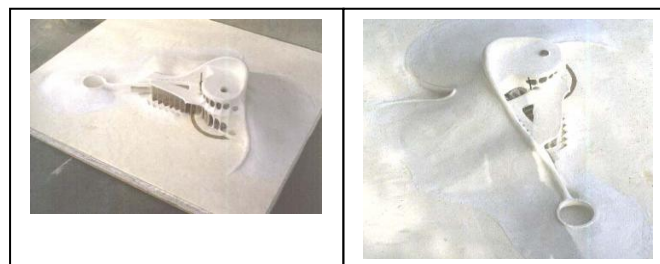


Figure (4) Project Self- Sufficient Residence

## STREET ARTS AND HISTORICAL BUILDINGS IN GEORGE TOWN, PENANG: TOWARDS PRESERVATION AND TOURISM

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### ABSTRACT

Street art and historical buildings are one of the key elements that can represent the identity of a place. This is because these artistic features and architectural structures often contain rich histories that depict the glorious past of the local people. This paper therefore discusses on the positive effects of preserving the street art and historical buildings in George Town, Penang. The writing begins by introducing a brief history of street art, which is actually derived from the humble and simple mural paintings that are found throughout the ancient world. It then continues with an explanation of the message behind street art and architecture before discussing in detail on the street art and architecture in George Town, Penang. The study also relates the street art with their surrounding landscape and historical buildings. It is hoped that through this study, issues on the preservation of these heritage throughout George Town will be addressed, considering that George Town is enlisted under the World Heritage Sites by UNESCO. In addition, this region is also gained as a place of attraction in tourism industry. This study concludes with several recommendations in the light of the results as addressed in the research findings.

**Keywords:** Street Art, Architecture, Preservation, Tourism

## 1.0 INTRODUCTION

Street art exists in many parts of the world. However, street art should not be confused with graffiti art as the two share many similar characteristics but are actually different (Hughes, 2009). The understanding and definition of street art as we see it today begins as a subculture of graffiti art, often crossing over and borrowing from one another (Hughes, 2009). As a result, the difficulties of defining street art are noted by many scholars (Young, 2013). There is as yet no simple definition of street art (Art Radar, 2010). The best definition that the author sees fit probably would be that mentioned by Nicholas Riggle. Riggle (2010) argued that street artworks are notable for making a 'material or artistic use of the streets' where that use 'is essential to their meaning' (Young, 2013). In other words, street art occurs when an artist uses the street as their canvas to express themselves, often transmitting their personal visions, values, and opinions on a daily basis (Hughes, 2009).

Architecture is also about expressing one's self. World-renowned architects, such as Renzo Piano and Daniel Libeskind, both believed that every building tells a story (Federis, 2008; Concrete Quarterly, 2006) Architecture has always been considered a carrier of messages (Ampatzidou & Molenda, 2014). Their stories can sometimes be discerned easily, and at other times need to be discovered through thoughtful consideration (Browne, 2010). The story can be as simple as a metaphor or as complex as a novel (Browne, 2010).

## 2.0 BRIEF HISTORY OF MURALS

Since the beginning of human existence, even before the invention of writing systems, men have constantly tried to record their daily life on the walls of caves through the form of symbols and drawings. These ancient murals often depict activities in which the people of the time engaged, from religious ceremonies to scenes of hunting and gathering for sustenance (Kotwal, 2005) as well as to express one's emotions. The function of murals varies from culture to culture and from one time period to another (Kotwal, 2005). After the invention of writing systems, sometimes people still prefer use art to deliver their ideas or beliefs. Overall, mural paintings are like historical documents that could provide us with valuable information.

Caves filled with mural paintings and even being drawn up until its ceiling like those in northern Spain (Altamira Cave) and southern France (Lascaux Cave) have attract the attention of many tourists. Based on observation on the quality of the mural paintings, it can be concluded that the primitive artists possess great knowledge as well as are highly skilled. In 1979, Lascaux was added to the list of UNESCO World Heritage Sites (Collins, n.d.).



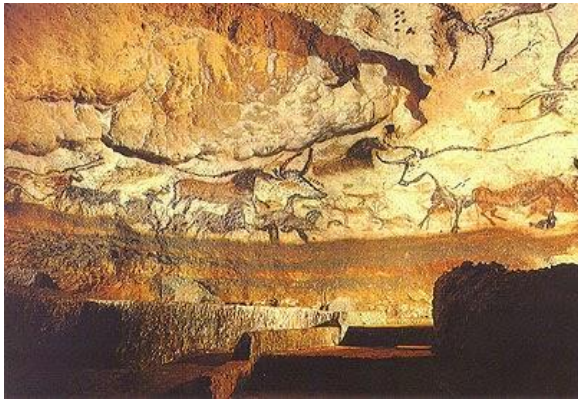


Figure 1: A section of the cave showing images of animals being drawn even up until the cave's ceiling

(Source: <http://www.visual-arts-cork.com/prehistoric/lascaux-cave-paintings.htm>)



Figure 2: A detail image of Lascaux Cave paintings

(Source: <http://www.visual-arts-cork.com/prehistoric/lascaux-cave-paintings.htm>)

The ancient Egyptians also used this method on their buildings' walls: chiseling fine lines that define the outline of an image that they intend to draw and then fill them with colors. Most ancient Egyptian drawings that were found on the walls of temples may include scenes of the people's lifestyle as well as depicting the life after death. Some image contains concerts, fishing and sailing on the river, as the artist used the Pharaonic sculpture on the walls of temples. (Jarus, 2013)



Figure 3: Manuscripts and murals showing some of the daily lifestyles of the Pharaohs

(Source: <http://www.livescience.com/41237-love-revealed-in-egypt-tomb.html>)



Figure 4: Inside a tomb dating back to the age of the Pyramids in Egypt held this image, an embrace between a priestess and her husband, a singer in the pharaoh's palace. The image has been recorded by researchers in full color.

(Source: <http://www.livescience.com/41237-love-revealed-in-egypt-tomb.html>)

In fact, most of the modern-day street art that have been painted on the street of Egypt are inspired by these Pharaonic art. A good example would be the *Women Climbing Ladder* which is actually inspired from the original mural that can be found in the Ramsseum Temple in Luxor. It tells a story of the glorious days to give hope to the oppressed people, that there will be a better future. It also tells the story of the importance of the role of women in all areas of daily life (Colute, 2012).





Figure 5: Street arts of *Women Climbing Ladder* (left) and *Marching Women* (right) that are found on the street of Cairo drawn by Alaa Awad  
(Source:  
[http://www.jadaliyya.com/pages/index/5136/visualizing-revolution\\_the-politics-of-paint-in-ta.%202012](http://www.jadaliyya.com/pages/index/5136/visualizing-revolution_the-politics-of-paint-in-ta.%202012))



Figure 6: The original *Women Climbing Ladder* from Ramsesum Temple in Luxor  
(Source:  
[http://www.jadaliyya.com/pages/index/5136/visualizing-revolution\\_the-politics-of-paint-in-ta.%202012](http://www.jadaliyya.com/pages/index/5136/visualizing-revolution_the-politics-of-paint-in-ta.%202012))

In the modern era, murals are one of the most important means of mass communication where it is often placed in public places and are not confined in art galleries. It is influential and effective tool to achieve political goals, social, and others, at a time the same is the beauty of cities and squares and walls in public and private places, as it sometimes may be a successful means of propoganda. (Kotwal, 2005)

### 3.0 THE MESSAGE OF STREET ART AND ARCHITECTURE

Art can be a powerful instrument of communication because it can connect with people at the emotional and belief-system levels, transcending rational (or irrational) and educational preconceptions (Muñoz & Sommer, 2011). Some forms of art, particularly visual, can easily communicate across political and cultural boundaries (Muñoz & Sommer, 2011). As a result, street art, which pushes art outside of the traditional museum or gallery in order to become accessible to a broader audience (Claes & Moere, 2014), can serve as a powerful means of reaching the public in order to raise awareness of social and political issues (Gleaton, 2012).

*If you want to know what is actually occurring inside, underneath, at the center, at any given moment, art is a truer guide than politics, more often than not*  
- Percy Wyndham Lewis (1884-1957), author and painter.

Street art uses simple slogans and images to spread important and inspiring ideas in ways that are easy to remember (Architecture and Design, 2015). However, depending on the artist's creativity, sometimes these images are open for diverse interpretations (Rozenburga, 2012). Such art can inspire people to act or at least remind them about important issues that they may have forgotten (Architecture and Design, 2015).

Besides that, artists, similar to commercial advertisers, consider the effect of colours and design will have when communicating with the public (Gleaton, 2012). Chaffee (1993) explains that colours are used as a means of manipulating emotions (Gleaton, 2012). He states that warm colours — vibrant shades such as red, orange, and yellow — generate a feeling of excitement or passion while black can be used to convey emotions of revolution, death, and violence. On the other hand, blue and green — cool colours — indicate calm, reassurance or is used to represent the environment while white is a symbol of peace and purity (Gleaton, 2012).

As mentioned in the previous section, architecture, be it traditional or modern, also contains messages. Architects have long sought to communicate their craft through their building imagery (Browne, 2010). This has resulted in various styles of architecture throughout history (Browne, 2010). Whether displaying the power of their clients with the strength of a façade like the Palazzo Farnese for the Medici's, or the awesome other-worldliness inspiring Gothic cathedrals with their flying buttresses and soaring groin vaults, or the solidity of a corporation like Mies' Seagrams Building, each communicates a message greater than the function contained within (Browne, 2010).

#### 4.0 STREET ART AND HISTORICAL ARCHITECTURE IN GEORGE TOWN, PENANG

George Town is the capital city of the state of Penang, Malaysia (Hassan & Yahaya, 2012). Established in the 1776 by Captain Francis Light and named after King George III, the King of England during that time, it is the oldest British colonial city in Malaysia (Hassan & Yahaya, 2012). The city was to function as a British trading center in South-east Asia (Hassan & Yahaya, 2012). It was chosen due to its geographically strategic location, which is located at the Strait of Malacca, the most important trading sea-route in South-east Asia (Hassan & Yahaya, 2012).

The uniqueness of George Town being a trading center since two hundred years ago had evolved into a multicultural city (Hassan & Yahaya, 2012). It is here where trades from India, China, South-east Asia, Middle East and Europe once took place (Hassan & Yahaya, 2012). These activities had attracted people from various places and ethnic backgrounds to settle in George Town (Hassan & Yahaya, 2012). Consequently, the settlements created hybrid architecture in the city (Hassan & Yahaya, 2012). On 7<sup>th</sup> July 2008, the historical sites of George Town along with Malacca have been enlisted under the UNESCO World Heritage List due to an outstanding example of traditional multicultural settlement (Hassan, 2009). Since then, George Town, Penang, has developed a vibrant street art scene (Tye, 2015) which draws the attention of many tourists.

It all started with 'Marking George Town' in 2009 (Tye, 2015), an idea competition initiated by the Penang State Government to physically brand George Town as a UNESCO World Heritage Site (Penang Global Tourism, 2015). Out of the 40 entries within the country and from abroad, *Sculpture at Work*, a Kuala Lumpur-based art company triumphed with its design concept of 'voices from the people' (Penang Global Tourism, 2015). Subsequently, 52 unique and humorous caricatures, some designed by well-known local cartoonist including Baba Chuah (Tye, 2015) in the form of iron rod sculptures depicting the prevailing colloquial demeanor of the early settlement days were installed against the city's building walls (Penang Global Tourism, 2015).



Figure 7: Mr. Five Foot Way Sculpture  
(Source: Author's field work)



Figure 8: Roti Benggali Sculpture  
(Source: Author's field work)



Figure 9: Tok Tok Mee Sculpture  
(Source: Author's field work)

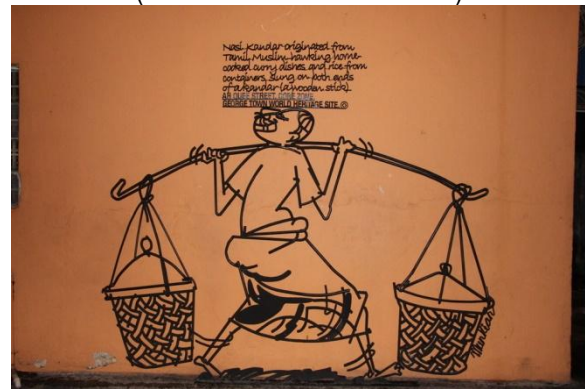


Figure 10: Kandar Sculpture  
(Source: Author's field work)

Later in 2012, in conjunction with the 2012 George Town Festival celebrations, Ernest Zacharevic, a London-trained Lithuanian artist, was commissioned by the Penang municipal council to paint 'Mirrors George Town', a collection of street murals within the inner city of George Town (Tye, 2015) that mirroring the life and practices of the local community (Chang, 2014). The murals consisting of figure drawings and portraits celebrate the multiculturalism and diversity of the community, the living heritage of George Town (Ministry of Tourism and Culture Malaysia, 2014). It is also noted that Zacharevic uses images of children as they represent simplicity and innocence, which make visitors feel comfortable and lively while transporting them back in time to their beautiful childhood memories. In fact, some of the people painted in his murals are real people living in George Town (Ministry of Tourism and Culture Malaysia, 2014). Furthermore, these murals also show figures and scenes that are full of energy (Sadatiseyedmahalleh *et. al.*, 2015). These murals want to transform a sense of witty, unusual, and lively behavior to this old heritage area (Yeo, 2013; Sadatiseyedmahalleh *et. al.*, 2015).





Figure 11: *Little Children on a Bicycle*  
by Ernest Zacharevic  
(Source: Author's field work)



Figure 12: *Boy on a Bike*  
by Ernest Zacharevic  
(Source: <http://the--art.blogspot.my/>)



Figure 13: *The Awaiting Trishaw Peddler*  
by Ernest Zacharevic - interestingly, located on the opposite of this building across the street is where most trishaw peddlers in George Town normally wait for customers  
(Source: Author's field work)



Figure 14: *Children in a Boat*  
by Ernest Zacharevic – located in the famous Chew Jetty, this mural gives an insight to the life of water village people  
(Source: <http://the--art.blogspot.my/>)

After Zacharevic, street art in George Town begins to proliferate with more and more international as well as local street artists eager to show off their skills until recently, concerns was raised regarding the abundance of art could be damaging to a heritage city as fragile as George Town (Time Out Penang, 2013).



Figure 15: *Brother and Sister on a Swing*  
by Louis Gan – Louis decided to paint his own idea  
of childhood  
(Source: Author's field work)



Figure 16: *Children Playing Basketball*  
by Louis Gan  
(Source:  
<http://penangstreetart.weebly.com/chulia-street.html>)



Figure 17: *The Real Bruce Lee would Never Do That*  
by Artists for Stray Animals (ASA) – this mural is  
one of the compilation of animal-themed murals  
known as '101 Lost Kittens'. The idea behind '101  
Lost Kittens' is to create more awareness over the  
issue of helping find homes for stray animals  
(Source: Author's field work)



Figure 18: *The Indian Boat Man*  
by Julia Volchkova – located on 75 Stewart  
Lane, the purpose of this painting is to celebrate  
the role that Stewart Lane played in the maritime  
industry  
(Source: Author's field work)

As mentioned earlier on, George Town is also famous for its hybrid architecture as a result of multicultural settlement. There are buildings with colonial influence as well as various religious and ethnic backgrounds (Hassan & Yahaya, 2012). The architecture of Penang is seen as an eclectic mixture of the European classical style, with Islamic, Malay, Indian, Chinese and later Art Deco motives (Mohamed *et. al.*, 2002). Interestingly, the different religions, cultures and architecture of the various groups co-exist in harmony (Mohamed *et. al.*, 2002). As a result, it is common to see mosques, churches, Buddhist and Hindu temples standing side by side on the same street in George Town, Penang (Mohamed *et. al.*, 2002).





Figure 19: Kapitan Keling Mosque which is built to represent the Indian Muslim community is influenced by the Mughal architecture of India (Source: Author's field work)



Figure 20: Residence of Ku Din Ku Meh, now being restored to a guesthouse, has an eclectic mixture of colonial and Malay architecture (Source: Author's field work)



Figure 21: A row of shophouses in George Town with its façade richly decorated with Chinese and European ornaments (Source: Author's field work)



Figure 22: A row of shophouses in George Town with Art Deco motives (Source: <https://zainabdullah.wordpress.com/category/art-deco/>)

Historical buildings in George Town can be categorized into (Hassan & Yahaya, 2012):

1. Religious buildings and monuments from all trading communities with various ethnic backgrounds (the Malays, Indian Muslims and Hindus, Chinese and Europeans)
2. Government building which are heavily influenced by European architecture. British had built many buildings in George Town for the purpose of administration and settlements during colonial time.
3. Educational institutions
4. Historical buildings like Fort Cornwallis, Victoria Memorial Clock Tower, Syed Alatas Mansion, mansions at No. 30 Barrack Road and 114 York Road, Cheong Fatt Tze Mansion, Hotel 1926 and Guest House at Universiti Sains Malaysia.
5. Shophouses and financial institutions

While most historical buildings in George Town are about expression of cultural identity, colonial buildings and monuments on the other hand symbolize an expression of the British's

architectural sovereignty over the existing local and expatriate architecture in the conquered land (Hassan & Yahaya, 2012).



Figure 23: City Hall  
(Source: [https://en.wikipedia.org/wiki/City\\_Hall,\\_Penang](https://en.wikipedia.org/wiki/City_Hall,_Penang))



Figure 24: Cathedral of the Assumption  
(Source: <http://www.thestar.com.my/Travel/Malaysia/2012/05/25/Preserving-Penangs-heritage-buildings/>)

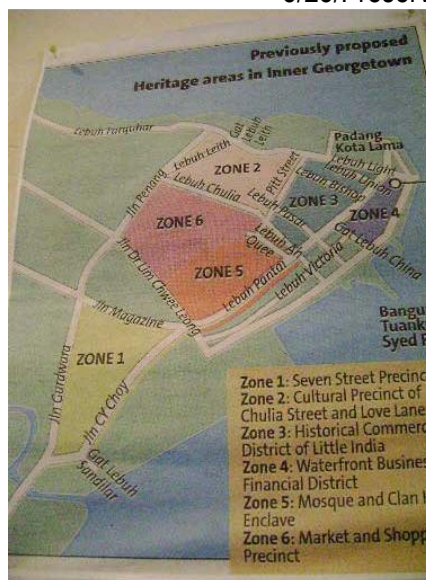


Figure 25: Originally, the heritage zone in George Town are divided into 6 areas as shown, which is a direct result from the application of the gridiron layout that tells an important story of the street settings under the ‘divide and rule’ concept of governance by the British authority.  
(Source: <http://www.penangheritagecity.com/map-of-george-town.html>)

## 5.0 DISCUSSION AND FINDINGS

Street art and historical buildings play a major role in promoting Penang, particularly George Town city as a heritage city as well as a distinguished tourist destination, attracting many tourists from all around the world. Ever since George Town was recognized as a UNESCO World Heritage Site in 2008, Penang’s tourism sector has been experiencing a growing trend (Ong, 2015). Penang’s international visitors expanded by 7.5% annually from 2008 – 2014, accounting for about 720,000 visitors arriving at Penang International Airport in 2014 (Ong, 2015). Nowadays, tour around George Town to discover the well-preserved pre-war historical buildings and interesting street art is widely promoted as a must tour under the local as well as the international tour packages (Chang, 2014). As a



result, the almost dying streets within George Town city have now become the lively and vibrant visiting spots, which found crowded with visitors during most of the weekends and public holidays (Chang, 2014).

The growth in Penang's tourism industry has also led to authorities taking huge steps in preserving these historical assets. Many of the historical buildings in George Town are being restored and converted into guest houses, hotels, restaurants, museums and art galleries. Indirectly, this also significantly benefited the local business operators as well as providing job opportunity to the local people.

As the street art continues to sprout in Penang, it is crucial for the local government to consider the challenge in managing the artworks and also dealing with any side impacts which might arise (Chang, 2014). A well-planned practical guideline or policy are urgently needed to regulate, preserve or maintain, facilitate as well as support the current and future street art projects in Penang (Chang, 2014).

As for the historical buildings, a walk around George Town city reveals that there is still much conservation works that need to be done as there are a large number of heritage buildings decaying due to age, neglect, high maintenance cost (Kamal et al., 2008) and lack of comprehensive guidelines and understanding of heritage buildings' maintenance management practices (Idrus, 2010).



Figure 26: Historical buildings that are yet to be restored in George Town  
(Source: Author's field work)

## 6.0 CONCLUSION

Street art and historical buildings in George Town are indeed very valuable heritage assets. The identity of a people and nation is largely defined by this heritage (Idrus, 2010). Heritage is something which is passed down from one generation to another (Prentice, 1994; Idrus, 2010). Heritage is not only about the past (Mohamed *et. al.*, 2002). It is about the present generation who continues to cherish and to learn about the vibrant and glorious history, culture and past civilization (Mohamed *et. al.*, 2002). It is mainly through conservation of heritage buildings that we can pass on to future generations what is currently identified as being of cultural significance today, and this would be difficult to achieve if the best practice approach to the maintenance management of heritage buildings is not fully adopted (Idrus, 2010). Apart from being a national treasure, this heritage can be promoted as tourism products which are indeed beneficial not only to the local community, but the country's

economic as well. However, the work of preservation of these assets still has a long way to go and it is hoped that the issues addressed in the paper can shared some light on what is not clear.

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## THE EVOLUTIONARY DEVELOPMENT OF THE STATEWIDE TRANSPORTATION PLANNING PROCESS IN THE UNITED STATES

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### ABSTRACT

The Statewide transportation planning environment has seen a continuous change. No matter how we investigate state level transportation planning and its complexity, its basic premises are developed through the urban planning process. Over the last several decades, the Federal government issued several acts and guidelines that affected transportation procedures and systems. These federal requirements mandate state transportation agencies to search for an appropriate strategy and planning process to establish a safe, accountable, flexible, efficient and effective multi-modal statewide transportation planning processes for the smarter transportation systems. Our current state transportation planning systems are struggling to meet the demands of highly urbanized areas. Accordingly, transportation agencies are faced with new challenges; clearly we need a smarter and more efficient transportation planning processes.

This paper's objectives are to document, analyze and capture the picture of dynamic change and its effect on the transportation planning spectrum by focusing on some of the more significant events that help illustrate the evolution of the transportation planning process and help identify the planning perspective. The paper will use the materials gathered through literature review arranged in chronological order to address and investigate evolutionary development of the statewide transportation planning process. The scope includes analyzing different planning approaches, procedures, and philosophies. The primary focus of the paper is three-fold: 1) an overview of the evolutionary development of the transportation planning process, 2) classification of the theoretical framework of statewide planning, and 3) Investigation of the required modification of the planning processes as seen from different planning approaches.

**Keywords:** Decentralization, Transportation Ecosystem, Digital Infrastructure, Multi-Model Transportation System, Strategic Planning and Management, Transportation Policy, Public Participation.

## INTRODUCTION AND BACKGROUND

In recent years, a number of changes have occurred in the planning procedures through which transportation planning concepts at the state level are developed. The evolutionary development of transportation planning can be attributed to several different circumstances including responses to changing issues, conditions, and values. The changes have been ongoing and rapid. As (1) suggests, knowing the reasons why certain things have happened in the past provides a better guide toward understanding the present, and anticipating what will happen in the future.

It is not an easy task to summarize more than 70 years of transportation planning history. There are numerous individual and group efforts contributing to the evolution of transportation planning and its process, beginning with efforts as early as in 1930s and continuing all the way to more recent provisions of the federal government issued acts and guidelines such as 2005 (SAFTE- LU) and 2012 (MAP-21). The focus of this paper will be on some of the more significant events that help illustrate the evolution of the transportation planning process and help identify the planning perspective. This paper divides the evolution of transportation planning into five major phases: i) Early Development phase covering the early years upto 1950s; ii) Unified Approach phase covering 1960s and 1970s; iii) Decentralization Era covering 1980s; iv) Cooperative Approach phase covering 1990s and 2000s; and lastly, v) Smarter Approach phase of present era. Within each of these phases the main purpose of this paper is to highlight the evolving issues of concern, and define and critique the emerging transportation planning approaches.

## EARLY DEVELOPMENT OF TRANSPORTATION PLANNING

### Planning Activities in the 1950s

In the late 1940's and early 1950's, transportation was subjected to extensive government intervention. The emphasis was on national interstate and defense highway systems. The planning process targeted a long-range time horizon of 20 years. The focus of transportation planning in urban areas was mainly on economic evaluation, i.e. cost and benefit analysis. The planning procedures were a straight-line projection of traffic counts using a unified growth factor on an area wide basis and comparing expected future volume to the existing capacity (2). Major attention was given to the geometric design, road materials, and evaluation of alternatives based on economic criteria (3 and 4).

### Urban Transportation Studies (UTS)

The Detroit Metropolitan Area Traffic Study (DMATS) was the first to put together the procedures of urban transportation studies between 1953 and 1955. This pioneer urban transportation study consisted of six basic steps: (i) data collection; (ii) forecasts; (iii) goal formulation; (iv) preparation of network proposals; (v) testing of proposals, and (vi) evaluation of the proposals (2, 4). Four years later, the results of this Detroit study were applied to the Chicago Area Transportation Study (CATS). Urban Transportation Studies (UTS) were conducted on an ad hoc basis by special policy committees (2). Transportation planning was tied to highway planning and little attention was given to public transit (5). The primary objective of the UTS was to produce a plan and report on it in a limited time frame. This early effort was restricted due to the limited capacity of the available staff and computer technology

(6). The output of the planning activity was a regionally-oriented highway network based on economic criteria.

## THE UNIFIED APPROACH

### New Perspectives of the Transportation Planning Process in the 1960's

In the 1960's, urban transportation plans continued to be developed based on the methodology of late 1950s. The travel demand analysis of the 1960s owes its start to the large scale transportation studies pioneered in Detroit and Chicago, as described above. Transportation planning activities in the 1960s focused on predicting travel demand in urban regions in relation to the growth in population, employment, and income. The attempt was to predict the distribution of travel demand (7).

### The Urban Transportation Planning Process (UTPP)

The Urban Transportation Planning Process (UTPP) was established to provide a long-range regional comprehensive plan (2). It was associated with wide macro-planning objectives that focus on large urban area transportation studies. The travel demand model is the basic tool of transportation analysis; it provides an input to policy formulation. The model includes four steps: (i) trip generation, (ii) trip distribution, (iii) modal split, and (iv) trip assignment. The UTPP approach was used later with a variety of formats for most of the early statewide transportation planning studies. Major criticism of the UTPP approach rests on two shortcomings: (i) the UTPP model neglects the effects of congestion on highway demand (increasing congestion on a certain route reduces the usage of this route--consequently forcing people to shift to another route), and (ii) due to extensive data collection requirements and costs associated with base-year calibration, the model does not encourage the evaluation of a wide range of alternatives. Another short-coming is the lack of feedback among the four steps of the travel demand model (8).

### The Comprehensive Approach: "3C" Process

In 1962 the Federal Highway Administration (FHWA) established a regulation called the "3C" (continuation, cooperation, and coordination) plan. It required the Metropolitan Planning Organizations (MPOs) to adopt a Transportation Improvement Plan (TIP) and a process to oversee the allocation of federal aid to urban systems (9). Within the plan there are two main features which significantly affect the organizational arrangement in performing the planning process. The first feature of the plan required adopting a planning process in urban areas rather than cities. It focused attention and responsibility on metropolitan or regional levels. The second feature established that the planning process should be a mutual responsibility, carried out on a cooperative basis between state and local communities (2).

### UTPP vs. 3C

Urban transportation planning of the 1960's led to two approaches: the UTPP, which is travel-demand oriented, and the 3C process. The 3C process offered more flexibility and free choice to change the model parameters in response to future alternatives. A major advantage of the 3C process, in comparison to the UTPP, is that it does not take travel demand for granted. However, the 3C process does increase the cost and expand the time of the alternative analysis, consequently, the focus of the 3C is limited only to a small number of alternatives (10). In both approaches, there was one common weakness in the planning process--the problem identification phase was limited to the formulation of objectives rather than defining the issues. The reason for this shortfall might have been caused by limitations in obtaining meaningful consensus among all legitimate transportation-interest groups. In 1966, the Department of Transportation (DOT) was created to coordinate the transportation program

and to facilitate development and improvement of coordinated transportation systems. The mission of DOT was to create safe, efficient, convenient transportation at a lower cost—matching national objectives (11).

### **Shifting Attention in the 1970's**

By the late 1960's there was a lot of criticism of urban transportation planning. The complaint focused on the neglected social, environmental, and energy impact, and the limited number of alternative evaluation analysis. Planning activities during the 1960s had a long-range time horizon with limited emphasis on the multi-modal concept, and less responsiveness to emerging issues. There were several issues and concerns that helped accelerate the shift of planning emphasis of the 1970s. Some of the concerns include: (1) scarce resources in terms of constructing new facilities, (2) a growing awareness of environmental concerns, and (3) the 1973 oil crisis and its implications for energy demand. Consequently, in the 1970s, there was a major shift of interest toward an increased assessment of social, environmental, and energy impacts. During the 1970s there was a change in perception of transportation problems starting with air pollution and high energy consumption. By the end of the decade the problem increased in complexity by the addition of growing concerns about issues of financial drain and governmental funding for social services. Transportation planning activities shifted their emphasis from long-range to short-range focus.

### **The Systems Approach**

The systems approach is a technique of utilizing scientific methods and knowledge to resolve complex problems. It stresses the analysis of the system as a whole by taking into account a large range of variables. The basic characteristics of the systems approach is objectivity, multi-disciplinary, inter-relatedness, reliance on quantitative models, and similar techniques (12). Alternatively, the systems approach has been described as a diagnostic approach to deal with the problems of systems performance, i.e., level of service, time, money, and energy cost (13). The 1970s witnessed a growing interest in large scale systems approaches for transportation problems. Modeling techniques received wide attention. Their application was made possible by rapid computer development and newly expanded capabilities. This situation facilitated more sophisticated transportation evaluation methods. However, the major obstacle was the limitation of data availability. The planning process during the 1970s centered more explicitly around identification of problem-setting goals, recognition of a wide range of external effects, and an increased environmental and social concern at the state and national level (2, 4, 14, and 15). Major criticism of the systems approach stands on the fact that "in the final analysis, the transportation policy maker still evaluates the performance of the system in terms of its own effectiveness rather than in the needs of society" (13).

### **Transportation System Management**

Due to the increased complexity of the transportation environment during the 1970s, large scale data collection and sophisticated modeling techniques became questionable. There was a growing awareness of the need for more simplified travel analysis tools (4). While the federal government tried to take the lead and force new issues, there was great emphasis on the new Transportation System Management (TSM), where the general trend of planning activities focused on preservation rather than expansion of the existing system. Several attempts were made to incorporate new TSM concepts into planning activities. However, that was a period characterized by learning to perform and implement TSM. The main challenge of the planning process was on how to keep a balance between accuracy, simplicity of assumption, and quick response. Due to the increased complexity, uncertainty, and conflicting situations, in addition to the difficulty in quantifying, the judgmental-oriented approach

was the best available methodology at hand (4). The commitment to public decisions without effective citizen involvement placed an additional burden on the planning process (2).

### **Statewide Transportation Planning**

In 1973 the Federal government required urban areas to submit annual unified work programs for all transportation planning activities to the state DOTs as a condition of receiving planning funds. The work program also required identification of the agencies responsible for each activity and a proposed funding resource. This process was meant to rationalize the planning activity and to secure joint funding under DOT assistance. By the end of the year 1973, about twenty states had created their own Department of Transportations (16). The Transportation Research Board (TRB) conducted several national conferences on issues concerning statewide transportation planning between 1974 and 1979.

Most of its recommendations concentrated on a planning and programming process for a multi-modal system. Statewide transportation planning is described as a continuous process of analysis, recommendations, decisions, and subsequent evaluations covering intermediate, short-range and long-range actions on a specific network of transportation facilities within the state (17). This direction requires that transportation interests deal with a wide range of impacts, alternatives, capital investments, options, political/institutional restraints, and public involvement. To help cope with the complex transportation policy environment of the 1970s, Congress required each urbanized area to establish Metropolitan Planning Organizations (MPOs) composed of local officials. Highway Act 1973 dedicated a small portion of each state's funding from the Highway Trust Fund for new Metropolitan Planning Organizations (MPO) to be established or designated in each urbanized area over 50,000. Thus, Congress gave federal officials the legal mandate and financing to transform regional bodies across the country into effective, multi-modal planning agencies. Many saw the new MPOs as a means to counter the domineering influence of state transportation departments in pushing highway projects. Traditionally, the MPOs initiate the planning phase of the project development while programming (scheduling projects for implementation) is done by state DOTs. Thus, one major weakness of the statewide practice was the lack of connection between planning and programming. The practice should have been a coordinated effort of the involved agencies with planning, programming, and implementation as a shared process (16 and 18).

## **DECENTRALIZATION ERA**

### **Flexibility in the Planning Process of the 1980's**

Throughout the decade of the 1970's there was an increase in complexity in addressing urban transportation planning. A growing number of requirements, regulations, and emerging issues placed an obvious burden on the planning process. The 1980's brought a new challenge and responsibility to urban transportation planning - it was the start of decentralization of transportation authority and responsibility. Moreover, there was a significant reduction of government involvement. Consequently, state and local governments were allowed more flexibility in formulating planning processes. By the end of the '70s there were several remarkable changes (5). For instance, a shift from the previous classic approach to (i) less reliance on computer programs, (ii) more public participation, (iii) a wider range of criteria for evaluation, and (iv) increased consideration of transit alternatives.

### **The New Direction**

The 1980's witnessed several fundamental changes that effected the transportation environment. Publicly funded transportation planning agencies shifted emphasis from what was essentially a single program or project planning (highway) to multi-modal planning activities. Federal



government policy also witnessed a major reform. Its intervention into the transportation planning process was limited to the determination of a specific output of transportation activities, while the details of the planning and programming procedures were left to state and local agencies (2). Transportation planning activities of the 1980's enabled the implementation process to be shorter and less complicated. The major indicator of successful implementation was the link between planning and programming and the degree of achieving a prespecified mission. An advantage of the new flexibility was that it enabled planners and decision makers to create (in coordination with elected officials) and integrate new processes. Urban transportation planning activities were still a mutual responsibility of the MPOs, and state and public transit authorities. However, several significant features of urban transportation developed with the decentralization of authorities. These developments included (i) the assurance of more citizen involvement, (ii) an increased interest in urban revitalization, and (iii) the integration of corridor planning into urban transportation planning. However, the responsibilities of the MPOs were to be determined by the state's governor (11). The federal government was still committed to urban planning and required that projects be based on the principle of the 3C process; it continued to provide funds for planning activities without specifying how the process should be performed (2).

### **Strategic Planning and Management**

In the 1980's, planning activities and processes tend to focus on more than just the 3C process. They shifted attention to consider possible future events and how to plan (strategically) and influence the outcome (19). The strategic planning approach is described as a systematic process of identifying opportunities and threats in the future environment, formulating policies based on organizational resources and goals for operations in the environment over a relatively long period of time. Strategic planning process contains five steps: (i) formulation of the overall missions, goals, and objectives, (ii) environmental scan and analysis to identify factors that affect the transportation organization, including present and future impacts, (iii) fiscal resource allocation, (iv) evaluation and selection of the strategic options (where the options are selected based on organizational resources and within the surrounding constraints), and (v) implementation (20). Despite the fact of a wide recognition and adoption of the strategic planning approach, the basic problem in applying the concept to transportation planning activities was that there was little connection between the plans and the day-to-day operations and budgets of the agencies (21). The plan, developed by planners (with limited experience in operations), and implemented by engineers, was based on the decision-makers attitude. Consequently, many strategic plans were not successfully implemented.

The strategic management approach is described as a process of preparing future vision to achieve organizational planning objectives in order to direct and control the entire organizational activities to accomplish the pre specified mission. The objective of strategic management is the formulation and selection of actions, and implementation of these actions that will enable an organization to achieve its objectives (21). Within literature there is no consensus concerning the definition of strategic management. Each organization is expected to develop its own version in terms of its surrounding environment and constraints. A pioneer example of strategic management by public transportation agencies is the attempt of the Pennsylvania DOT to modify the strategic planning approach. The process aims at uniting the diverse functions on a cohesive line of action and setting participation process to develop the statewide transportation plan (19). The proposed approach was an interactive process to link the planning process in the strategic planning approach with day-to-day operation and management. The key difference between strategic management and other planning, management, and administrative processes within transportation agencies is that it requires basic changes in the organizational structure, including changes in attitude. It is a time consuming processes. The "strategic" concept rests heavily on three foundations: 1) participation, 2) process element, and 3)

product. A major criticism of the strategic management approach is the long time needed for formulation and implementation.

### **Critique of the Transportation Planning Process during 1980s**

Literature indicates that in the area of statewide transportation planning and programming, there were numerous conferences held and efforts made to predict the future of transportation planning and its processes in order to meet the challenges of the 21st Century (18, 22, and 23).

Several individuals presented their critique and expectations for the future of the transportation planning process. The article "The Future of Statewide Transportation Planning," points out that the traditional transportation planning process has been centered around the development and analysis of alternatives in the form of comprehensive schemes for long-time horizons (20-30 years) (18). Within that format, urban-level transportation planning activities were dominated by the 3C process and at the state level, planning activities were dominated by the management of large scale data collection and related technical methods, i.e. cost-benefit analysis-focus was on assessing the impact of the different courses of action using sophisticated technical methods (centered around data collection needs). Criticism of this framework rested on three major elements: the implication that the planning approach viewed transportation planning to be somewhat removed from the political process, neglecting the value issues of conflicting goals and objectives, and forced the planning activity to be away from the emotionally expressed needs and desires of various interested groups. It was stressed that there was a need to challenge traditional transportation planning rules and methods and called for new techniques and approaches for the analysis of statewide planning, programming and options (18). Also, there was an emphasis on the opportunity to perform a quick, simple, and flexible technique that covers a wide range of impact areas, such as priority and programming.

New research specified that in the future, the main question will be how to position ourselves within the processes that have been used to develop plans and the proposed future of US transportation (24). Further, it was pointed out that the current process is comprised of three distinct steps: (i) the process deal with the determination of society's needs. These needs influence the travel characteristics and form the requirements of the society; (ii) the process is to seek understanding and definition of the transportation problems. This includes the perspectives of providers, users, and operators of the system; (iii) the process is to formulate programs and transportation improvement that respond to social changes and needs.

It was argued that many public sector organizations thought of planning only at the program or project level (25). Also, it emphasized that planning should be viewed as a process that is inextricably linked to organizational decision making. The basic philosophy is that the planning process should be rooted to the premise of the organization, and should be viewed as providing useful information to decision makers (at all levels) in an organized fashion and timely manner. The overall objective of the process is to enable the organization to understand where it is and where it is going. Further, it was argued that planning must be an integral part of the decision-making process, and the planning process should focus on communication, with the basic aim of the decision makers to provide useful information to identify and select alternative courses of action.

In 1982, the American Association of State Highway Transportation Organization (AASHTO), in cooperation with the Federal Highway Administration (FHWA), sponsored a survey on statewide planning. The result indicates that the substantive (technical) activity of statewide planning (including programming/scheduling of project) has been isolated from management. As a result of the survey,

AASHTO recommended that the transportation planning agencies consider management concepts (policy, communication) as an integral part of the planning process rather than a separate one, and that the substantive content of statewide planning should not only deal with financial constraints but also provide the needed information for the decision maker.

## THE COOPERATIVE APPROACH

### The Features of the 1990's Transportation Environment

In the early 1990's there was major criticism concerning the urban transportation planning process of the 1980's. Planning was criticized for fragmenting institutional responsibility in the vertical hierarchy as well as the horizontal hierarchy. There were loose ties between land use, air quality, and other modes. The early application of the Transportation System Management (TSM) in the 1980's did not prove effective in the 1990's. Although there is a wide recognition of the traffic management system and an increased awareness of the system operations, there is still a great need for a methodology that emphasizes interplay among demand and supply and among different planning levels (MPOs, DOTs).

The TSM analysis is used by most of the MPOs in analyzing subdivision requests (26). However, the analysis approach has several shortcomings due to the shortage of local data (the analysts depended on "default values" or data borrowed from another area, assumptions made about future travel behavior, origin destinations, and so on). Consequently, the results were highly approximated. It was stressed that ignoring land use analysis weakened the link and caused conflicting issues which affected transportation planning. Planners are responsible for land use while engineers are responsible for transportation. Moreover, most transportation facilities and services are provided by state and regional agencies, rather than local agencies, while land development is overwhelmingly a private sector initiative.

In 1990, a National Cooperative Highway Research Program (NCHRP) report described the changes in the transportation environment. Some of the factors contributing to these changes are: economic, demographic, transportation services and user demand, wide range of transportation providers, shift in the federal attitude toward financial support, essential completion of the interstate system, and the trend towards consolidating public transportation modes into umbrella agencies (19). The 1990s have seen two major changes in the transportation environment: (i) after a decade of decentralization of authority and responsibility, urban transportation planning was faced with the dilemma of low density development patterns, congestion, and air pollution. This situation required a more regional scale or statewide transportation planning to deal with the problems of urban areas; (ii) the federal government has had a major change of attitude concerning financial aid, providing more flexibility for fund allocation and encouraging cooperative planning efforts among Federal, state, and local planning organizations. The flexibility of the financial policy requires a new set of techniques and procedures to deal with multi-modal alternative analysis and planning (11 and 27).

### Federal Guidance to the Transportation Planning Process

Changes in goals and objectives can influence planning philosophy. In the 1990s there was a growing concern toward moving to a more long-range, multi-year and multi-modal process. Although there were several proposed strategies and management planning processes in the late 1980s, there was little, if any, successful implementation. In fact, there was limited flexibility and an existence of conflict of interest between planners/operators (or decision makers)/designers within the transportation system. The period of 1990s witnessed a trial to overcome institutional fragmentation and strengthen the relationship between planner/engineer/manager within the existing transportation hierarchy (MPOs

and DOTs). There was Federal government intervention to guide and strengthen transportation planning activities. The five acts of legislation that furnished new direction for transportation planning in 1990s and 2000s are:

1. The Clean Air Act Amendment of 1990 (CAAA),
2. The American Disability Acts of 1990 (ADA), and the
3. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA)
4. Transportation Equity Act for the 21<sup>st</sup> Century of 1998 (TEA-21)
5. The Safe, Accountable, Flexible, Efficient Transportation Equity Act of 2005 (SAFTE-LU)

### **The Intermodal Surface Transportation Efficiency Act (ISTEA)**

Generally speaking, ISTEA is considered to be the most significant act bringing in a major change in the transportation planning and policy in the United States. It was meant to fix the limitations of the previous federal acts and direct transportation planning into a new era. The vision statement of ISTEA states "It is the policy of the United States to develop a National Intermodal Transportation System that is economically efficient and environmentally sound, provides the foundation for the Nation to compete in the global economy, and will move people and goods in an energy efficient manner" (11 and 27).

ISTEA directed a great amount of attention to the planning methodology at both state and local levels. First, at the local government level (MPOs), ISTEA emphasized that the planning process must include consideration of several issues such as land use, method to enhance transit service, and need identification. These key transportation planning components were to be considered in a more comprehensive, decision-making fashion. Second, at the state level, ISTEA allowed for new opportunities and requirements per the following three ways:

#### *a) Greater Flexibility in the Use of Funds for a Variety of Transportation Modes and/or Project Types*

ISTEA created a new block grant program, the Surface Transportation Improvement Program (STIP), which provides funds available for a wide range of highway, mass transit, safety, and environmental purposes. The highway and mass transit planning practices before ISTEA did not enable state and local agencies to perform trade-off analysis. This limited capability affected the performance of cross-modal fund analysis. The traditional planning activities at the state level focused on a planning process that was associated with fiscal planning at the state level and performed a modal-oriented approach (i.e., highway only). ISTEA provided state and local agencies with a greater flexibility in the selection of highway and mass transit projects. The change and increased flexibility brings attention to the model trade-off issue.

#### *b) Requirements for Development and Operation of Inter-modal Transportation Management in Each State*

ISTEA strengthened the MPO's processes and expanded their role in project selection and transportation decision making. In addition to the fifteen interrelated factors in the development of long-range MPO's transportation plan, there were additional requirements related to congestion management, project selection, and certificates.

#### *c) Requirements for Developing Statewide Transportation Processes, Planning, and Programming in Each State*

Statewide transportation planning is the activity (or series of activities) that tends to lead to a recommendation for making coordinated change in construction, investment, technological improvement, pricing, subsidizing, and regulations with respect to transportation facilities and services

of all types, including facilities for the movement of people and goods (27). In accordance with 23 USC, Section 135 as amended by the ISTEA, all highway and transit projects in the states funded under title 23 of the Federal Transit Act must now be included in a federally approved, multi-year STIP. The STIP must reflect expected funding and priorities for programming and provide opportunities for public comments. States were required to develop a long-range plan (STIP) covering all modes of transportation in coordination with MPOs and utilize public comments. MPOs needed to adopt a four-year Transportation Improvement Plan (TIP) for informational purposes only.

## SMART ECOSYSTEM APPROACH

### Current Status of Transportation Planning

Federal acts and provisions introduced in 2000s addressed some of the issues that were neglected in previous decades. However, the transportation ecosystem as such is ever-changing and there is a continuous need to update planning procedures, policies and philosophies in tune with the changes in its ecosystem new paradigm. No other period in our history has seen the kind of disruptive changes in transportation ecosystem that is being witnessed in the recent few years. Astounding advances in digital and communications technologies brought in changes in our day-to-day life in ways that were unthinkable just few years ago (28). These technological advances present enormous opportunities to improve the transportation eco-system as a whole through appropriate transportation planning and policies. At the same time, current era presents its own challenges related to drastic environmental deterioration, rapid urbanization, and funding limitations. Need of the hour is to approach the transportation planning in a holistic manner giving due consideration to and being cognizant of the entire ecosystem in which it is being conducted.

### Need for Effective Multi-Modal Approach in Statewide Transportation Planning

Generally, DOTs have an abundance of project development resources but fall short of needed capacity in system planning and in operations. Also, most DOTs are highway-oriented with limited experience in multi-modal planning concepts. Therefore, besides strengthening their planning units, the DOTs need to improve their ability to operate their highway system. Per State Smart Transportation Initiative (SSTI) report, Caltrans' Integrated Corridor Management (ICM) arrangement in San Diego holds great promise, but it has not been replicated elsewhere in the state (29).

Similarly, DOTs should allocate more resources and provide more expertise in planning and prioritization to the offices dealing with other modes of transportation such as rail and freight. Improvements will require a significant refocus as well as a change in attitude and culture from a central command structure and approach for highway construction to a more partnership-based and collaborative approach to building or improving multimodal connections. For example, The Alameda Corridor and Colton Crossing projects received national recognition for separating freight related to the Ports of Los Angeles and Long Beach from local traffic (29). Although Caltrans played a key role in both these projects, local partners maintain that the Department primarily concerned itself with the freeways in these projects, rather than providing vision and strong facilitation.

Lastly, it is extremely important to plan a transportation facility that provides safe mobility for not only automobiles but for all users, including bicyclists, pedestrians, transit riders, and motorists (30). For the same, DOTs need to ensure that bicycle, pedestrian, and transit user needs are addressed and deficiencies identified during system and corridor planning, project initiation, scoping, and programming.



### **Need for Integrating Physical Infrastructure with Digital Infrastructure**

Recent technological advances brought us to a point where it is now possible for physical infrastructure and digital infrastructure to go hand in hand (31). Solutions to most of the present and future transportation problems do not lie in mere empowerment of the existing transportation systems. Rather, it is in the integration of digital infrastructure with physical infrastructure. An average transportation user these days is equipped with high power processing machines in the form of smart-phones, tablets and such other gadgets. Governments and public agencies should come up with effective policies and innovative procedures facilitating the integration of these individual gadgets with transportation systems creating a powerful, safe, and sustainable transportation eco-system. Thus, policies should not only focus on modernizing the physical infrastructure, but also on empowering and better integrating the user itself. The future transportation systems should not just be reactive, but also pro-active. In other terms, they should just not react to the problems, but should also be able to anticipate the problems and function accordingly (28). For the benefit of the whole transportation eco-system, smart systems should be able to address the following four main challenges: 1) congestion mitigation and capacity planning, 2) transportation user empowerment, 3) safety and security, and 4) eco-efficiency (28).

### **Moving Ahead for Progress in the 21st Century (MAP-21) Act**

MAP-21 was signed by President Barack Obama on July 6, 2012. Though it is primarily a funding and authorization bill governing federal transportation spending, it does include many significant reforms. Some of the key provisions of MAP-21 are as follows: 1) establishing a performance based program, 2) creating jobs and supporting economic growth, 3) supporting DOT's aggressive safety agenda, 4) streamlining federal highway transportation programs, and 5) accelerating project delivery and promoting innovation (32). Through these provisions, MAP-21 intends to develop a streamlined, performance based, and multi-modal program to address many challenges that are being faced by the current transportation systems. Some of the main challenges that MAP-21 specifically focuses on are: a) delays in project delivery, b) efficiency of the system and freight movement, c) environmental protection, d) congestion mitigation, and e) user safety. USDOT also intends to work closely with stakeholders to ensure local communities are able to build multi-modal and sustainable projects benefitting all types of users i.e. rail user, road user, bicyclists and pedestrians (32).

### **CONCLUSION**

Investment of resources in functions besides traditional project development, along with a strong emphasis on multimodal approach should serve as the leading light for modern day statewide transportation planning. Moreover, federal government and other public transportation agencies should realize the importance of building smart transportation ecosystems integrating latest digital and communications technological advances into transportation planning. Provisions of Map-21 are satisfactory in terms of addressing the need to develop a multi-modal approach. However, much left to be desired in terms of facilitating and promoting the creation of a smart transportation eco-system.

There are many examples of successful implementation of new technologies and innovative ideas to solve transportation problems and improve transportation systems. Dynamic Parking Pricing in San Francisco, CA, Lane Management with Peak-Period Transit Discounts in Minneapolis, MN and SmartBus Project in Chattanooga, TN are just few among many successful programs (31). However, what is lacking here is the focused efforts of State DOTs to promote the efforts local agencies and the efforts to develop smart eco-systems at regional, state or national level.

To sum up, this research team firmly believes it is high time that the state DOTs and Federal government realize the importance of building smart transportation eco-systems. Rapid urbanization along with quickly aging population, pervasive presence of technology, outdated planning methodologies leading to increased life-cycle costs, and government budget deficits all point towards the changes required in the present system. United States is a global leader in digital and communications technologies. Thus, it is not only appropriate but also highly critical that we maximize the use of these technologies to build safe, efficient, effective, and sustainable transportation ecosystems.

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## AN ALIEN LAND OR HOME: INVESTIGATING RURAL-URBAN MIGRANTS' SENSE OF PLACE IN THE CITY DURING CHINA'S RAPID URBANIZATION

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### ABSTRACT

Urbanization and urban development have already brought enormous changes in China. Rural-urban migration has been the main driver of urban growth in the past few decades. The sheer size of the rural-urban migration has not only changed the social, spatial, and economic landscapes of Chinese cities, but also has made the urban scene much more diverse, lively, and dynamic. Despite the recent proliferation of research on rural-urban migration in various disciplines, there is little study on rural-urban migrants in China from the perspective of people-place relationships. This paper uses the concept of sense of place to investigate the rural-urban migrants' interconnections with the urban place, particularly in terms of how the migrants reestablish their psychological bonds with city through place experience. Baoding City was carefully selected as a case and quantitative approaches (survey design with 431 questionnaires) was used. Major findings in this research included: 1. Majority of respondents had developed a moderate intensity of sense of place to their homes; 2. They had not generated sense of place to their neighborhood in general, which interpreted by the mean scores of sense of place to neighborhood present in a negatively low level; 3. Although the respondents has delivered sense of place to the city, its level was not high. The results were consistent with one of the several scholars' interesting findings that a curvilinear, U-shaped pattern between scales of places (apartment, neighborhood and city) and strength of sense of place was observed.

**Keywords:** rural-urban migrants, urbanization, sense of place, rural attachment

### 1. INTRODUCTION

#### 1.1 Rural-urban migration and migrants

Since the adopting of its well-known reform and open-door policies in 1978, China has experienced dramatic economic growth (Liu, Li, & Zhang, 2003). Nearly 10 percent annual growth rate in the last few decades has allowed the country to enjoy a sustainable and unbroken economic development process (Cao & Dai, 2001). Under the high speed economic development, China becomes the largest recipient of foreign investment (Carrillo, 2004), and a lot of domestic enterprises boom, both of which demand huge number of labors. As in most developing countries, rural-urban

migration is driven by employment. Between 1980 and 2000, 268 million Chinese entered into the urban areas, mainly through migration from rural areas. By 2020, 200 million or more rural dwellers will join the ranks of the urban population (Yusuf & Saich, 2008, p. 1). The sheer size of the migrant flows and its consequences of change in economy and society have already greatly affected economic growth and urban development. The movement of rural-urban migration not only has fundamentally changed the social, spatial, and economic landscapes of Chinese cities, but also has made the urban scene much more diverse, lively, and dynamic (Ma, 2001).

## 1.2 Rural-urban migration and sense of place

“Space and place are basic components of the lived world” (Tuan, 1977, p. 3). Space is around us, while we human beings live in places which mean space endows with meanings (Relph, 1976; Tuan, 1977). People reside in one place, are aware of that place, and build up a storehouse of intimate about their place. They pursue security, belonging and rootedness from place as they experience day-to-day life. A sense of place is created gradually in the mist of feelings, sensation, and deep connections to the place. Sense of place is crucial to human beings, as it is the basic for people involving within the physical and social world. When separated from their previous bonds with places, people may suffer pressure or grievance. Fried (2000) points out that displacement from community may lead to grief and mourning, because of the discontinuity of physical places and social relationships from one community to another.

Taking into accounts of the large amount of rural-urban migrants in China, they not only “subject to difficulties in material aspects of surviving and socializing” (Qian, Zhu, & Liu, 2011, p. 172), but also are faced with “predicaments in reestablishing psychological bonding with place” (Qian et al., 2011, p. 172), as well as suffering from some institutional obstacles such as the household registration system and urban-rural dual system. The massive rural-urban migration in China has attracted scholars in various disciplines, such as economic, sociology, psychology and others, but the rural-urban migrants’ bonds to place are seldom studied in the field of people-place relationships. This project uses sense of place as a lens to investigate a broader understanding of Chinese rural-urban migrants’ interactions with the urban environment.

## 2. LITERATURE REVIEW

### 2.1 People-place relationships and Sense of place

People live in the place because it provides them not only the basic components for living but also “a sense of continuity” (Manzo, 2003, p. 54). Generally people make conscious decisions to where to live based on their needs and their self-concept (Manzo, 2003). People’s self concepts will dominant their choice of environment, their modification of settings to better present themselves, and their moving to somewhere to be more congruent with their sense of self (Twigger-Ross & Uzzell, 1996). The people-place relationship is so important that it has always attracted the most attention from scholars.

For decades, researchers from kinds of disciplines have tried to explore people’s relationships with place and plethora of concepts are used to name the relations between people and place in the literature, particularly “sense of place” (Hay, 1990, 1998a, 1998b; Steele, 1981; Tuan, 1977), “place attachment” (Hidalgo & Hernández, 2001; Lewicka, 2011), “place dependence” (Jorgensen & Stedman, 2006; Pretty, Chipuer, & Bramston, 2003), and “place identity” (Proshansky, Fabian, & Kaminoff, 1983; Twigger-Ross & Uzzell, 1996). The definitions of these concepts cover broadly and have somewhat different meanings. Some overlap both theoretically and methodologically (Lewicka, 2010b).



Sense of place “is often invoked as the concept that best describe the relationship between people and their spatial-environmental settings” (Nielsen-Pincus, Hall, Force, & Wulfhorst, 2010, p. 443). Steel defines sense of place as “the pattern of reactions that a setting stimulates for a person. These reactions are a product of both features of the setting and aspects the person brings to it” (1981, p. 12). According to Altman and Low, sense of place “involves an interplay of affect and emotions, knowledge and beliefs, and behavior and actions in reference to a place” (1992, p. 5). Many scholars (see Lewicka, 2011 for a review) have made endeavors to illustrate the constructs of sense of place. Jorgensen and Stedman (2001, 2006) and Qian et al. (2011) argue that place attachment, place identity and some other related terms are parallel dimensions which are under a supra-ordered concept: sense of place. According to Jorgensen and Stedman’s (2001) proposition, place attachment is the emotional bond between people and places (Altman & Low, 1992), place identity is the belief that a place is reflected in the self (Proshansky et al., 1983), and place dependence is “a functional attachment that reflects the importance of a place in providing features and conditions that support specific goals or desired activities” (Williams & Roggenbuck, 1989; Williams & Vaske, 2003, p. 831).

## 2.2 Geographical scale and sense of place

“Place exists at different scales” (Tuan, 1977, p. 149). As a meaningful location, place “is an entity that has a social dimension, but also a palpable and very real physical basis” (Lewicka, 2011, p. 213). For the physical definition features, place has its concentric character: “smaller places are incorporated within larger ones” (Lewicka, 2011, p. 211). From small to large, home apartment, buildings, neighborhood, city districts, cities, country regions, countries, continents, among others, constitute the different place scale of sense of place. As research expands, some more specific places become the target of place bonding theory, such as sacred sites (Mazumdar & Mazumdar, 1993), working places (Milligan, 1998), football grounds (Charleston, 2009), campus (Sun & Maliki, 2013) and even some virtual and imagined places (Droseltis & Vignoles, 2010). However, the vast majority of recent publications on place bonding deal with the place as “residence place” and Lewicka points out that the favorite target of people-place relationships research is “neighborhood, followed by home, city .....” (2011, p. 211). The majority of people-place relationships researchers pay their attention to “one place scale only and avoid comparisons of attachments to different place scales” (Lewicka, 2011, p. 211). In this study, the rural-urban migrants’ sense of place is presented aimed at investigating and comparing their bonding to three places differing in scale: home, neighborhood, and city.

### 2.3 People’s movement through space and time

In the book *Triumph of the city*, Edward Glaeser (2011) demonstrates that the city is the best possible place to live in the past, the present, and the foreseeable future. According to the traditional economic model of migration, people migrate to the city for jobs and higher income, “considering monetary and psychic costs” (Rudzitis, 1991, p. 81). In China, the emergence of rural-urban migration is the consequence of a variety of factors which refer to not only the economic reason, but also some noneconomic variables such as the state’s decision of relaxing migration control, developing gap between the urban and the rural, and some others from the change of society, family and individual themselves (Zhao, 1999).

For the individual, it is obvious that dislocation may result in pressure or grievance when the migrants are separated from previous place. Cuba and Hummon argue that “mobility ..... undermines place attachment by eroding place differences and destroying the particularity of place relations” (1993a, p. 550). They also indicate that “individuals who are torn from valued places are likely to experience severe emotional grief and a profound sense of ‘displacement’” (1993a, p. 550). Gustafson (2001) indicates that relations between place attachment and mobility are both positive and negative. Place attachment signifies roots, security, and sense of place as well as imprisonment and narrow-

mindedness, while mobility may imply freedom, opportunities, and new experiences, but also uprootedness and loss. Gustafson (2001) even concludes that both place attachment and mobility may contribute to the individual well-being and life satisfaction in today's society.

### 3. METHODOLOGY

#### 3.1 Place of fieldwork and participants

To probe the rural-urban migrants' sense of place within the context of rapid urbanization in China, there are two criteria in the case selection. The first is that the selected case city should be a medium-size city which will be more representative. The second is that the city should be an old city with large number of rural-urban migrants to facilitate the investigation on the social inclusion and exclusion between the urban residents and migrants. In order to meet the two criterions above, Baoding city, a prefecture-level city, locating in the Beijing-Tianjin-Hebei Region, is selected as the case city. Baoding Lies in the middle part of Hebei Province. It is a national historic city with 2300 years history. Baoding is 140 km south to Beijing and 160 west to Tianjin. It is called "the south gate of Beijing". According to the Sixth Population Census in 2010, Baoding has a population of 11.35 million.

Despite the proliferation of research on rural-urban migration in China, many different concepts and terms about migrants (such as floating population, temporary migrants, and permanent migrants) are still confusing due to the frequent changes of definition in census and the development of public policy. In this study, the rural-urban migrant is considered the people who leave the countryside for the purpose of gaining better social-economic opportunities in Baoding city regardless of the duration of stay in the city and registered permanent residence.

#### 3.2 Study design employing quantitative methods

From October 2014 to February 2015, questionnaires were distributed to collect data. The questionnaire consists of four parts. The first part is about the participants' demographic information. The second part is to achieve participants' sense of place to home including nine items. The items include physical term, such as views from the house (Lobo, 2004), house size, satisfaction with house in terms of spatial layout, interior design and decoration (McAndrew, 1998), and psychological term, such as the respondents' self-identity at home, getting emotional help and support from family and talking about problems with family (Suitor, 2013), emotional bonds to home (McAndrew, 1998), feelings at home and attachment to home (Kyle, Graefe, Manning, & Bacon, 2004; Shamai & Ilatov, 2005; Williams & Roggenbuck, 1989).

In both the third and fourth parts, the three constructs: place dependence, place attachment and place identity are used to measure participants' sense of place to neighborhood and Baoding city. Place dependence on neighborhood and Baoding city is measured by two aspects: the quality of the neighborhood or the city as a resource for goal-directed (Chipuer et al., 1999; Jorgensen & Stedman, 2001, 2006; Pretty et al., 2003; Qian et al., 2011), and the quality of neighborhood or the city compared to alternative ones (Jorgensen & Stedman, 2001, 2006; Nielsen-Pincus et al., 2010). Place attachment to neighborhood and Baoding city relates to behavioral commitment subscale (Lewicka, 2008, 2010b; Qian & Zhu, 2014; Qian et al., 2011) and emotional subscale (Jorgensen & Stedman, 2001, 2006; Lewicka, 2005, 2008, 2010a, 2010b; Nielsen-Pincus et al., 2010). Place identity with neighborhood and Baoding city refers the aspect of self-categorization and social identity (Brown, Condor, Mathews, Wade, & Williams, 1986; Buckner, 1988; Obst, Smith, & Zinkiewicz, 2002; Pretty et al., 2003).

For each item in part two to four, a five-point Likert-scale is applied with 1 denoting "strongly disagree" and 5 denoting "strongly agree". The data with questionnaire survey are analyzed with SPSS 18.0. After initial design, the questionnaire is evaluated by an associated professor who has abundant research experience in urban design and urban planning to "reveal problems with survey instruments

..... (and) to sort items into groups that are more or less likely to exhibit measurement errors” (Olson, 2010, p. 296). As the respondents are Chinese, the questionnaire is translated into Chinese by the researcher. Then both the original English version and the Chinese translation version are reviewed by two associated professors in English linguistics in China to ensure the faithfulness of the translation. Before the formal survey, a pilot study with 72 respondents is conducted to obtain information about the reliability of the instrument. In the pilot data, most of the scales obtained a Cronbach’s alpha higher than .70 when running the reliability test in SPSS. However, only eliminating some items in five different constructs could the construct meet the Cronbach’s alpha criterion of .70 or higher. After the pilot study, a formal survey with 431 valid questionnaire is conducted. The social-demographic characteristics are outlined in Table 1.

Table 1 Social-demographic characteristics of the survey sample.

	Frequency	Percentage		Frequency	Percentage
<i>Gender</i>			<i>Education</i>		
Male	217	50.35	Primary school	4	.93
Female	214	49.65	Junior high school	27	6.26
<i>Age</i>			Senior high school	85	19.72
Under 24	45		Vocational or technical training	104	24.13
25 – 31			Bachelor degree	143	33.18
32 – 38			Postgraduate degree	68	15.78
39 – 45			<i>Residence length in Baoding (years)</i>		
46 and above			Under 3	69	16.01
<i>Marital status</i>			4 – 6	65	15.08
Single	74	17.17	7 – 10	103	23.90
Married	351	81.44	11 – 20	145	33.64
Divorced	4	.93	Above 20	49	11.37
Widow/Widower	2	.46	<i>Residence length in neighborhood (years)</i>		
<i>Home ownership status</i>			Less than 1 year	77	17.87
Own	322	74.71	1 year – 2 years	79	18.33
Rent	109	25.29	2 years – 5 years	119	27.61
<i>House size (m<sup>2</sup>)</i>			5 years – 10 years	94	21.81
Under 60	62	14.39	Above 10 years	62	14.39
61 – 89	150	34.80	<i>Profession</i>		
90 – 120	140	32.48	Leaders of enterprises and institutions	46	10.67
121 – 144	47	10.90	Professional and technical staff	157	36.43
Above 144	32	7.42	Handle affairs personnel and concerned staff	59	13.69
<i>Having urban hukou</i>			Commercial staff and service personnel	52	12.06
Yes	287	66.59	Production, transportation and related workers	97	22.51
No	144	33.41	Other occupation not elsewhere classified	20	4.64

## 4. RESULT AND ANALYSIS

### 4.1 Rural-urban migrants’ sense of place to home

Nine items are used to assess the respondents’ sense of place to home. Scores of the nine items are added and averaged to reach a construct indicating the intensity of sense of place to home. The score of the construct ranges from 2.22 to 5.00 with a mean of 3.81 (SD = 0.59). In order to further analyze the distribution of the respondents’ bonding to their homes, the respondents are divided into six groups based on the construct score of sense of place to home (Table 2). The largest three groups fall into the categories of 3.5-4 (N = 143, 33.18%), 4-4.5 (N = 102, 23.67%) and 3-3.5 (N = 80, 18.56%). The modest groups are the categories of 4.5-5 (N = 53, 12.30%) and 2.5-3 (N = 47, 10.90%) and the fewest group is the categories of 2-2.5 (N = 6, 1.39%). Therefore, it can be concluded that the participants in the sample have developed a moderate intense of sense of place to their homes in general.

Table 2 The score categories distribution for the sense of place to home construct.

Categories	Frequency	Percent
2-2.5	6	1.39
2.5-3	47	10.90
3-3.5	80	18.56
3.5-4	143	33.18
4-4.5	102	23.67
4.5-5	53	12.30
Total	431	100.0

#### 4.2 Rural-urban migrants' sense of place to neighborhood

To determine the intensity of respondents' sense of place to neighborhood (NSOP), items are added and averaged in the constructs of place dependence, place attachment, and place identity. Higher scores in the constructs are consistent with stronger place bonding to neighborhood. As shown in Table 3, the mean score of place dependence on neighborhood (NPD) is 2.59 (SD = 0.87). The most frequent score distribution focuses on the category of 2.5-3 (N = 116, 26.91%). The results show that over half of the respondents have not developed place dependence on their neighborhood.

Table 3 Mean scores, standard deviations and the score distribution of the constructs of sense of place to neighborhood.

	Place dependence on neighborhood		Place attachment to neighborhood		Place identity with neighborhood		Sense of place to neighborhood	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
1 – 1.5	78	18.10	11	2.55	9	2.09	7	1.62
1.5 – 2	56	12.99	27	6.26	26	6.03	27	6.26
2 – 2.5	69	16.01	37	8.58	35	8.12	58	13.46
2.5 – 3	116	26.91	134	31.09	143	33.18	128	29.70
3 – 3.5	59	13.69	86	19.95	119	27.61	139	32.25
3.5 – 4	44	10.21	102	23.67	73	16.94	51	11.83
4 – 4.5	5	1.16	18	4.18	20	4.64	17	3.94
4.5 – 5	4	0.93	16	3.71	6	1.39	4	0.93
Total	431	100	431	100	431	100	431	100
Mean	2.59		3.17		3.16		2.97	
SD	0.87		0.76		0.67		0.64	

The mean score of place attachment to neighborhood (NPA) is 3.17 (SD = 0.76). The most frequent score distribution concentrates on the categories 2.5-3 (N = 134, 31.09%) and 3.5-4 (N = 102, 23.67%). The data indicate that one half of the respondent has delivered place attachment to their neighborhood, although the overall intensity of the respondents' place attachment presents a comparatively low level.

The mean score of place identity with neighborhood (NPI) is 3.16 (SD = 0.67) with the most frequent score massing on the categories 2.5-3 (N = 143, 33.18%) and 3-3.5 (N = 119, 27.61%). The data illustrate that a half of the respondents has generated place identity with their neighborhood, but the overall place identity degree of the whole respondents is not high.

A one-way within subjects analysis of variance is conducted to test whether the three constructs of sense of place to neighborhood differ significantly. As illustrated in Table 4, the respondents' place dependence on, place attachment to and place identity with neighborhood are significantly different, Greenhouse-Geisser adjusted  $F(1.83, 233.11) = 174.76, p < .05, \text{partial } \eta^2 = .29$ .

Table 4 ANOVA test mean scores for place dependence on, place attachment to and place identity with neighborhood.

		Type III sum of square	df	Mean square	F	Sig.	Partial eta squared
NSOP	Greenhouse-Geisser	94.74	1.83	51.78	174.76	.000	.29
Error (NSOP)		233.11	786.74	.296			

Dependent-samples *t* test is conducted to assess which of the constructs of sense of place differs from one another, with each test conducted at an alpha level of .016. As shown in Table 5, the results indicates that the score of respondents' place dependence is significantly lower than the score of place attachment,  $t(430) = -15.14, p < .016$ , and the score of place dependence as compared to place identity,  $t(430) = -15.02, p < .016$ . There is not a significant difference between the scores of place attachment and place identity,  $t(430) = 0.35, p > .016$ .

Table 5 Paired samples test for place dependence on, place attachment to and place identity with neighborhood.

		Mean	SD	SD error mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	NPD - NPA	-0.58	.79	.04	-.65	-.50	-15.14	430	.000
Pair 2	NPD - NPI	-0.57	.79	.04	-.64	-.49	-15.02	430	.000
Pair 3	NPA - NPI	0.01	.61	.03	-.05	.07	0.35	430	.729

At last, the intensity of sense of place to neighborhood is calculated by averaging the mean scores of the three constructs of place dependence, place attachment and place identity. The score of the construct of sense of place ranges from 1.17 to 4.92 with a mean of 2.97 (SD = 0.64) (Table 3). The most frequent score distribution concentrates on the categories of 2.5-3 (N = 128, 29.70%) and 3-3.5 (N = 139, 32.25%). Based on the above analysis, it can be concluded that majority of respondents have not developed sense of place to their neighborhood and their overall intensity of sense of place to their neighborhood is in a negative level.

#### 4.3 Rural-urban migrants' sense of place to Baoding city

Like the neighborhood scale, the respondents sense of place to Baoding city (CSOP) is measured by the intensity of place dependence on, place attachment to and place identity with the city. As illustrated in Table 6, the mean score of place dependence on the city (CPD) is 3.00 (SD = 0.66) with the most frequent score distribution concentrating on the categories of 2.5-3 (N = 136, 31.55%). The data manifest that only small part of the respondents have developed place dependence on the city with the overall level presenting in a very low level.

Table 6 Mean scores, standard deviations and the score distribution of the constructs of sense of place to the city.

	Place dependence on city		Place attachment to the city		Place identity with the city		Sense of place to the city	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
1 – 1.5	8	1.86	4	0.93	2	0.46	0	0
1.5 – 2	39	9.05	16	3.71	7	1.62	8	1.86
2 – 2.5	73	16.94	42	9.74	30	6.96	35	8.12
2.5 – 3	136	31.55	124	28.77	116	26.91	107	24.83
3 – 3.5	101	23.43	84	19.49	132	30.63	156	36.19
3.5 – 4	55	12.76	129	29.93	97	22.51	102	23.67
4 – 4.5	16	3.71	20	4.64	42	9.74	20	4.64
4.5 – 5	3	0.70	12	2.78	5	1.16	3	0.70
Total	431	100	431	100	431	100	431	100
Mean	3.00		3.27		3.37		3.21	
SD	0.66		0.68		0.60		0.53	
Skewness	-.05		-.16		-.14		-.05	
Kurtosis	.10		.18		.47		.05	

The mean score of place attachment to the city (CPA) is 3.27 (SD = 0.68) with the most frequent score distribution focusing on the categories of 3.5-4 (N = 129, 29.93%) and 2.5-3 (N = 124, 28.77%). The results show that more than half of the respondents have generated place attachment to the city while the left have not.



The mean score of place identity with the city (CPI) is 3.37 (SD = 0.60) with the most frequent score distributions massing on the categories of 3-3.5 (N = 132, 30.63%) and 2.5-3 (N = 116, 26.91%). The data indicate that most respondent have formed a relatively moderate level of place identity with the city.

Table 7 ANOVA test mean scores for place dependence on, place attachment to and place identity to the city.

		Type III sum of square	df	Mean square	F	Sig.	Partial eta squared
NSOP	Greenhouse-Geisser	30.87	1.97	15.68	74.48	.000	.15
Error (NSOP)		178.20	846.58	.21			

A one-way within subjects ANOVA is used to assess whether the three constructs of sense of place to the city differ significantly. The results in Table 7 show that the respondents' place dependence on, place attachment to and place identity with the city are significantly different, Greenhouse-Geisser adjusted F (1.97, 846.58) = 74.48,  $p < .05$ , partial  $\eta^2 = .15$ .

Table 8 Paired samples test for place dependence on, place attachment to and place identity to the city.

		Mean	SD	SD error mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	CPD - CPA	-0.27	.67	.03	-.33	-.21	-8.39	430	.000
Pair 2	CPD - CPI	-0.36	.66	.03	-.43	-.30	-11.47	430	.000
Pair 3	CPA - CPI	-0.10	.60	.03	-.15	-.04	-3.29	430	.001

Table 8 illustrates the results of dependent-samples *t* test which is conducted to assess whether of the constructs of sense of place to the city differed from one another, with each test performed at an alpha level of .016. The score of respondents' place dependence is significantly lower than the score of place attachment,  $t(430) = -8.39$ ,  $p < .016$ , and also significantly lower than the score of place identity,  $t(430) = -11.47$ ,  $p < .016$ . The score of place attachment is significantly lower than the score of place identity,  $t(430) = -3.29$ ,  $p < .016$ .

Finally, summing and averaging the mean scores of the three constructs of place dependence, place attachment and place identity can obtain the respondents' intensity of sense of place to the city. The mean score of sense of place to the city is 3.21 (SD = 0.53) ranging from 1.69 to 4.75. The most frequent score distribution focuses on the categories of 3-3.5 (N = 156, 36.19%), 2.5-3 (N = 107, 24.83%) and 3.5-4 (N = 102, 23.67%). According to the analysis above, it can be concluded that majority of the respondents have delivered sense of place to the city, but its level is not high.

Conducting a one-way within subjects ANOVA, the results show that there is significant difference between sense of place to home, neighborhood and Baoding city, Greenhouse-Geisser adjusted F (1.93, 831.46) = 335.98,  $p < .05$ , partial  $\eta^2 = .44$  (Table 9).

Table 9 ANOVA test mean scores for sense of place to home, neighborhood and city.

		Type III sum of square	df	Mean square	F	Sig.	Partial eta squared
SOP	Greenhouse-Geisser	158.31	1.93	81.87	335.98	.000	.44
Error (SOP)		202.61	831.46	.24			

The results of dependent-samples *t* test (Table 10) shows that the mean score of sense of place to home is significantly higher than those to neighborhood,  $t(430) = 23.78$ ,  $p < .016$ , and is significantly higher than those to the city,  $t(430) = 17.36$ ,  $p < .016$ . The mean score of sense of place to neighborhood is significantly lower than those to the city,  $t(430) = -8.12$ ,  $p < .016$ .

Table 10 Paired samples test for sense of place to home, neighborhood and city.

		Mean	SD	SD error mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	HSOP – NSOP	0.83	0.73	.04	.76	.90	23.78	430	.000
Pair 2	HSOP – CSOP	0.59	0.71	.03	.52	.66	17.36	430	.000
Pair 3	NSOP – CSOP	-0.24	0.62	.03	-.30	-.18	-8.12	430	.000

## 5. DISCUSSION AND CONCLUSION

### 5.1 The construct of sense of place in the scales of neighborhood and the city

Sense of place to both geographical scale of neighborhood and city is measured with the construct of place dependence, place attachment and place identity. The three constructs are chosen on the basis of each fulfilling a unique feature of sense of place concept, notwithstanding the individual construct of sense of place shows differences in ability to discriminate migrants' place bonds to neighborhood and the city.

The mean score of place dependence on neighborhood ( $M = 2.59$ ) can be interpreted that the respondents goal-directed activities cannot be met by their neighborhood and they show no preference to stay there. The result of respondents' place dependence on the city ( $M = 3.00$ ) indicates that the city cannot fulfill the respondents' demands of goal-directed behavior, and they prefer to work and live in an alternative city.

The respondents' place attachment to neighborhood and the city are assessed by the aspects of behavioral commitment and emotional bonding. The results indicate that place attachment to the two geographical scales is developed in a low level interpreted by the mean score of 3.17 and 3.27, respectively.

The social identity question "who am I?" is transformed to the question "where am I?" or "where do I belong?" (Cuba & Hummon, 1993b) to answer the place identity question: personal position in place and self-identity in the physical setting. Results in this study show that the respondents have developed place identity with neighborhood and the city in a low level.

Many scholars have attempted to construct the subscales of sense of place including place dependence, place attachment, place identity, belongingness, place satisfaction, among others. This study follows the argument proposed by Jorgensen and Stedman (2001, 2006) and Qian et al. (2011). In the neighborhood scale, the result of no significant difference between place attachment and place identity indicates that there might be overlap in the conceptual representation and empirical indicator between the two constructs. In the city scale, there are significant differences among the three constructs of sense of place. The different performance of the three constructs of sense of place in two different geographical scales concern complicated cause. First, most of the research about people-place relationships is carried out under the context of western society. When probing issues in China, especially the complicated social phenomenon of rural-urban migration in China, more efforts is needed to investigate the discriminating indicators of place attachment and place identity under the consideration of the Chinese social background. Second, the construct of sense of place may differ along with the change of geographical scale. This is noted for future study.

### 5.2 Scale of place and sense of place

In this study, it can be seen that sense of place develops to different intensity towards places with different spatial ranges. Post-hoc tests in this work reveals that neighborhood, the range which "has been considered the most important in the formation of bonds of attachment", is the one with the weakest level of sense of place. This finding mostly stay in agreement with what Hidalgo and

Hernández (2001) have proposed: a curvilinear, U-shaped, relationship between intensity of place bonding and scale of place. The general conclusion that curvilinear relationship may be a universal shape of the relation between emotional bonds with places and place scales. In her research in four Central-European cities, using five places (apartment, building, neighborhood, city district, city) in four cities, Lewicka (2010b) also confirmed the curvilinear relationship. Hidalgo and Hernández point out that “it is not the case that people are not attached to the neighborhood. In fact they are. But in comparison to other spatial ranges this attachment is weaker” (2001, p. 279). However, the results in this research is different from their statement. Respondents in this study have not developed sense of place to their neighborhood which is interpreted by the mean score ( $M = 2.97$ ) presenting in a negatively low level. Although the respondents have delivered sense of place to city, but its level was not high ( $M = 3.21$ ). Most scholars elaborate the rural-urban migrants’ lack of emotional connection to neighborhood and city from the lens of social inclusion (Li, 2006; Yang, 2001). Clearly future research is needed to investigate why the rural-urban migrants have difficulties to develop place bonding to their neighborhood from the perspective of people-place relationships.

When touching with the respondents during the survey, the researcher find that the respondents always unconsciously compare their current living place with their rural hometown. Although a few scholars (Maliki, Abdullah, & Bahauddin, 2015; Shamai, Arnon, & Schnell, 2012) attempt to compare place bonding to current living settings and previous hometown, this issue is still worthwhile to future research.

In Chinese culture, home is a symbol of rootedness, privacy, comfort and happiness. “Modern people’s sense of home is at the core of their sense of place” (Hay, 1990, p. 43). The moderate intensity of migrants’ sense of home is not as strong as the researcher would like it to be. After all, they migrate to the city in search of a better life.

In summary, the intensity of rural-urban migrants’ sense of place manifests that they have not develop emotional connection to their current living place. Although working and living in the city, the rural-urban migrants have not rooted in the city and deem it as an alien land.

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## USE OF SPACE TECHNOLOGY IN MAKING FLOOD AFFECTED CITIES LIVABLE

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### ABSTRACT

Use of space technology is currently becoming extremely important with the advantages of covering wide area and saving both time and money.

Many regions of the world face annual flooding threats. These floods result in destruction of cropland, damage to infrastructure and ultimately the loss of human lives. Through the use of hydrologic modeling techniques it is possible to better predict, prepare for and react to such events.

This paper presents a modeling approach that makes use of remotely sensed data and geospatial tools to forecast flows. The available spatial data; digital elevation model (DEM), Soils, land use/ Land cover, vegetation, etc.; are used in catchment characterization, runoff generation and water balance calculation. The modeling exercise facilitated the use of space technology in flood early warning as well as flood risk assessment and inundation mapping. Vulnerability assessment eased the delineation of vulnerable areas.

With a good flood early warning system in hand floods can be predicted a priori. With proper inundation maps flood plains are delineated and types of buildings as well as construction materials in these areas are set, hence making hindered cities livable.

**Keywords:** Space Technology, flood early warning, flood risk, flood inundation, vulnerability mapping

### 1.0 INTRODUCTION

During the past decades, a number of major flooding events have drawn attention to the need for wide-area monitoring systems for hydrologic hazards (Kunkel and et al, 1994, Christie and Hanlon, 2001). The goal is to provide early warning to at-risk populations and decision makers, and to direct the efforts of relief agencies involved in humanitarian assistance and sustainable development activities.

Poor ground-based monitoring or data transmission systems hamper the efforts of local water authorities to issue spatially specific flood warnings in a timely fashion. Consequently, hydrologic modelling has been adopted as the main approach for estimating flows for warning generation. Most of the commonly used models are unsuitable for wide-area implementation in data scarce environments. The models may not be designed to ingest geospatial data sets.

Observed stream flow data for estimation of model parameters is often not available. Another common problem is the absence of a steady and reliable stream of daily forcing data sets to facilitate near-real time operation.

Parameters relevant for hydro(geo)logy are spatially distributed and may show significant temporal variability. Earth Observation (EO) data, when used jointly with in situ data, can provide an essential contribution for:

- the creation of inventories of surface water resources, the extraction of thematic maps relevant for hydro(geo)logical studies and models (landcover, surface geology, lineaments, geomorphology...) or
- the retrieval of (bio)geophysical parameters (water quality and temperature, soil moisture...)

The large area coverage of each observation, on one hand, helps moving beyond the point-based readings provided by gauge networks to basin-wide measurements of discharge and storage, and on the other hand derives common databases of inter-country comparable information. Repeatability of observations allows the generation of a time-series of observed parameters and may result in an improved capability to analyze, monitor and forecast the evolution of phenomena, facilitating water resources management.

Most of the catchment areas of river basins traversing Sudan lie outside Sudan territorial area. No protocol of data sharing available in the region. Some of the important river basins have only small lag time to reach important areas inside Sudan. These challenges call for changing modelling paradigm.

Leveraging the vast geo-spatial data archived available input parameters derived from remotely sensed data and continental-scale datasets and input data parsimonious models.

Catchment scale modeling framework was selected as opposed to a grid cell based model to simplify a balance for a physical realism of the process representation and availability of data to describe the system and to make life easier to operate in operational real-time.

The study is carried out on the Blue Nile up to Khartoum (Figure 1). The model used in this study comprises of a rainfall-runoff model in the runoff generation areas and routing model along the river channel with special reservoir routing unit. A two dimensional hydrodynamics model is then used produce flood inundation maps and flood hazards. Finally, risk maps are produced by overlaying vulnerability maps with economic functions.

## 2.0 INPUT DATA

Grid of elevation data that describes the physical characteristics of each subwatershed that makes up the watershed being modeled. The digital elevation model (DEM) data is available from the U.S. Geological Survey's Earth Resources Observation System (EROS) Data Center.

Land Use and Land Cover in conjunction with soils information used to partition rainfall incident on a basin to separate surface runoff from water infiltrating into the soil. The land use/land cover and soils data are also used to calculate response function of each basin. The response function describes how excess precipitation is routed to the outlet of the basins. The land cover data set and its derivatives are available from USGS.

Soils Data used to derive soil parameters (soil water holding capacity, saturated soil hydraulic conductivity, hydrologically active soil layer depth, and soil texture) extracted from the Digital Soil Map of the World available from FAO.

Daily Satellite Rainfall Estimates (RFE) and Potential Evapotranspiration (PET) are available from NOAA.

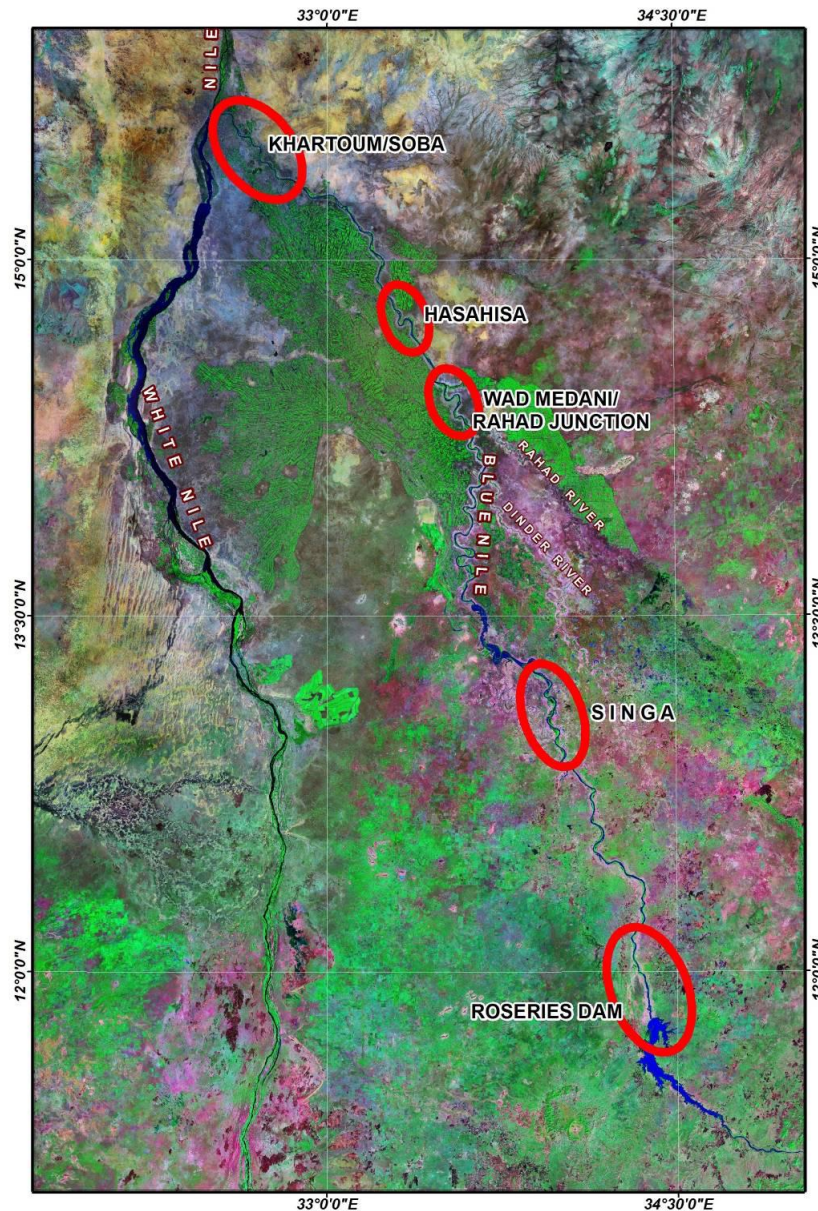


Figure 1: The study area in Blue Nile-Sudan

An inventory of the existing available topographic data was performed in order to identify data gaps and the need for additional field surveys. The following data were collected and processed:

- 1992 field data used in the configuration of the Flood Early Warning System (FEWS) developed for the River Nile were retrieved. A total of 87 field-surveyed cross-sections for the Blue Nile from Roseires Reservoir to Khartoum were available from this system. The cross-sectional data



were available in distance-elevation format for each cross-section. As such, there was limited information with which to locate the specific cross sections geographically on a map for subsequent integration with other data sources for the development of a terrain model, for hydraulic modeling, and for inundation mapping.

- Bathymetric Survey for the 25 Km Blue Nile River Reach between Khartoum and Bagair, 2007
- A recent bathymetric survey performed by the Dam Implementation Unit (Sudan) in association with Ministry of Irrigation and Water Resources (MOIWR Sudan). This survey covers a 25 km reach between Khartoum and Bagair and is a very dense bathymetric survey collected at an interval of 100 m. The available data are in distance-water depth format for each cross-section. The data were geo-referenced using the same approach outlined in the previous section. Almost no error or shift was encountered because of the large amount of cross sections and the short distance between cross-sections.
- Bathymetric survey for Roseires Reservoir, 2007 performed by the Dam Implementation Unit in association with MOIWR for Roseires Reservoir. The survey covers a reach of about 110 km upstream of Roseires Reservoir with geo-referenced data. The data were pre-screened to check for the right datum projection (WGS-UTM84) and a number of referenced points were utilized to verify the accuracy of the data.
- Field Survey performed by Riverside Technology (RTi) and UNESCO Chair in Water Resources (UNESCO- CWR) 2010 were used to supplement the available data and verify the accuracy of existing river cross-sections. The survey at each river cross-section was tied to a control point of known elevation. For the purpose of consistency, the Elevation Datum was chosen to be a MOIWR reference datum because all the previous cross-section surveys were based on MOIWR elevation data. There is a vertical shift of 3 meters between the survey datum and MOIWR datum.

Other data such as observed stream flow, observed stream water levels, observed rainfall were collected from the respective authorities locally.

### **3.0 FORECASTING AND EARLY WARNING BLUE AND MAIN NILE-SUDAN**

#### **3.1 Rainfall-Runoff Component**

HEC-HMS was used as a rainfall-runoff model. The model is calibrated and validated using observed data (Bashar, and Zaki 2004). Figure 2 shows the model results during calibration period (1990-1994).



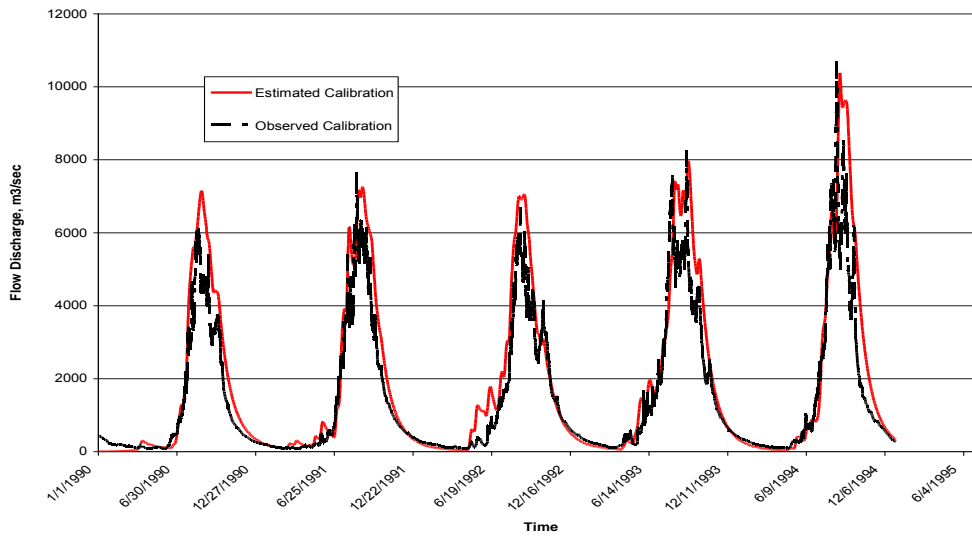


Figure 2: Computed and observed hydrographs during calibration of HEC-HMS

It can be pointed out that the model produced relatively reasonable results taking into consideration averaged (time invariant) parameters were used for the whole calibrated period and lumped parameters values for the whole area of the Blue Nile watershed. The  $R^2$  of the calibration period is about 92%.

During the verification period (1995-1996) the model performance was also reasonable. Figure 3 shows the model results during the validation period. The  $R^2$  of the validation period is about 90%.

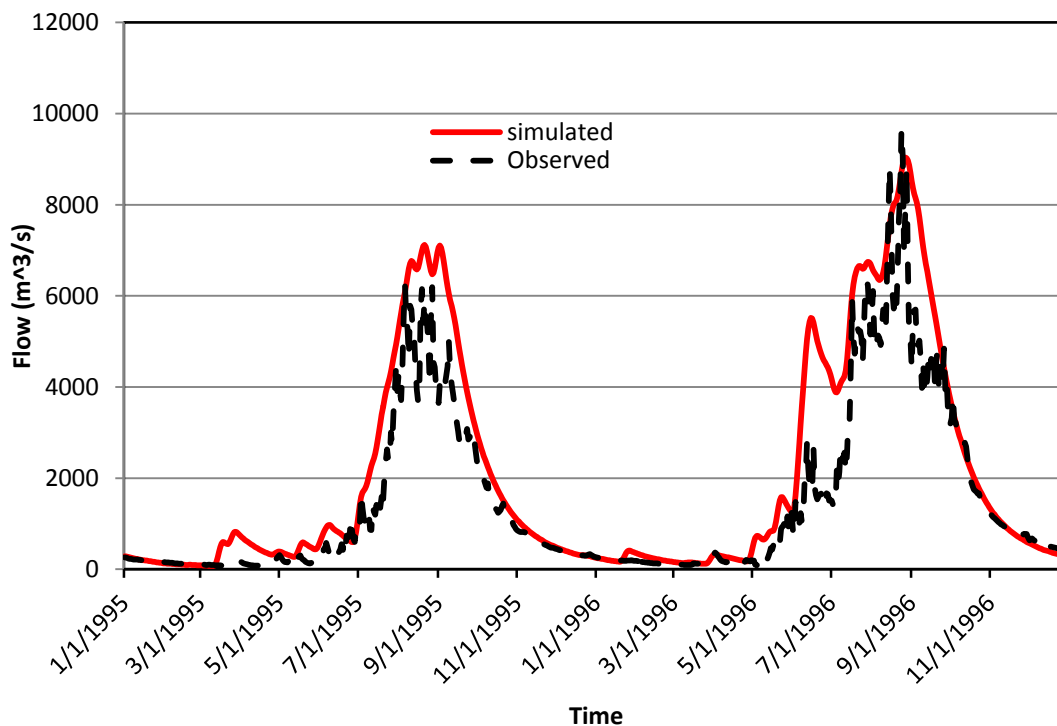


Figure 3: Computed and observed hydrographs during validation of HEC-HMS

### 3.2 Hydraulic Routing Component

HEC-RAS was used to route the flow along the Blue Nile river channel from the Sudanese-Ethiopian border at Eddeim station to Khartoum. The model was calibrated and validated using selected flood events.

Before applying HEC-RAS a TIN layer to define the earth surface resulting from field surveying and RAS model should be developed in a preprocessing module called HEC-GeoRAS. A multi-step procedure was used to create a TIN and RAS model from multiple sources of elevation data. The following steps were used:

1. Generate a TIN using the survey data exclusively (no DEM data for the floodplain). The TIN generation is an automated GIS process that generates a preliminary TIN whose exclusive purpose is to incorporate the survey data into a surface for extraction into HEC-RAS.
2. Digitize the centerline and bank lines of the river from satellite imagery. This step adds additional information about river alignment and meandering that is not available in the reaches between surveyed cross sections.
3. Delineate cross sections in GeoRAS that correspond to surveyed cross section locations, but that are confined within the bank lines drawn in step 2
4. Extract the cross sections, bank lines, and river centerline to RAS. This step provides HEC-RAS with all of the original cross section data in a geo-referenced form.
5. Interpolate additional cross sections at 100-meter spacing between surveyed cross sections, following the river centerline, and export the cross sections to GeoRAS. In many sections of the river, the surveyed cross section spacing was greater than 6 kilometers, so this step resulted in the addition of more than 60 interpolated cross sections between each surveyed cross section. In areas with surveyed cross sections that are spaced more closely than 100 meters (such as most of Khartoum), no interpolation is performed.
6. Delineate break lines at the centerline and at previously defined bank lines with elevations defined by surveyed and interpolated cross sections.
7. Extract elevation point data for the floodplain from the 90-meter SRTM gridded DEM.
8. Generate a multi-source TIN surface by combining the break lines and cross section data points with elevation data from the 90 meter SRTM gridded DEM.

The resulting TIN can be used for extracting cross sections that extend into the floodplain, as well as for mapping flood hazard using results from a hydraulic model. The interpolation of the TIN points from the break lines between cross sections results in some generalization of the cross section into a triangular shape between cross sections in the final TIN. This aspect of the TIN does not impact the hydraulic model, which considers only the specific cross section shapes, and it does not impact the flood extent mapping because the effect is seen only within the low-flow channel. The effect is seen, however in the flood depth maps. The final TIN was used as the basis for extracting cross sections for the hydraulic model, and subsequently in mapping the flood hazard.

Once the digitization process was complete, the HEC-GeoRAS data was imported into HEC-RAS. The transition between the pre-processor and the hydraulic model is smooth and results in a visual representation of the RAS model identical to that created in the pre-processor.

The calibration was done for 1988 flood and the validation was done in 2003 flood. Figures 4 and 5 show the calibration and validation results for Khartoum station respectively.

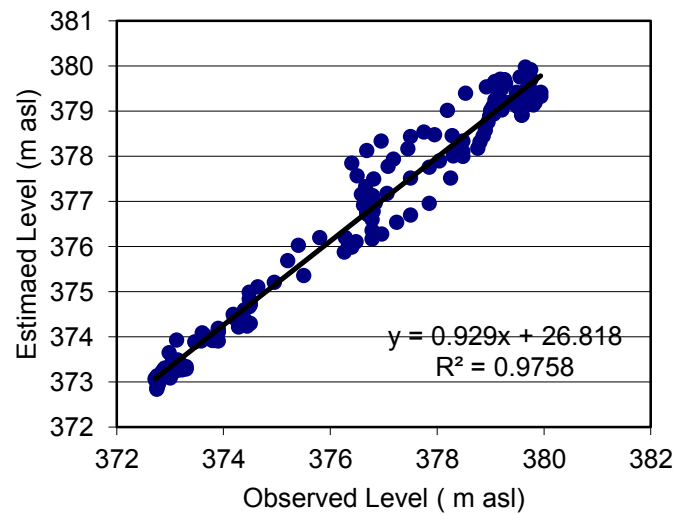
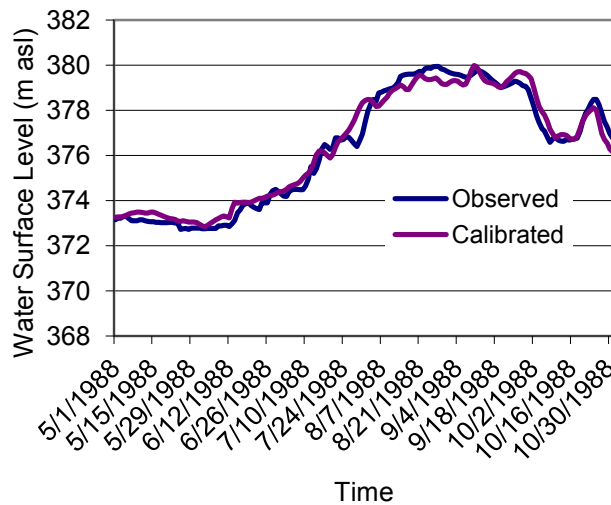


Figure 4: Calibration results for Khartoum station-1988 flood

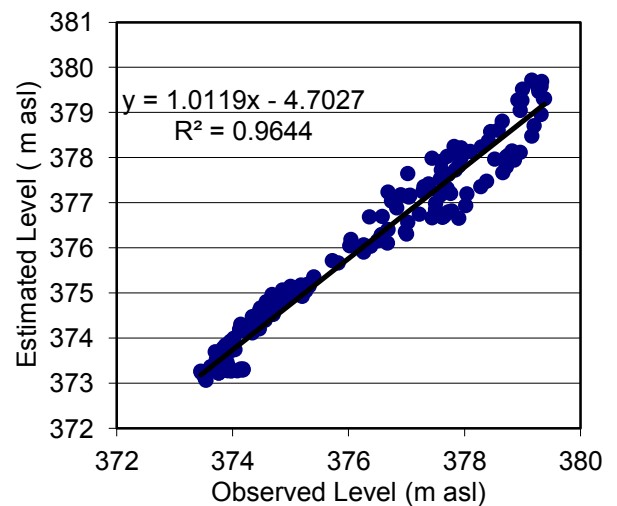
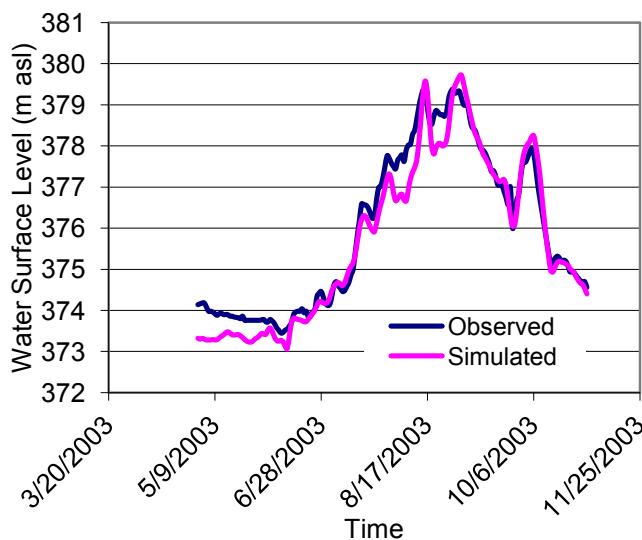


Figure 5: Validation results for Khartoum station-2003 flood

### 3.3 Hazard Mapping (Hydrodynamic modelling)

A key feature of the HEC-RAS and HEC-GeoRAS tools is the ability to pass geo-referenced simulated water surface elevation information to the GIS to permit inundation mapping. This process was used in an iterative fashion as part of the hydraulic modeling to visualize inundated areas and hydraulic connectivity to the channel. As part of this process, exported water surface elevations is assigned to the entire width of an associated cross section in the GIS, which represents the same cross section from the hydraulic model. A water surface is then interpolated between adjacent cross sections. These surfaces are intersected with the terrain model to obtain a polygon layer of inundated area, as well as a depth grid, as shown in Figure 6, indicating depth of inundation at any point in the inundated area. These layers describe components of the hazard

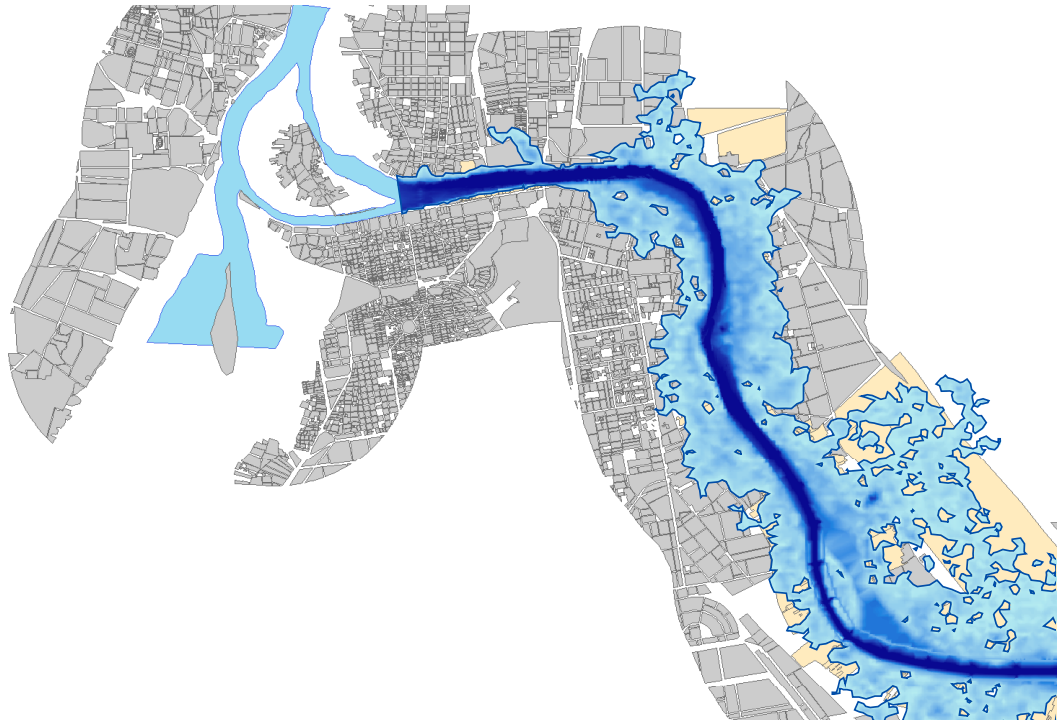


Figure 6: Inundated area and depth of inundation at Khartoum for 100 year flood event

Another component of hazard is the velocity associated with the peak discharge. HEC-RAS simulates the variation in velocity across a given section. This velocity distribution can also be exported to the GIS, where a velocity surface can be interpolated between the cross sections to create a velocity grid. Areas within the velocity grid that coincide with areas outside the inundation extents will be clipped so that no velocity information is implied where there is no water, as shown in Figure 7. The velocity grid can be viewed as providing guidance on local velocities to be expected, with the assumed flow direction being from upstream to downstream cross sections.

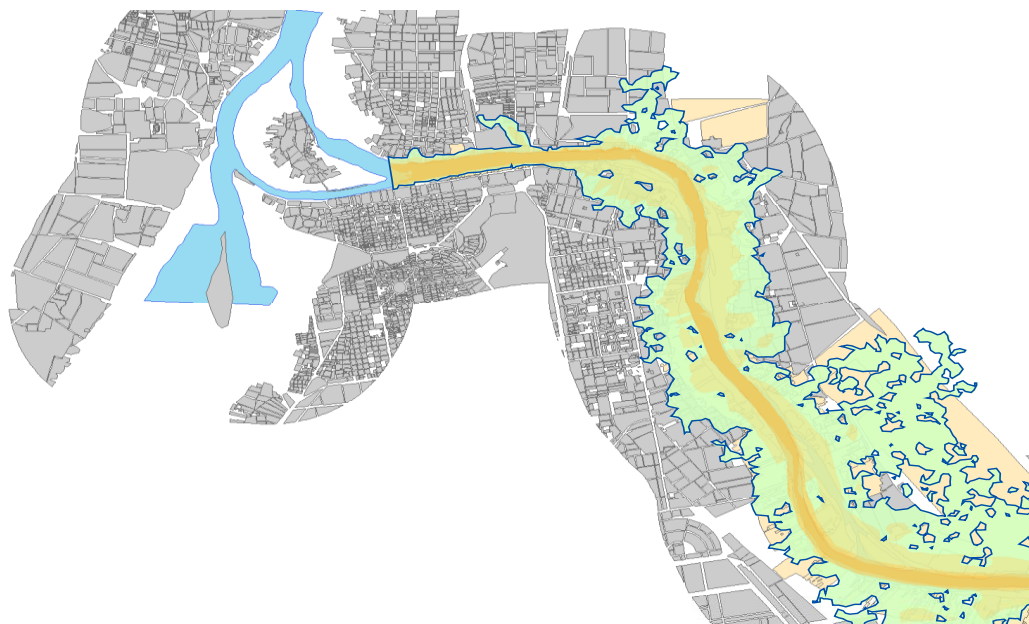


Figure 7: Velocity vector map of inundation at Khartoum for 100 year flood event



### 3.4 Vulnerability Mapping

The vulnerability mapping involves GIS processing to intersect the flood depth layer for a given frequency event with each of the asset elements in the spatial database, identifying the associated damage from the damage curves, and creating a raster or grid representing the combined damage from all asset elements within each grid cell. Figure 8 shows a section of the vulnerability map at Khartoum City. The red and orange cells represent higher vulnerability than the green and lighter color cells.

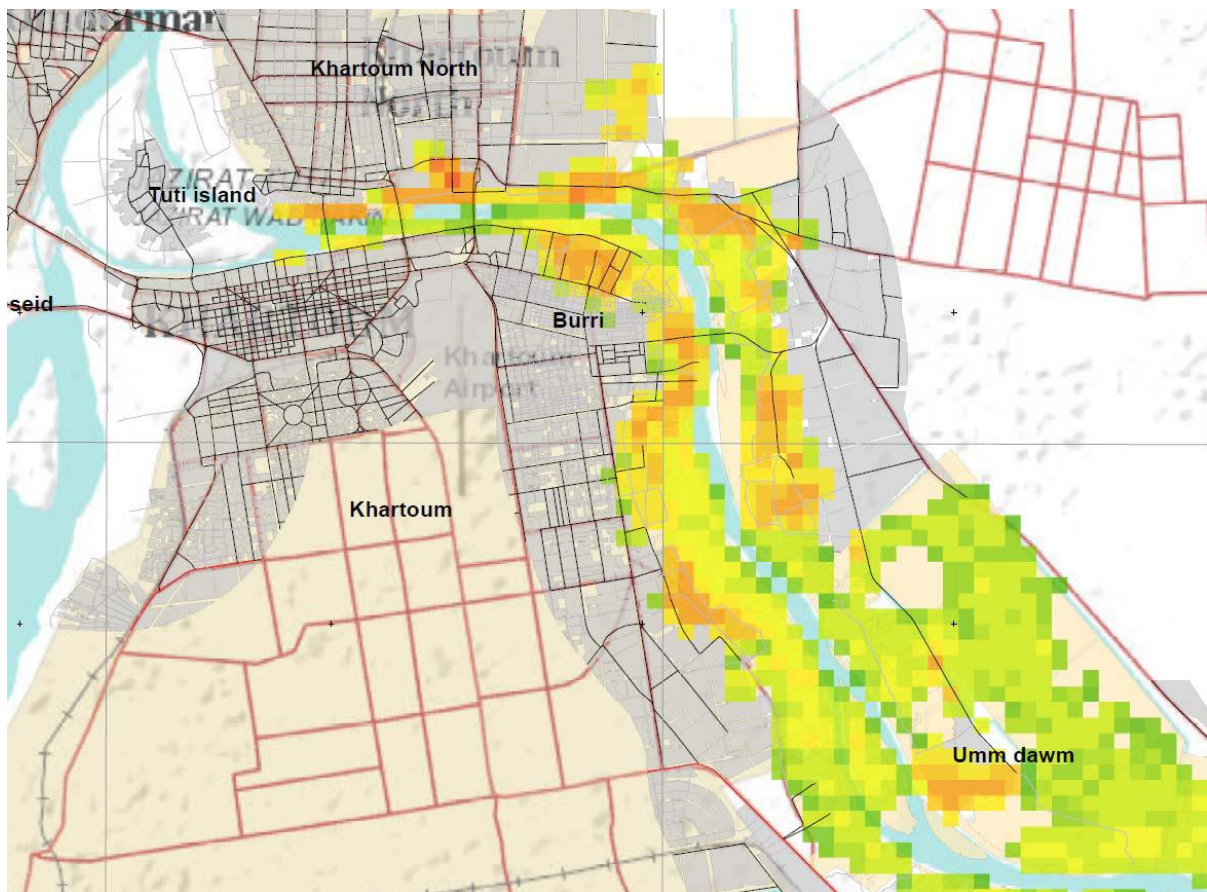


Figure 8: Vulnerability map at Khartoum for 100 year flood event

### 3.5 Risk Mapping and Assessment

The risk mapping involves the integration of the results from the hazard and vulnerability maps. A damage probability curve was constructed from the estimated damages caused by the events with different probabilities of occurrence (eg 0.5, 0.2, 0.1, 0.02, and 0.01 corresponding to events of 2, 5, 10, 50, and 100 year return periods). A total of five damage-probability pairs of points were used to define the damage probability curve, using the total damage values computed from the vulnerability maps. The annualized risk was computed as the area under this curve. The curve was divided into slices to compute the area as the product of the damage and the range of probability associated with it.

A similar procedure was performed in the GIS environment to develop an annualized risk map. For each vulnerability map, each grid cell was multiplied by the probability range computed from the damage-probability curve to produce a partial damage grid representing the annualized damage for each probability range. The damage grids for each probability range were then combined to produce



the average annual damage grid, which is the annualized risk map. Figure 9 shows a section of the annualized risk map in Khartoum City. The intensity of cell colors is slightly subdued compared to the 100 year vulnerability maps due to the reduction in cells values obtained when the damages are multiplied the low probability of occurrence of the 100 years event.

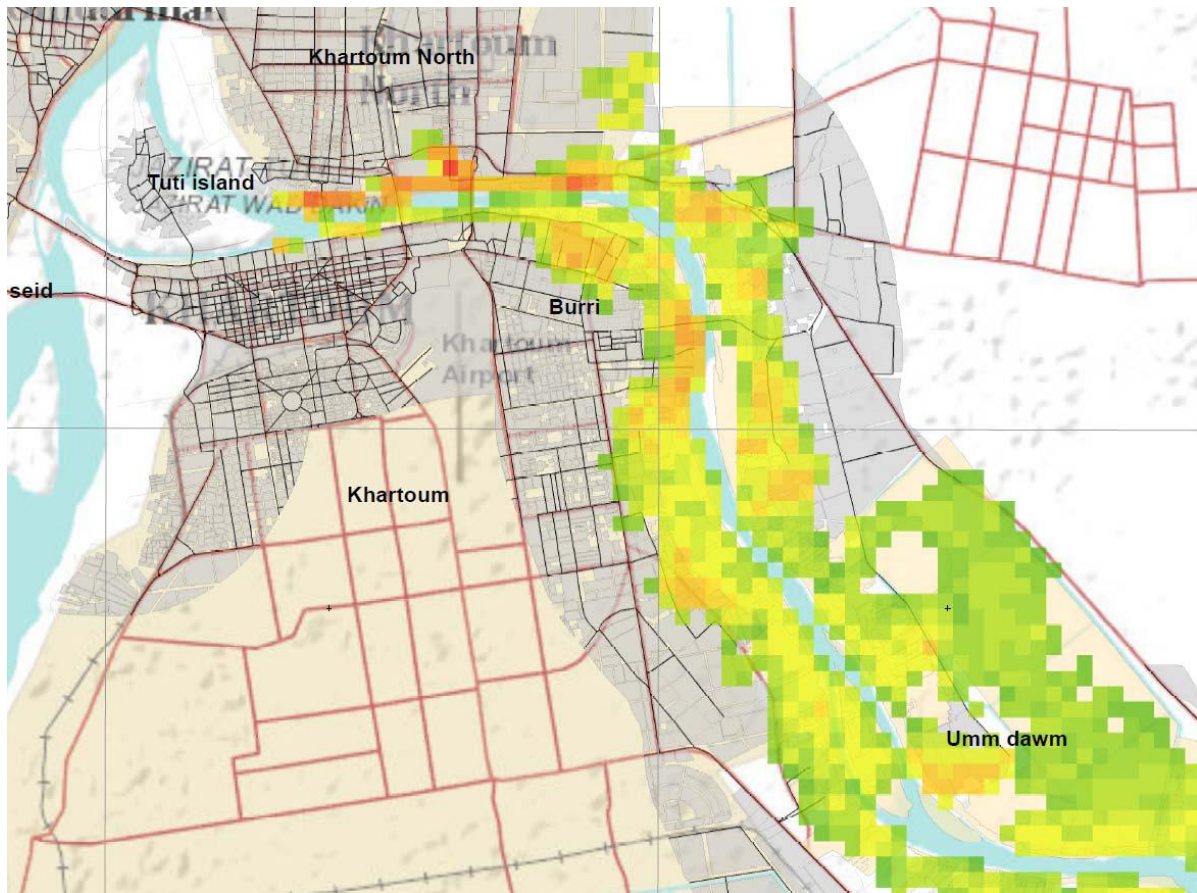


Figure 9: Risk map at Khartoum for 100 year flood event

#### 4.0 CONCLUSION AND RECOMMENDATIONS

Flood risk mapping can be an important aid to a community in taking action in the present to reduce future damages, in planning for flood preparedness and response, in developing infrastructure for reducing flood severity and flood damage, and in guiding development to avoid increased risk where hazard is frequent and hence making our cities livable.

Some useful outcomes

- The produced maps can be studied for use in emergency response
- The produced maps can be used to guide development policy, i.e. to restrict types of development within the floodplain or to establish economic policies to encourage responsible development.
- The flood boundary maps can be used to identify areas of focus for subsequent data collection and refinement of results.
- Vulnerability and risk maps can be studied to improve understanding of locus of expected damages due to flooding.

- Populations in high flood hazards areas could be encouraged/educated regarding flood resistant construction materials and methods consistent with hazard (frequency of depth, velocity hazards).
- The hydraulic model can be used as part of analyses for the design of flood protection works (embankments)
- The hydraulic model can be used to evaluate increasing stages resulting from development and encroachment on the river.

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## EVALUATE UNIVERSAL PROCESSES OF QUALITY MANAGEMENT SYSTEM IN THE MILITARY CONSTRUCTION ORGANIZATION

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### ABSTRACT

This paper illustrates how evaluation fundamental processes of quality (EQP) management system (QMS) in the military construction organization (IDMW). A "Process" can be defined as a "set of interrelated or interacting activities, which transforms inputs into outputs". These activities require allocation of resources such as people and materials. A major advantage of the process approach is in the management and control of the interactions between these processes and the interfaces between the functional hierarchies of the organization. The International Organization for Standardization (ISO) submitted are four basic questions that should be asked in relation to every process being evaluated when evaluating processes in ISO:9000. While Dr. Juran (1904-2008), who is Called the Father of Modern Day Quality Management, submitted three universal processes of quality management in 1986 which are later known by "Juran Trilogy". Juran Trilogy represents the concepts of Quality Planning (QP), Quality Control (QC), and Quality Improvement (QI).

**Keywords:** Juran Trilogy, Quality Management System, ISO 9000

### PROBLEM STATEMENT

Regardless of the approach adopted toward the quality management maturity of the military construction organization, a business may need to demonstrate to the regulatory authorities that its processes are both effective and under control and that procedures and systems are supervised efficiently. The standard requirements are not limited to a certain part of the organization, but they

involve all of the sections of the organization; the quality processes are responsible for achieving the standard requirements (Biazzo & Bernardi, 2003). Each process has a constant purpose in the quality policy of an organization. The the QMS universal processes are quality Assurance (QA), quality control (QC) , and quality improvement (QI) (Juran & Godfrey, 2008). Therefore, the QMS universal processes are evaluated (EQPs) to measure the change that would occur.

## LITERATURE REVIEW

Dr. Juran (1904–2008), who is known as the Father of Modern-day Quality Management (Donaldson, 2005), submitted three universal processes of quality in 1986 (Juran, 1986). These processes were later referred to as the “Juran Trilogy.” The Juran Trilogy represents the concepts of Quality Planning (QA), Quality Control (QC), and Quality Improvement (QI). Juran pertained to these processes as “universal.” These processes represent the sequences of events to plan, control, and improve quality. These processes have been used extensively in all industries around the world for numerous years (Bersimis, Psarakis, & Panaretos, 2007).

To illustrate the concept of Juran Trilogy, Figure 1 shows the diagram and interrelations among Quality universal processes.

The beginning of the operation process denotes starting the control phase. However, the operation shows that the process will be incapable of producing products 100%. The diagram shows that more than 20% of the work must be redone because of poor quality. This problem signifies chronic waste. Chronic waste occurs because of glitches in planning the operation. Under traditional patterns of responsibility, labour forces are unable to dispose of chronic waste. Implementing quality control could prevent the situation from worsening.

The diagram exhibits a sporadic increase in the level of defects to more than 40%. This increase may be caused by unplanned events, such as power outage, collapse of the process, and human error. As part of quality control, measures are required for restoring the status quo, which is often referred to as “corrective action.” The result requires restoring the level of the error back to the level of chronic waste, which was at 20%. The chart shows that acting in a timely manner can even reduce the chronic waste down to the original level. This gain came from the third phase in the trilogy on improving quality. Chronic waste is an opportunity for improvement, and steps are undertaken to address this improvement (Juran & Godfrey, 2008).

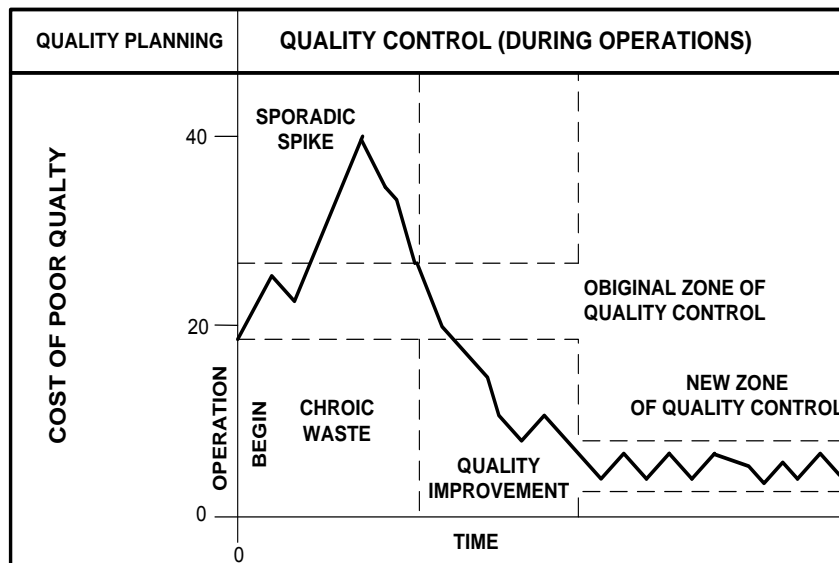


Figure 1 Diagram of the Juran Trilogy (Juran & Godfrey, 2008, p. 2.7)

### Quality Assurance (QA)

Quality assurance focuses on providing confidence that quality requirements will be fulfilled (Clause 3.2.11 of ISO 9000:2005). In other words, QA pertains to all of the planned and systematic actions necessary for providing adequate confidence that a product will satisfy the requirements for quality (Chung, 1999; Griffith, 1990). This fundamental shift in concept stems from the reactive downstream approach of quality control via detection to a proactive upstream approach that controls and manages upstream activities to prevent problems from arising (Khan et al., 2007).

### Quality Control (QC)

Quality control focuses on fulfilling quality requirements (Clause 3.2.10 of ISO 9000:2005). QC is a set of activities or techniques undertaken to ensure that all quality requirements are met (Cao, 2010). To achieve this purpose, processes are monitored and performance problems are solved. The quality control function of an organization initially evolved when inspectors were hired to examine products and differentiate between the good and the bad (Noman, 2010). The 100% inspection subsequently evolved into sampling inspection (Juran, 1945). In other words, operational techniques and activities, such as the aforementioned sampling inspection, are used in fulfilling the requirements for quality. The nature of this approach relatively remains a detection, which is considered a reactive downstream approach (i.e., correction only after problems occur).

### Quality Improvement (QI)

Quality improvement focuses on increasing the capacity to fulfil quality requirements (Clause 3.2.12 of ISO 9000:2005). QI is concerned with doing things better to improve system efficiency and effectiveness, and not with correcting errors (Dawda, Jenkins, & Varnam, 2010). ISO offers the PDCA cycle as a useful tool for continuous improvement. The methodology applies to both high-level strategic processes and simple operational activities (Sokovic, Pavletic, & Pipan, 2010).

To evaluate quality universal processes (EQPs), four basic questions should be asked in relation to every process being evaluated (ISO, 2005);



- 1) Is the process identified and appropriately defined?
- 2) Are responsibilities assigned?
- 3) Are the procedures implemented and maintained?
- 4) Is the process effective in achieving the required results?

The collective answers to these questions can determine the results of the evaluation. The evaluation of a QMS can vary in scope and encompass a range of activities, such as auditing and reviewing QMS, as well as self-assessments.

## METHODOLOGY

The questionnaire will be posed in the study to evaluate quality management system processes (EQP). EQP, is represented by three dimensions, namely, evaluating quality assurance EQP-QA, control EQP-QC, and improvement processes EQP-QI.

### Population and Sampling

The questionnaire will be formulated to ensure that all branches of IDMW are included and surveyed based on stratified random sampling (Gay & Diehl, 1992). This section consists of the research population and sample for this study. The research population for this study are IDMW, which refers to “technical staff”(44 % of total staff) who are only throughout Iraq. This sample was chosen to ensure that study results would be generalizable (Fraenkel, Wallen, & Hyun, 2012). Theoretically, researchers could specify an even finer distinction of population, called “study population.”

The population for this study for the quantitative method comprised IDMW from IMOD. The selected IDMWs were asked to fill in the present research questionnaires that were sent to both Administration and Training Department managers in selected IDMW.

As for research sample, Sandelowski (1995) added that any research sample could be a subset of the population being studied. The method includes the process of selecting a few (samples) from a bigger group (the sampling population) to become the basis for estimating or predicting a fact, situation, or outcome regarding the larger group. By contrast, the present research sample should be as large as possible. A larger sample means that study results are more likely to be representative and generalizable. Considering the impossibility of attaining information from every single individual in a particular population, sampling is performed instead. Sampling involves collecting data from a sufficient number of persons in the population to popularize the findings to the entire population (Hair, Black, Babin, & Anderson, 2010). Various ways are used to determine a sufficient sample size based on population number. The sample size can be calculated with the following formula (Yamane, 1967):

$$n = \frac{N}{1 + e^2} \dots \dots \dots (1)$$

**Note:** n is the sample size, N is the population size, and e is the level of precision.

A total staff of IDMW includes all branches throughout Iraq, which number 1428 persons. The technical staff comprises 632 (N), who represent the “study population,” as shown in Table 3.17.

Table 1 Study Population in IDMW

	Branches of IDMW	No. units in Iraq	Support Staff	Technical staffs	Total staffs
1	(Headquarters)	1			
	Regional	4	83		

	<b>Department</b>				
	<b>Regional Sections</b>	15	344		
	<b>Resident Engineer</b>	4	20		
	<b>Warehouse</b>	1	52		
	<b>Training school</b>	1	29		
	<b>Σ</b>			N=632	

When applying N & e values or 632 and 0.05, respectively, in Equation (1), the sample size will equal to 245.

### Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) was performed to assess measurement model adequacy. It statistically tests the ability of the hypothesized factor model to reproduce the sampled data. In other words, CFA measures the adequacy of the measurement model by assessing the model's goodness-of-fit to the data, as well as the convergent and discriminant validity of the study constructs.

### RESULT AND ANALYSIS

EQPs was represented by three factors with a total of 12 measurement items, including EQP-QA (P, 4 items) and EQP-QC (C,4 items), and EQP-QI (I, 4 items). The resulted of the reliability analysis revealed that it had very good Cronbach's Alpha 0.891. An EFA was conducted using the PCA technique with the rotation method was Varimax with Kaiser Normalization for the three factors that reflecting the Evaluating Quality processes in order to label and loading of items. As shown in Table 2 The items extracted in three dimensions. All items loaded on their respective factor higher than 0.5, KMO score of 0.897 indicated a good sampling adequacy, Bartlett's test of sphericity was significant ( $\chi^2 = 1422.392, p < 0.001$ ), the degree of freedom was 66, and the total variance accounted for by the three factors was 69.62%. in fact , The loadings of the items ranged from .563 to .834, above the cutoff value of .50 as recommended by (Hair et al.,2010).

Table 2 Exploratory Factor Analysis for EQP

Construct	Item	1	2	3
EQP-QA	C1	.780	.134	.256
	C2	.793	.201	.153
	C3	.799	.214	.120
	C4	.817	.169	.178
EQP -QI	I1	.101	.798	.221
	I2	.241	.759	.200
	I3	.193	.789	.214
	I4	.211	.772	.201
EQP-QA	P1	.105	.171	.823

	P2	.288	.194	.779
	P3	.212	.258	.748
	P4	.145	.233	.771
Eigenvalues Value		2.86	2.75	2.73
Total Variance (69.62%)		23.78	22.93	22.90

### Descriptive Statistics for Variables

To calculate the level of each single construct for measurement study purposes, descriptive statistics are required for this type of construct (Pallant, 2013). Two tests of descriptive statistics have been performed in this study. They are the mean and standard deviation. The mean of each variable range from 2.87 to 3.61. EQP-QI has the lowest mean (2.87) and EQP-QA (0.84) has the highest mean. EQP-QC has the highest standard deviation (0.88) and the standard deviation value for EQP-QI (0.63) is considered the lowest value compared to other variables. The results revealed that the respondents displayed balanced levels of values in each scale, as shown in Table 3.

Table 3 Descriptive Statistics for Each Variable

No. Construct	Construct Name	Min	Max	Mean	Std. Deviation
1	EQP-QA	1.00	5.00	3.61	0.84
2	EQP-QC	1.00	5.00	3.42	0.88
2	EQP-QI	1.00	5.00	2.87	0.65

Identify EQPs which responsible for the implementation of the standard requirements of ISO 9001 in IDMW. Identify EQPs was performed according to Clause 3.2.11 of ISO 9000:2005. Descriptive Statistical analysis shows the mean of application overall EQPs was 3.30. The EQP-QI ( $m = 2.87$ ,  $SD = 0.65$ ) is less than EQP-QA ( $m = 3.61$ ,  $SD = 0.84$ ) and EQP-QC ( $m = 3.42$ ,  $SD = 0.88$ ). EQP-QI should be higher to ensure continuous improvement (Juran & Gryna, 2008). According to the Juran trilogy concept, The beginning of project implementation denotes starting the quality control process. However, the quality control process shows that the process will be incapable of assuring the quality 100%. The work must be redone because of the EQP-QA did not applied by 100%. Under traditional patterns of responsibility, labour forces are unable to dispose of chronic waste. Implementing quality control could prevent the situation from worsening. But, the level of defects would be increased because  $EQP-QC < EQP-QA$  as well as unplanned events. EQP-QC must be higher than EQP-QA for restoring the status quo through "corrective action." But, this result could not restore the level of the error back to the level of chronic waste. The third phase in the trilogy in improving quality process. Chronic waste is an opportunity for improvement, and steps are undertaken to address this improvement. It is expected the improvement procedures to have the effect of very little or imperceptible because EQP-QI smallest from the both EQP-QC and EQP-QA.

### CONCLUSION

The major objective of the present study was to evaluation fundamental processes of quality for the military construction organization in Iraq, according to ISO 9000. Hence, the existence of a gap

refers to an imbalance in both of a framework to guide senior management of organizations towards improved performance, and evaluating quality processes represent the sequences of events to plan, control, and improve quality. While, EQP has three elements: evaluating Quality assurance process, evaluating Quality control process, and evaluating Quality improvement process. Thus, an effective QMPs can help the IDMW to enhance standard requirements response and EQPs.

Descriptive Statistics analysis of this research show of QMPs is high in the military construction organization in Iraq. This reverse positively on the response to the standard requirements. While, The evaluating quality improvement processes are less than evaluating quality assurance and quality control, but it should be higher to ensure continuous improvement. The Current level of evaluating quality improvement processes did not achieve the purpose of continuous improvement. The system reformed plan should focus on raising, evaluating quality improvement processes through enhancing the application of a framework to guide senior management of organizations towards improved performance percentage.

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## INVESTIGATE THE EFFECT OF QUALITY MANAGEMENT PRINCIPLES ON EVALUATING QUALITY PROCESSES IN THE MILITARY CONSTRUCTION ORGANIZATION IN IRAQ

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### ABSTRACT

This paper illustrates how What's the effect of quality management principle (QMPs) application level on the evaluation level of quality management processes (EQPs) in the military construction organization (IDMW). This papers highlight upgrading the EQPs are through measuring the influence of the QMPs. The QMPs was represented by eight factors: Customer Focus, Involvement of People, System approach to management, mutually beneficial supplier relationships, Process approach, Continual Improvement, Leadership, and Decision making. While, Evaluating Quality processes was represented by three factors: Evaluating Quality Assurance processes and Evaluating Quality Control processes, and Evaluating Quality Improvement processes. The Correlation and Multiple Regression analysis was used to predict the effect of QMPs on EQP performance. Significant interaction effects were found in the relationship between EQP and QMPs.

**Keywords:** Quality Management principles, Quality management system, ISO 9000.

## PROBLEM STATEMENT

Iraqi Directorate of Military Works (IDMW) is the case study of this research. IDMW is the major organization responsible for preparing the architectural and construction drawings, details, and technical specifications, which are required in the contract documents for the construction of infrastructure projects of the Iraqi army. The regulatory authorities in Iraq pointed out in their periodic reports a number of issues on the quality system of IDMW (Performance Report, 2013). Despite the abundance of financial resources for military projects because the report above clearly indicates IDMW has failed to provide the basic requirements for quality management system

The majority of studies have focused on the process of evaluating and measuring the gap between the ISO 9001 requirements and the actual QMS within different industrial sectors as the basis for evaluating the effectiveness of their QMS (Abdullah et al., 2011; Llach, Marimon, & Bernardo, 2011; Sumaedi & Bakti, 2011).

Previous studies have suggested filling the gap through the continuous improvement cycles of the QMS requirements. They neglected to focus on the effect of a fundamental framework or beliefs for leading and operating an organization aimed at continually improving its performance in the long term by addressing stakeholder needs, which are known as quality management principles (QMPs). The continuous improvement cycles must be included in QMPs to avoid changing the path toward QMS into the quality documentation system (Ahmed, Aoieong, Tang, & Zheng, 2005; Ofori, Gang, & Briffett, 2002; Yates & Aniftos, 1997). This inclusion requires an investigation of the effectiveness of QMPs (ISO, 2012).

If the efficiency of the system fits inversely with the requirements gap, that is, directly proportional to the EQPs, then which factors are responsible for implementing those requirements and reducing the gap processes by enhancing QMPs? What are the effects of QMPs on EQPs?

## LITERATURE REVIEW

### Quality Management Principles (QMPs)

The technical committee of ISO 176 (ISO/TC 176) derived eight quality management principles on which the standards of the revised ISO 9000:2000 series are based according to the collective experience and knowledge of international experts who participated in ISO/TC 176. These principles reflect the best practices and are designed to enable the continual improvement of the system. These principles can be used by senior management in guiding their organizations toward improved performance. The following eight principles are indicated in the literature reviews of QMS in the construction industry and management science fields: Customer Focus (QMP-CF), Leadership (QMP-L), Involvement of people (QMP-IP), Process Approach (QMP-PA), System Approach to Management (QMP-SAM), Continual Improvement (QMP-CI), and Factual approach to Decision Making (QMP-FADM), and Mutually Beneficial Supplier Relationships (QMP-MBSR) (ISO, 2012).

### Evaluating Universal Quality Processes of QMS (EQPs)

Dr. Juran (1904–2008), who is known as the Father of Modern-day Quality Management (Donaldson, 2005), submitted three universal processes of quality in 1986 (Juran, 1986). These processes were later referred to as the “Juran Trilogy.” The Juran Trilogy represents the concepts of Quality Planning (QA), Quality Control (QC), and Quality Improvement (QI). Juran pertained to these

processes as “universal.” These processes represent the sequences of events to plan, control, and improve quality. These processes have been used extensively in all industries around the world for numerous years (Bersimis, Psarakis, & Panaretos, 2007).

To evaluate quality universal processes (EQPs), four basic questions should be asked in relation to every process being evaluated (ISO, 2005);

- a) Is the process identified and appropriately defined?
- b) Are responsibilities assigned?
- c) Are the procedures implemented and maintained?
- d) Is the process effective in achieving the required results?

The collective answers to these questions can determine the results of the evaluation. The evaluation of a QMS can vary in scope and encompass a range of activities, such as auditing and reviewing QMS, as well as self-assessments.

## METHODOLOGY

This study suggests that continuous improvement cycles must include QMPs and EQPs and to avoid changing the path of QMS into a quality documentation system (Ahmed et al., 2005; Ofori et al., 2002; Yates & Anifto, 1997) by measuring the suitability of QMP and EQP. QMP is applied in the internal environment as standard requirement (Al-Khatib, 2008), fundamental framework, or beliefs to lead and operate an organization at continually improving performance over the long term. QMPs further addresses the needs of all stakeholders (ISO, 2012). Meanwhile, EQPs aims to achieve standard requirements within IDMW to adopt a QMS and find relationships between QMPs and EQPs. All these requirements reveal the position of IDMW toward standard specifications.

The questionnaire will be posed in the study to evaluate quality management principles (QMP) and evaluating quality management system processes (EQP). The independent variable for this study, QMP, has eight dimensions, which are QMP-CF, QMP-IP, QMP-SAM, QMP-MBSR, QMP-PA, QMP-CI, leadership, and QMP-FADM (ISO, 2012). The dependent variable, EQP, is represented by three dimensions, namely, evaluating quality assurance, control, and improvement processes. These variables were constructed based on ISO QMS requirements (ISO 9000, 2005). The questionnaire will be formulated to ensure that all branches of IDMW are included and surveyed based on stratified random sampling (Gay & Diehl, 1992).

## RESEARCH HYPOTHESES

Based on literature review, the relationship of QMPs focuses on EQP within a military construction organization.

### **H<sub>1</sub>: Overall QMPs has a Positive effect on Overall EQPs. (Topical hypotheses)**

QMPs can target the highest service quality for patients by creating an environment oriented to continual improvement of processes at lowest expenditure (Colesca & Zgodavová, 2007). QMPs are internalized such that they guide employee behavior. This notion of internalization is critical to successful ISO implementation (Dai, Huang, Zhang, Wang, & Feng, 2004). Companies that implement ISO 9000 as a quick fix to quality problems seldom make ISO practices part of daily decision making to improve quality (Saravanan & Rao, 2006). However, other companies are more likely to make ISO principles part of their daily routine (Sun, 2000). Hence, assuming that the relationship should be higher for QMPs and EQPs is reasonable. This general hypothesis and three related hypotheses were

formulated, one for each process variable under QMPs. Therefore, a hypotheses model was developed comprising three main hypotheses.

QMPs were represented by QMP-CF, QMP-L, QMP-IP, QMP-PA, system approach, QMP-CI, QMP-FADM, and supplier relationships. EQPs was represented by evaluating quality planning processes (EQP-QA), evaluating quality control processes (EQP-QC), and evaluating quality improvement processes (EQP-QI). Under these variables, 24 sub-hypotheses were classified into 3 groups that reflected the relationships of QMPs with each evaluating process of EQPs depicted in the theoretical framework.

Therefore, the first main hypothesis of the current study is as follows:

## H<sub>2</sub>: QMPs have a Positive effect on EQP-QA.

Table 1 Sub-Hypotheses of First Main Hypothesis

Sub-Hypo.	Statement of Hypotheses	Reference Support
H2a:	QMP-CFhas a positive effect onEQP-QA.	(Öztaysi, Sezgin, & Fahri Özok, 2011; Sanuri Mohd Mokhtar, 2013)
H2b:	QMP-Lhas a positive effect onEQP-QA.	(McCarthy, 2012; Rothwell, 2010)
H2c:	QMP-IP has a positive effect onEQP-QA.	(Felstead, Gallie, Green, & Zhou, 2010; Kim, MacDuffie, & Pil, 2010).
H2d:	QMP-PAhas a positive effect onEQP-QA.	(Rezaei, Çelik, & Baalousha, 2011).
H2e:	QMP-SAMhas a positive effect onEQP-QA.	(Kerzner, 2013; Rothwell & Kazanas, 2011)
H2f:	QMP-CI has a positive effect onEQP-QA.	(Bryson, 2011; Schweitzer & Aurich, 2010).
H2g:	QMP-FADMhas a positive effect onEQP-QA.	(De Bruijn & Ten Heuvelhof, 2010)
H2h:	QMP-MBSRhas a positive effect onEQP-QA.	(Chien & Chen, 2010; Tompkins, White, Bozer, & Tanchoco, 2010)

The second main hypothesis of the current study is as follows:

## H<sub>3</sub>: QMPs have a positive effect on EQP-QC

Table 2 The Sub-Hypotheses of the Second Main Hypothesis

Sup-Hypo.	Statement of Hypotheses	References Support
H3a:	QMP-CFhas a positive effect onEQP-QC.	(Sichtmann, Selasinsky, & Diamantopoulos, 2011).
H3b:	QMP-Lhas a positive effect onEQP-QC.	(Simons, 2013; Snyder, 2010)
H3c:	QMP-IPhas a positive effect on EQP-QC.	(Turkyilmaz, Akman, Ozkan, & Pastuszak, 2011; Yee, Yeung, & Cheng, 2010)
H3d:	QMP-PAhas a positive effect on EQP-QC.	(Keane, Sertyesilisik, & Ross, 2010; Serag, Oloufa, Malone, & Radwan, 2010)
H3e:	QMP-SAMhas a positive effect on EQP-QC.	(Nezhad & Niaki, 2010; Schmitt, Monostori, Glöckner, Stiller, & Viharos, 2011)

H3f:	QMP-CI has a positive effect on EQP-QC.	(Series, Management, & Hutchins, 2012; Sokovic, Pavletic, & Pipan, 2010)
H3g:	QMP-FADM has a positive effect on EQP-QC.	(Zimmerman & Yahya-Zadeh, 2011)
H3h:	QMP-MBSR has a positive effect on EQP-QC.	(Liu, Li, & Zhang, 2010; Talib & Rahman, 2011)

The last main hypothesis of the current study is as follows:

**H<sub>4</sub>: QMPs have a Positive effect on EQP-QI.**

Table 3 Sub-hypotheses of third main hypothesis

Sup-Hypo.	Statement of Hypotheses	References Support
H4a:	QMP-CF has a positive effect on EQP-QI.	(Al-Refaie, Ghnaimat, & Ko, 2011; Phan, Abdallah, & Matsui, 2011)
H4b:	QMP-L has a positive effect on EQP-QI.	(Apekey, McSorley, Tilling, & Siriwardena, 2011; Sharabi, 2010)
H4c:	QMP-IP has a positive effect on EQP-QI.	(Eivani, Nazari, & Emami, 2012; Mendes, 2012)
H4d:	QMP-PA has a positive effect on EQP-QI.	(Gotzamani, 2010; Łukasiński, 2011)
H4e:	QMP-SAM has a positive effect on EQP-QI.	(Rusjan & Alic, 2010)
H4f:	QMP-CI has a positive effect on EQP-QI.	(Dawda, Jenkins, & Varnam, 2010)
H4g:	QMP-FADM has a positive effect on EQP-QI.	(Yu et al., 2012)
H4h:	QMP-MBSR has a positive effect on EQP-QI.	(Biotto, De Toni, & Nonino, 2012)

## POPULATION AND SAMPLING

The questionnaire will be formulated to ensure that all branches of IDMW are included and surveyed based on stratified random sampling (Gay & Diehl, 1992). This section consists of the research population and sample for this study. The research population for this study are IDMW, which refers to "technical staff" (44 % of total staff) who are only throughout Iraq. This sample was chosen to ensure that study results would be generalizable (Fraenkel, Wallen, & Hyun, 2012). Theoretically, researchers could specify an even finer distinction of population, called "study population."

The population for this study for the quantitative method comprised IDMW from IMOD. The selected IDMWs were asked to fill in the present research questionnaires that were sent to both Administration and Training Department managers in selected IDMW.

As for research sample, Sandelowski (1995) added that any research sample could be a subset of the population being studied. The method includes the process of selecting a few (samples) from a bigger group (the sampling population) to become the basis for estimating or predicting a fact, situation, or outcome regarding the larger group. By contrast, the present research sample should be as large as possible. A larger sample means that study results are more likely to be representative and generalizable. Considering the impossibility of attaining information from every single individual in a particular population, sampling is performed instead. Sampling involves collecting data from a sufficient number of persons in the population to popularize the findings to the entire population (Hair, Black, Babin, & Anderson, 2010). Various ways are used to determine a sufficient sample size based on population number. The sample size can be calculated with the following formula (Yamane, 1967):



$$\dots\dots\dots(1)$$

**Note:** n is the sample size, N is the population size, and e is the level of precision.

A total staff of IDMW includes all branches throughout Iraq, which number 1428 persons. The technical staff comprises 632 (N), who represent the “study population,” as shown in Table 4.

Table 4 Study Population in IDMW

	Branches of IDMW	No. units in Iraq	Support Staff	Technical staffs	Total staffs
1	(Headquarters)	1			
	Regional Department	4	83		
	Regional Sections	15	344		
	Resident Engineer	4	20		
	Warehouse	1	52		
	Training school	1	29		
	Σ			N=632	

When applying N & e values or 632 and 0.05, respectively, in Equation (1), the sample size will equal to 245.

## CORRELATION

Correlation is identified as the degree of relationship between two or more variables, and shows the relation or conflict of two variables with each other (Bernard, 2000). Moreover, three techniques address such relationships between two variables, namely, scatter grams, expectancy tables, and correlation coefficients.

- i) Pearson product moment correlation coefficient

This method is the most powerful and commonly used method of correlation coefficients. Cohen and Cohen (2003) asserted that Pearson moment correlation is commonly applied when a linear relationship is suspected between two variables. Common standards indicate that the higher the sum of the person’s score, the higher is the correlation (Cohen & Cohen, 2003).

## MULTIPLE REGRESSIONS

Regression is a measurement method that indicates the relationship between independent and dependent variables (Tabachnick, Fidell, & Osterlind, 2001). Tabachnick, Fidell, and Osterlind (2001) described this method as an extension of correlation analysis, where it is possible to predict a variable based on a number of other variables. Multiple linear regression is used to evaluate the effect of a change in a set of independent variables based on a set of dependent variables (Rosenthal, Rosnow, & Rubin, 2000). The obtained results from the measurement of multiple regressions contains a measure

called “R-squared,” which indicates how well a set of variables explains a dependent variable. Regression results measure the direction and size of the effect of each variable on the dependent variable. Multiple linear regressions for this study were measured in a step-wise manner, with significant independent variables and their relation to the dependent variables.

## RESULT AND ANALYSIS

### Hypothesis Testing

There are two types of regression analyses that have been performed to test the four hypotheses. Regression analysis was employed to assess the relationship between EQPs and QMPs. After that, the multiple regression was employed to investigate the role of intervening variable on the relationship between EQPs and QMPs. The hypotheses are taking, EQPs factors as dependent and QMPs factors as independent variables as follows:

#### H<sub>1</sub>: Overall QMPs has a Positive Effect on Overall EQPs (Topical hypotheses)

QMPs is an independent variable that has regressed on EQP. To assess the regression model, the  $R^2$  was discussed. QMPs can explain 37.0% ( $R^2 = 0.37$ ) of variance towards EQPs. The 63% (100% -  $R^2\%$ ) was explaining by other factor that does not include in this study. R squared is the proportion of variation in the dependent variable explained by the regression model. The values of R squared range from 0 to 1. The regression model is significant ( $F = 144.10$ ,  $p < 0.000$ ).

#### H<sub>2</sub>: The QMPs have a Positive Effect on EQP-QA

The QMPs factors are independent variables that have regressed on EQP-QA. To assess the regression model, the  $R^2$  was discussed. QMPs can explain 23.9 % ( $R^2 = 0.239$ ) of the variance towards EQP-QA. The 76.1 % (100% -  $R^2\%$ ) was explaining by other factor that isn't included in this study. R squared is the proportion of variation in the dependent variable explained by the regression model. The values of R squared range from 0 to 1. The regression model is significant ( $F = 9.344$ ,  $p = 0.000$ ).

Thus, Sub-hypothesis testing Summary of H<sub>2</sub> components shown in Table 5.

Table 5 Summary of Sub-Hypothesis Testing of H<sub>2</sub> Components

Hypo.	Statement of Hypotheses	Result
H4a:	QMP-CF has a positive effect on EQP-QA.	Supported
H4b:	QMP-L has a positive effect on EQP-QA.	Supported
H4c:	QMP-IP has a positive effect on EQP-QA.	Supported
H4d:	QMP-PA has a positive effect on EQP-QA.	Supported
H4e:	QMP-SAM has a positive effect on EQP-QA.	Not Supported
H4f:	QMP-CI has a positive effect on EQP-QA.	Not Supported
H4g:	QMP-FADM has a positive effect on EQP-QA.	Not Supported
H4h:	QMP-MBSR has a positive effect on EQP-QA.	Supported

#### H<sub>3</sub>: The QMPs have a Positive Effect on EQP-QC

The QMPs factors are independent variables that have regressed on EQP-QC. To assess the regression model, the  $R^2$  was discussed. QMPs can explain 22.2 % ( $R^2 = 0.222$ ) of the variance towards EQP-QC. The 77.8 % (100% -  $R^2\%$ ) was explaining by another factor that isn't included in this study. R

squared is the proportion of variation in the dependent variable explained by the regression model. The values of R squared range from 0 to 1. The regression model is significant ( $F= 8.842$ ,  $p=0.000$ ). Thus, Sub-hypothesis testing Summary of  $H_3$  components shown in Table 6.

Table 6 Summary of hypothesis testing of  $H_3$  components

Hypo.	Statement of Hypotheses	Result
H3a:	QMP-CF has a positive effect on EQP-QA.	Not Supported
H3b:	QMP-LE has a positive effect on EQP-QA.	Supported
H3c:	QMP-IP has a positive effect on EQP-QA.	Supported
H3d:	QMP-PA has a positive effect on EQP-QA.	Supported
H3e:	QMP-SAM has a positive effect on EQP-QA.	Not Supported
H3f:	QMP-CI has a positive effect on EQP-QA.	Supported
H3g:	QMP-FADM has a positive effect on EQP-QA.	Not Supported
H3h:	QMP-MBSR has a positive effect on EQP-QA.	Supported

#### H4: The QMPs have a Positive Effect on EQP-QI

The QMPs factors are independent variables that have regressed on EQP-QI. To assess the regression model, the  $R^2$  was discussed. QMPs can explain 33.2% ( $R^2 = 0.332$ ) of variance towards EQP-QI. The regression result is shown in Table 4.13. The 66.8 % (100% -  $R^2$ %) was explaining by other factors that isn't included in this study. R squared is the proportion of variation in the dependent variable explained by the regression model. The values of R squared range from 0 to 1. The regression model is significant ( $F= 14.800$ ,  $p=0.000$ ).

Thus, Summary of Sub-hypothesis testing of  $H_4$  components shown in Table 7.

Table 7 Summary of Sub-hypothesis testing of  $H_4$  components

Hypo.	Statement of Hypotheses	Result
H4a:	QMP-CF has a positive effect on EQP-QI.	Supported
H4b:	QMP-L has a positive effect on EQP-QI.	Supported
H4c:	QMP-IP has a positive effect on EQP-QI.	Supported
H4d:	QMP-PA has a positive effect on EQP-QI.	Supported
H4e:	QMP-SAM has a positive effect on EQP-QI.	Supported
H4f:	QMP-CI has a positive effect on EQP-QI.	Supported
H4g:	QMP-FADM has a positive effect on EQP-QI.	Supported
H4h:	QMP-MBSR has a positive effect on EQP-QI.	Not Supported

## CONCLUSION

This study has generally found three dimensions of QMP only to be significantly and positively related to evaluating all quality processes. Where, Leadership, Involvement of People, Process approach is significantly and positively related EQPs. This does not mean that the rest principles did not effect on the EQPs. Definitely, QMPs have an impact on the application of standards requirements and EQPs. This study proved that the impact of QMPs in different proportions in IDMW. But the three principles above must be included in any system reformed plan because of its impact on EQPs. Some

principles have an impact on only two quality processes such Customer Focus, Continual Improvement, and mutually beneficial supplier relationships. While the principles remaining System approach to management, and Factual approach to decision making, the study proved that they have an effect on the evaluating quality improvement only.

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## GREEN BUILDING TECHNOLOGY FOR PUBLIC RESTROOM CONCEPTUAL DESIGN VIA SKETCHUP

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### ABSTRACT

This work applies green building technology to design public restroom. The SketchUp® program is used as a study platform. Criteria of the green label standard, green building for sanitary ware and public toilet standards are taken into account in designing a green restroom. Construction materials and sanitary wares have been selected with certified environmental standards. Then a conceptual design of green restroom with calculations of water and electricity usages within 5 years is compared to a public toilet under conventional design. The green designed restroom can save up to 80 % of water consumption. By using the environmental standard certified electric appliances, it could reduce the monthly expenses down to 60 %. The green restroom investment project which certified with green building toilet standard, it requires a construction estimated twice the cost of the conventional public toilet. This green restroom design will be rewarding after five years usage. Even though, the estimated cost of restroom with green building technology design is more expensive compared to conventional design, but it is worth to consider in terms of environmental concerns.

**Keywords:** cost estimation; environmental standard; public toilet design; sanitary ware.

### INTRODUCTION

The economic progress and more industries lead to consumption of natural resources and environmental impacts later. Humans are concerned and vigilant about the environment which is another important factor. Many countries have begun to reset priority to build a foundation for sustainable development as well as physical works. The environmental conditions, the economy and society, we noted that the current modified implementation life-polluting less housing is another form of the model development and applications in accordance with nature. At present, people modify their lifestyles which affect the minimal environment. Housing is other form of the model development to harmony more with nature and becomes the green building. According to a group of Urban Catalyst Associations (Acuff, et al., 2005) who indicate that the cost premium for green buildings will be minimal in the days and years to come. The appropriate technologies used in the design, the construction and maintenance of buildings including the management and materials used must be considered to reduce or not cause negative effects on humans as well as the environment. It is a very good way of thinking to start now of the above discussion.

The public restroom is used as an example of green building's design via SketchUp. The design approach is focused on the water efficiency and the energy efficiency including the materials use. The materials use is friendly to nature, less energy consumption and less environmental pollution. Focusing on environmental concerns in the initial stages of thinking insures the public restroom for a livable area with disease-free and to reduce global warming from generating heat on the Earth. This is the basis of green buildings and to lead to sustainable development.

The aim of this study is to design a green public restroom building resulted in 3-dimensional models using Sketch Up. This program is a free virtual reality platform which is suitable for learning and applying. At least, an example design via SketchUp would be fitted with the green building technology in terms of the initiative launch. Scope of the model is to design an environmental friendly public restroom building by followings:-the guidelines for 3-dimensional model of SketchUp program; the standard of green buildings for sanitary ware and public toilet; the criteria of green label standards; and the green technologies applied to the design. Then, the configurations of 3D are displayed in an overview of the green public restroom building.

## METHODOLOGY

### Green Materials Selected

Starting with data available in the country, such as sanitary wares related to green label; requirement to the standards of green buildings; and cost comparing to equivalent products not less than 2 sources. A public restroom building will be reconfigured with SketchUp program in 3-dimensional model. The supporting program is AutoCAD helping for 2D figure sketching (Fig. 1).



**Figure 1** Material sources of SketchUp and AutoCAD Programs  
from <http://www.sketchup.com/> [June 17, 2015].

Sanitary wares and materials used for the public restroom building's design selected from 2 brand products distributed in Thailand are collected as shown in Table 1.

### Data Information

Sanitary wares and materials used for the public restroom building's design selected from 2 brand products distributed in Thailand are collected as shown in Table 1. It is detailed in terms of water consumption, electricity use and lifetime warrantee.

**Table 1** Details of the main materials use.

Item	Products	Unit Price, USD (Baht)	Water Consumption, L	Electricity Use, W	Lifetime Warrantee , year	Production Year
1. Floor Tile	ECO COTTO, ECO ROCKRETE	75 (2,250)	-	-	-	2010
	Choco Bar Series	75 (2,250)	-	-	-	
2. Sink & Faucet	HAF-008	200 (6,000)	8.33 %**	(AAA Battery)	5	2012
	Cotto Eco Faucet	58 (1,740)	10 %**	-	5	
3. Auto- Hand Dryer	FB-08111	267 (8,000)	-	650	5	2012
	<a href="#">STIEBEL ELTRON,</a> HTE 4	317 (9,500)	-	1800	5	
4. Toilet Flush Tank	Marvel Eco.1	500 (15,000)	1	-	5	2013
	KOHLER, Escale K-15703X-S	999 (29,960)	3 - 4.5	-	5	
5. Urinal Flush Tank for Man	Marvel	217 (6,500)	w/o water	-	5	2012
	Latvia, Kaspars Jursons	167 (5,000)	0.5 – 1.0	-	5	
6. Light Concrete Block	ECOBLOK Unit price/sq. m	12 - 13 (360 – 400)	-	-	5	2012
	QCON Unit price/sq. m	4.5 – 5.0 (135 – 150)	-	-	5	
7. Wall Attached Ventilator	Mitsubishi Model Ex	43 (1,300)	-	31	5	2012
	Panasonic, FV- 15EGK1T	36 (1,090)	-	35	5	
8. Roof	Eco-Roof	10 (300)	-	-	5	2013
	Red-brown Roof	5.5 - 85 (165 - 2,550)	-	-	5	
Solar Cells	Mono Crystal Line	500 (15,000)	-	-	5	

**Note:** \*\* 100 % of the water is to wash your hands in running water for 1 minute, 9 liters of water use.

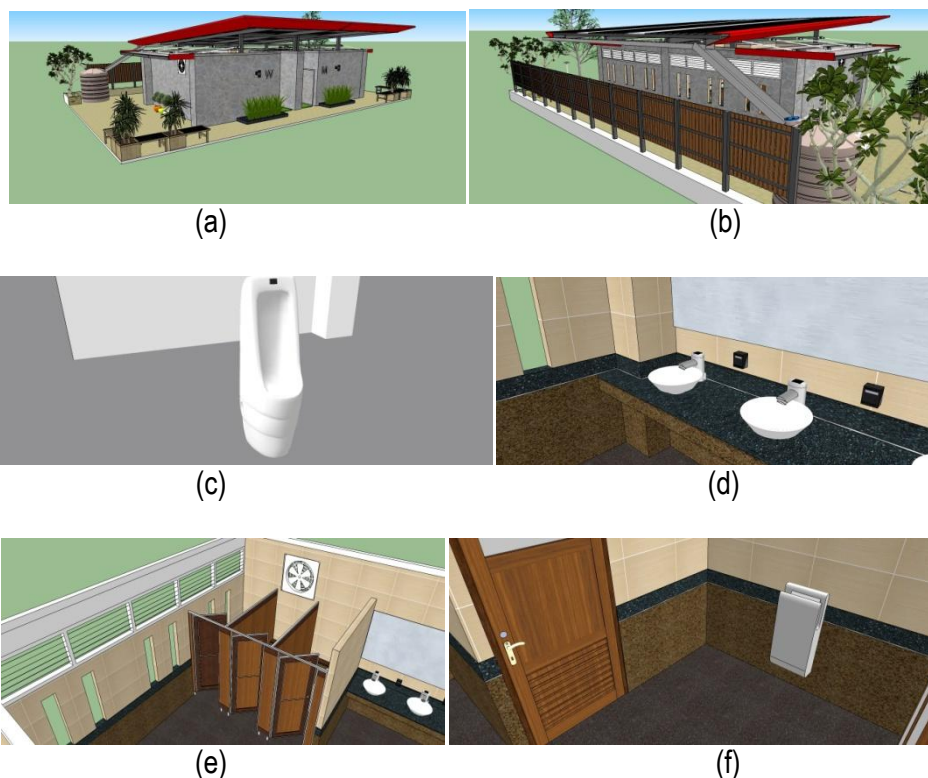


## RESULTS AND DISCUSSION

### Layout and Design

The layout and design of the green restroom building is taken into account such that the environment will conserve and create an inviting atmosphere while having energy reservation. There are as followed: the consideration of areas of the community to be constructed; the restoration and improvement of soil to be constructed and to conserve the areas that have not been destroyed; the reduction of the environmental impacts; and the consideration of the direction of the solar and wind circulation to reduce energy consumption to a minimum.

In order to build a well-to-air restroom in Bangkok, Thailand, a rectangular plan is taken into account to get as much as possible the ventilation (see Figure 2). Facing building plan in the north and south axis, the south wind comes in during the month of February until around September or October. Then, the wind is coming from the north during the months of October to January. SketchUp is a free program to use and practice as much as various figures outcome.



**Figure 2** Examples of the green public restroom building in 3D model by SketchUp: (a) the front view, (b) the back view, (c) the urinal flush tank for man, (d) the sinks and faucets, (e) the ventilator, and (f) the automatic hand dryer.

## Materials Use

The main materials used in the conceptual design shown in Table 2 are determined through green buildings standards of the public toilet, green label, and sanitary ware standards of the US Green Buildings and based on the functional response and worth to money paid.

**Table 2** Products selected to meet the green standards.

Product Selected	Toilet Standard	Green Buildings Standard	Green Label	Green Buildings of Sanitary Wares	No. of Green Standards met
1. ECO COTTO, ECO ROCKRETE	/	0	/	0	2
2. HAF-008	/	0	/	0	2
3. FB-08111	/	0	0	/	2
4. Marvel Eco.1	/	/	/	/	4
5. Marvel	/	/	/	/	4
6. ECOBLOK	/	0	/	/	3
7. Mitsubishi Model Ex	/	/	/	/	4
8. Eco-Roof	/	0	/	0	2
Solar cells	0	0	/	0	1

**Note:** / means to meet a green standard whereas 0 does not.

The design and modeling by SketchUp of the green public restroom building is consisted of 3 toilets for man and 6 toilets for woman with a floor area of 70 sq. m. The main items of the products selected with cost estimated in table 3 are compared to those of a conventional public toilet often constructed in Thailand. The total construction cost of the green public restroom building is 28,162 USD (844,868 Baht) based on labor and material cost estimated in 2015.

**Table 3** The main items of materials use for cost estimation.

Item	Product selected	Green Materials & Labor Cost, USD (Baht)	* Conv. Materials & Labor Cost, USD (Baht)	Difference, time x
1. Floor Tile,	ECO COTTO, ECO ROCKRETE (12 x 12) in. x 600 pc.	4,900 (147,000)	-	-
	Floor Tile 56 sq. m	-	341 (10,230)	14.4
2. Sink & Faucet, 8 sets	HAF-008	2,323 (69,680)	-	-
	Conventional Standard	-	960 (28,784)	2.4
3. Auto-Hand Dryer,	FB-08111	533 (16,000)	-	-

2 units	-	-	-	-
4. Toilet Flush Tank, 9 units	Marvel Eco.1	4,645 (139,350)	-	-
	Conventional Standard	-	1,290 (38,682)	3.6
5. Urinal Flush Tank, 4 units	Marvel	908 (27,240)	-	-
	Conventional Standard	-	506 (15,192)	1.8
6. Light Concrete Blocks, 381 sq. m	ECOBLOK (0.39 x 0.19 x 0.065) m	5,842 (175,260)	-	-
	Brick	-	801 (24,037)	7.3
7. Wall Attached Ventilator, 2 units	Mitsubishi Model Ex	120 (3,600)	-	-
	-	-	-	-
8. Roof,	Eco-Roof (1.00 x 2.40) m x 110 pc.	1,650 (49,500)	-	-
	Green Color Roof	-	337 (10,112)	4.9
Subtotal of item 1 to 8		20,921 (627,630)	4,235 (127,037)	4.9
Other items		7,241 (217,238)	14,135 (424,063)	(- 0.5)
Total Construction Cost		28,162 (844,868)	18,370 (551,100)	1.5

**Note:** \* The construction breakdown cost of a public toilet with the area of 75 m<sup>2</sup> was from the Department of Lands based on the year 2011.

### Water Efficiency

This green public restroom building costs more than traditional public toilet one, but improved water efficiency covers the increased cost over the life of the restrooms. By allowing the user to select a full (3 liter) flush or a half (1 liter) flush, this restroom reduces overall water consumption up to 80 %. The green flush tank is a Marvel Eco 1 and uses less than 3 liters of water (a typical flush tank uses 8 – 12 liters). Marvel also manufactured the urinal flush tanks, without water, this is non-comparable to a traditional unit.

### Energy Efficiency

The windows in the restrooms are louver wood windows with aluminum exterior cladding. Meeting the appropriate heat and wind blows in northeast-southwest axis, the windows contain insulated low-E glass.

The green restroom building is designed to install two air ventilators with air circulation type premium safety standard. The ventilator optimizes lower outdoor air temperatures, reducing the load on the AC unit. The energy saving light bulbs illuminate for the entire building. For additional outdoor (hot) ambient air protection, the Eco-Roof produced from recycled UHT milk box has durable strength and light weight for construction. A measurement of heat gained through the green roof reduced by an average of 70 - 90 % in summer and 10 – 30 % in winter (cited by Castleton et al, 2010). In addition, green roof is a passive cooling technique that stops incoming solar radiation from reaching the building structure below. An outcome of research from Ng and Akasah (2011) shows that energy-efficient design and renewable-energy technology applied in the office building are passive design, active systems, and building integrated photovoltaic systems. The solar cell panels, therefore, designed to install in the toilet building is also energy recovery rated. Then, the total electricity cost calculated saves as much as 60 % of electricity consumption.

The estimated annual utility (electricity and water) cost of 4,412 USD (132,365 Baht) for the green, compared to 8,124 USD (243,712 Baht) for a traditional public toilets, resulting in saving of 46 % on annual utility bills. Policy mechanisms to reduce cost and directly promote technical efficiency improvement may be more effective in the short term than price mechanisms, concluded by Anderson and Newell (2004). For long term, a study of Mithas et al. (2010) found that top management commitment is a key antecedent to green technology implementation, and higher green technology investments result in better outcomes such as savings in energy costs. It is accordant to the payback period of this study taken within 5 years.

## CONCLUSION

The attempt of this work is to apply green building technology to design a public restroom. The SketchUp program is used as a study platform. Criteria of the green label standard, green building for sanitary ware and public toilet standards are taken into account in designing a green restroom building. The construction materials and sanitary wares have been selected with certified environmental standards. Then a conceptual design of green restroom resulted in an area of 70 m<sup>2</sup> with calculations of water and electricity usage within 5 years is compared to a public toilet which area close to 70 m<sup>2</sup> (75 m<sup>2</sup>) under conventional design. The green designed restroom can save up to 80 % of water consumption. By using the environmental standard certified electric appliances, it could reduce the monthly expenses down up to 60 %. The green restroom investment project which certified with green building toilet standard, it requires a construction estimated cost of USD 28,162 (844,870 Baht), comparing on the conventional public toilet which built under the construction cost of USD 18,370 (551,100 Baht). This green restroom design will be rewarding after minimum of 5 years usage. Even though, the estimated cost of restroom with green building technology design is more expensive compared to conventional design, but it is worth to consider in terms of environmental concerns.

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## PROFESSIONAL ENGAGEMENT ISSUES IN GREEN CONSTRUCTION PROJECTS

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### ABSTRACT

Construction projects involved multi-disciplinary professionals who are brought together under certain formal engagement. The fees and any cost involved in this engagement is categorized as soft cost for the project as they are related to the cost of managing a project and some of the cost incurred are considered 'hidden' from the customary development cost. Green construction projects are expected to have additional construction professionals involved as there is a need to focus on green aspect of the projects such as green building facilitator and green building certifier. The challenges of the professional engagement begin at the very early stage of inception of a project. Many developers fail to see that the professional's engagement is crucial to ensure their organization objectives towards greener attitude can be achieved. Choosing the right professionals is one of the pillars of project success. Professional engagement is not only about fees, it is also about selecting the right people, understanding the roles and responsibilities and maintaining good relationship to avoid any misunderstandings and problems throughout the project and its progress. This paper explores the challenging issues relating to the engagement of these professionals and the soft cost incurred during this engagement process. The conceptual framework will be discussed to highlight the issues relating to pre-engagement procedure, the fee and selection of the professionals. The findings are expected to broaden our understanding on the challenges in professional engagement for further improvement in the future.

**Keywords:** Malaysian construction industry, Construction Professionals, Professional Engagement, Green Projects, Challenges, Consultant Fee

### I INTRODUCTION

Construction industry is characterized by a complex socio-cultural where it involves integration of multidisciplinary finesse to achieve specific goals and objectives. Construction industry has always been within the circle of people, time and cost. This multidisciplinary governance is known as the professionals or the consultants that came from various principles and areas governing the aspects that are required in planning, designing, managing, building and maintaining the built environment. Construction industry is a unique industry where the ups and downs of this industry are extensively liable to the people involved in it. Mathur, Price, Austin, & Moobela (2007) stated that those who affect the project are those that involved in the delivery of the project as well and those who determined the project context. In his point, the professional and consultants are among those that will contribute to the construction industry. It is rather crucial that the role of the professional and consultants being highlighted and fully understood by all parties in a projects. Some argued that clients some time normally fail to recognize the role and responsibility of each professionals and consultants (Ip, 2008).

The impact of the services provided by the consultant is significant to a project. The consultants play a multifaceted part in the construction project where their involvement would affect the performance and quality of the end product itself. So, who are these professional key players in construction industry? The regular basic professionals and consultants that provide services are namely the Architects and Quantity Surveyors. Their job scope in conventional construction would range widely from the preparation of schematic design until the post-completion inspection. Any organization should realize that hiring consultant requires a lot of preparation and careful thought as it is the vital process to ensure project success (Hattan & Nazir, 1997). Green construction has been seen as one of the key principles in ensuring tomorrow's sustainability. With its own uniqueness and complexity, professionals and consultants in green construction are believed and expected to have extensive and broader knowledge compared to other professionals in conventional construction. Therefore it is crucial for the developers who are keen towards building green to have the right and efficient team of professionals and consultants to propel their objective. Poor engagement of professionals and consultants might result in additional or boost of cost in the total construction cost. This paper hence explores on the engagement of the professionals and consultants in green construction projects, where the theoretical framework discusses on the general issues lingering these matter. It is expected that future research will focus on establishing the issues that have been highlighted.

## II GREEN CONSTRUCTION MOVEMENTS IN MALAYSIA

The increasing rate of greenhouse effects in Malaysia which accounts for almost 13% and 32% per GDP and per capita respectively between the year 1994 and 2000 have been an eye opener for the country to look upon the sustainable issue. It is also stressed out that Malaysia's emission of CO<sub>2</sub> per capita was higher than the average for Asia Pacific Region despite our small population. This triggered the need for increasing awareness towards sustainability, hence the government has introduced 'Sustainable Concept' for the construction industry (Idris & Ismail, 2011). The initiation of sustainable development on Malaysia have begin since late 1970's with the existence of national's policy known as National Energy Policy and National Depletion Policy (Suhaida, Tan, & Leong, 2013). It was until 1991 that the former Prime Minister of Malaysia Tun Dr. Mahathir emphasis on the importance for the country to be ecologically sustainable in the Malaysia's Vision 2020 (Zainul Abidin, 2010; Papargyropoulou, Padfield, Harrison, & Preece, 2012).

The Eight Malaysian Plan (2001-2005) stressed on the issue of sustainable development towards the whole industry. According to this plan, high priority is given by the Government of Malaysia to research and development as one of the strategy in promoting and enhancing sustainable development (Zainul Abidin, 2010). These have pushed the construction industry to adapt to the enactment and during 2004 till late 2008, few acts and guidelines were introduced to achieve GoM's vision such as Design Strategies for Energy Efficiency in New Buildings (Non-Domestic) (2004), Guidelines for Conducting Energy Audits in Commercial Buildings (2004), Code of Practice on EE and Use of RE for non-residential Buildings (2007), amendments of Uniform Building By-Laws (UBBL) (2007), and The Efficient Management of Electrical Energy Regulation (2008) (Suhaida et al., 2013). Sustainable issues continues to be one of national issues for the GoM since it has been identified as one of the five key thrust in the Ninth Malaysia Plan on 2006 (Zainul Abidin, 2010). In this plan, the Green Technology are introduced to promote sustainability among construction practitioners and raise the awareness concerning on environmental issues (Idris & Ismail, 2011). This policy is being created not to just enhance the awareness but as well as to further encourage the involvement of stakeholders by introducing a financial scheme; Green Technology Financing Scheme to all key players that are keen towards sustainability.

The existence of Green Building Index (GBI) in 2009 is one of the ways to boost greener Malaysia. GBI is a rating system which uses 6 criteria in measuring the energy efficiency such as the indoor air quality, sustainable site and management, materials and resources, water efficiency and innovation are being proposed by the Malaysian Institutes of Architects (PAM) to promote the importance of sustainable construction (Suhaida et al., 2013). This green certification is an adoption from few leading countries in sustainability; BREEAM in UK, LEED in USA, Green Star in Australia, and Green Mark in Singapore. In April 2009, the Ministry of Energy, Green Technology and Water (MEGTW) was established and has outlined Green Building as one of the priority areas for low carbon growth. This ministry also provides a comprehensive approach in all aspects including policies and regulation, rating tool, pilot project on Green Township, labeling and certification and not forgotten on promotion, industry and public awareness (KeTTTHA, 2009) in order to fulfill Malaysia's National Green Technology Policy on 2009. Year 2010 witnessed the Malaysia Economic Transformation Programme to include the EPMS or Energy Performance Management System to be used on government entities. Moving towards 2011, increasing prospect of green in Malaysia are propelled by various bodies and parties such as Public Work Department of Malaysia. A 5 year project in collaboration with the United Nations Development Program and Global Environment Facility has been conducted. Ministry of Housing and Local Government in the other hand have promoted a Green Neighborhood Guidelines which covers the social sustainability of the citizen on the elements such as green infrastructure and green communities' network (Suhaida et al., 2013). PWD further enhance their sustainability vision by proposing the PWD Green Rating Scheme that is specifically for the government buildings. This rating tool has 5 criteria which is energy efficiency, indoor environmental quality, sustainable site planning & management, materials & resources and water efficiency.

Construction Industry Development Board Malaysia (CIDB, n.d.) has identified the environment and other sustainability-related issues as one of its main concern in construction industry. They have formed many groups of researchers and construction practitioners to develop a good construction planning and management for the industry to be sustainable (Zainul Abidin, 2010). CIDB is expected to propose another certification system that liaises with the stakeholders which covers construction phase and operational phase of the building. The elements that will be in view for the construction phase is on the assessment of construction site, building materials, energy, water and waste. Whereas the operational phase will cover building indoor environmental quality, energy and water. This certification system is known as the Green PASS which represents Green Performance Assessment System in Construction.

### **III SOFT COST AND THE ROLE OF PROFESSIONALS AND CONSULTANTS IN GREEN CONSTRUCTION**

There are three types of costs in any construction projects; the land, hard and soft costs (Emerging Professional's Companion, 2013; Kubba, 2012; Zhang, Platten, & Shen, 2011; Yudelson, 2009). According to Emerging Professional's Companion, the site costs are those that cover the owner's initial land acquisition and development costs of the project. Hard cost in the other hand refers to the costs that are mostly affected by the decisions of the architect or in design decision. Cost incurred by the owner to move the project forward such as management fees, legal fees, taxes and others are known as soft cost. Soft cost in the other hand refers to the nonphysical expenses (Azizi, Abidin, & Raofuddin, 2015) and covers all architectural, planning, engineering, permitting, financing, and marketing costs (Collier, Collier, & D.A., 2007). Azizi & Abidin (2012) have identified 18 Soft Cost Elements and is breakdown into 3 main pillars that are professionals, legal and procedures.

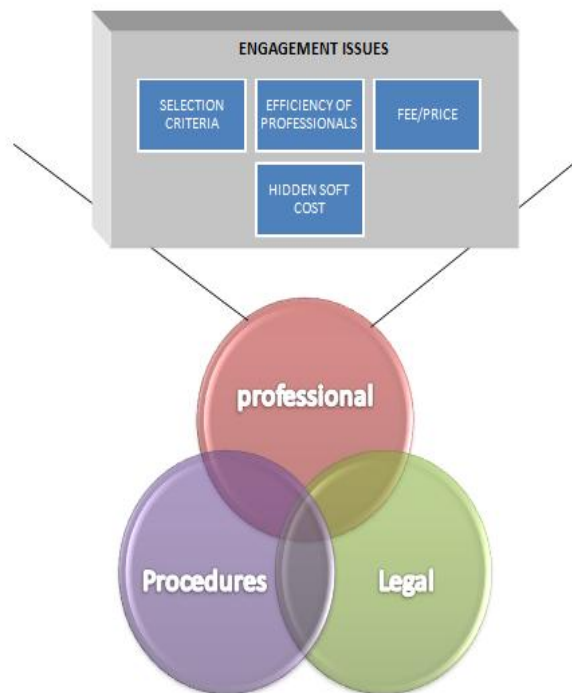
Professionals in this SCE are referred to necessary experts to engage for the projects. The first element of soft cost identified the professionals as among the costs that should be looked upon due to its importance in carrying out the process of the projects. 8 professionals are been known to be important on their role and services towards green construction which are the group of regular professionals i.e. Architect, M&E Engineer, C&S Engineer, and Quantity Surveyors, Landscape Architect, Town Planners, Soil Analysts, Surveyor, Environmental Specialist, Green Building Consultant, and Green Building Certifier.

The competence, commitment and attitudes of the professionals will strongly influence the quality and costs of built facilities. It is therefore crucial for the developers to take into account on the soft cost as it is the one that can ensure the projects keeps moving and can aid the management of the projects (Emerging Professional's Companion, 2013). With the high anticipation of Malaysia towards the green construction movements, the needs of having many professionals and consultants in green construction would be a challenge. As conventional construction would be, the professional in the construction industry has to have a set of skills that allows them to achieve the objectives of the project; green construction in the other hand requires an additional skill respective to being green. Adequate knowledge, broad experiences, high skills and vast references would be important so that they can address the environmental requirements of the projects. The need to hire professionals and consultants is to prepare studies, reports, and design for various projects (Hattan & Nazir, 1997). According to FIDIC (2011) the roles and services of the professionals is to primarily plan, design, deliver and maintain the world's infrastructure and built-environment. This is why the professionals are considered as critical players to cope with the ever-rising issues in demand for vitality to live. It is a paramount importance, since 3-4 percent of Life Cycle Cost is from the typical cost of professional and consultancy fees. General principles of the task of a professional that are engaged is to deliver value for money outcomes and to meet required services and quality, time and cost performance requirements (Australian Procurement and Construction Council, n.d.). An Architect for an instance, beside the basic services, they are expected to another few sustainable services such as; determining owner's sustainable objective, developing sustainability plan, defining sustainability measures and managing sustainable certification processes (Helena, 2012). Seah (2009) have stressed out that the Quantity Surveyor as one of the professionals in construction industry are in need to evolve and adapt to green construction by providing green costing, carbon footprint, life cycle assessment, Building Information Model (BIM) and others. An additional professional service required in undergoing green construction is GBI Facilitators in which they serve to establish the project GBI goals and to set tasks for the Project Consultant Team members to revert on what to achieve and related cost (GBI, 2009). In building green, there are supplemental resources of professional and consultant needed to propel the green objectives. The need of having green specialist such as Environmental Specialist, Green Building Consultant and Green Building Certifier (Azizi et al., 2015) is the key principal. These professionals are hired based on their qualifications and extensive knowledge on the green and sustainable construction. Therefore, it has been a concern in which the developers seems to take for granted on these green professional and consultants roles in aiding them to achieve their green objectives. Basically, their services is limited and fundamentally on green construction.

#### **IV ISSUES OF PROFESSIONAL ENGAGEMENT IN GREEN CONSTRUCTION: CONCEPTUAL FRAMEWORK**

This paper discusses on the issues pertaining to professional engagement in green construction. Many developers fail to see that the professional engagement issues are preeminent in order to achieve higher success rate in green construction. Issues regarding the efficiency of the

professional, hidden soft cost, selection criteria and the fee aspects would be further discussed as a conceptual framework of this paper. These issues have been highlighted due to their contribution to the cost efficiency of a project. Some research provides statements that cost of building green can be efficiently managed if these issues are properly encountered. Figure below explains on the conceptual framework of this research paper.



**Figure 1: Conceptual framework on professional engagement in green construction**

1. Efficiency of professional

One of the critical success factors for any building and construction projects are the quality of the consultants required (Australian Procurement and Construction Council, n.d.). Professionals in green construction in the other hand would possess additional responsibility; environmental risks and opportunities as their priority. It is the main objective of a company or organizations to have the best team to deliver the project within the budget and time constrains. The challenges of the professionals engagement is in collaboration aspects such as the communication skills, commitment, attitudes and general interpersonal trust. In normal basis, the engagement of professionals by the developers or clients is by recommendation by colleague or another party (Sporrong, 2011). The most importance attributes that have been a challenge for all clients to seek is the professional competence; elements such as education/knowledge, training, practical experience, and the expertise are being looked upon (FIDIC, 2011). Choosing the right professionals is one of the pillars of project success. Professional qualifications would be the challenge since not many professional companies or consultants have this qualification or experience in green certification. The efficiency of the professionals however is a subjective measure as it depends on the organizational objectives of the clients. Nevertheless, the efficiency of the professionals will hence determine the cost efficiency of the project. Professionals in green construction should have an additional set of skills that allows them to command the life cycle of construction activities. And with that so, it is believed that this professional team will need to be efficient. The green construction process is rather environmental-friendly and is unique on its own.



## 2. Hidden soft cost

What is soft cost? Generally, capital costs in construction comprised of three major categories; site costs, hard costs, and soft costs. According to Emerging Professional's Companion, the site costs are those that cover the owner's initial land acquisition and development costs of the project. Hard cost in the other hand refers to the costs that are mostly affected by the decisions of the architect or in design decision. Cost incurred by the owner to move the project forward such as management fees, legal fees, taxes and others are known as soft cost. Colliver (2007) states that the financial risk associated with implementation of green building is at the soft cost; by which on cost involving with designing, permitting, certifying the project, and not forgotten the delay cost. (Cupido, Baetz, Pujari, & Chidiac, 2010) in the other hand states that this rather high soft cost is among the barrier in green construction. Green buildings have been associated with higher first cost compared to the conventional design (Azizi & Abidin, 2012). It is also said that the higher cost of green building does not worth the expenditure (H. Kats, 2003). However, the definition of soft cost is still in the mud and this resulted in poor understanding of the 'soft' cost elements. With poor understanding comes poor management and administration of this soft cost. The competence, commitment and attitudes of the professionals will strongly influence the quality and costs of built facilities. A guide paper entitled 'Buying Green! A Guide for Purchasing Environmentally Preferable Products' stated that buildings have a substantial functional lifecycle therefore proper procurement, design and construction decisions are vital to achieve few objectives; optimum total cost of ownership, lowering the future costs of reworks or change orders and optimum environmental performance. Moreover, Hattan & Nazir (1997) stated that the selection process of these professionals will require time and cost expenditure. In respect to the professional engagement, as one of the elements in soft cost, the issues that lies is that there is a research gap in identifying the soft cost that lingers in the engagement processes and procedures. Soft cost issues such as the documentation, fees, and administrative component involve in the professional engagement in green construction will be further enhanced.

## 3. Selection criteria

It is the outmost important for any developers or those who are keen towards green construction to select the right professionals and consultants (Sporrong, 2011). Any organization should realize that hiring consultant requires a lot of preparation and careful thought as it is the vital process to ensure project success (Hattan & Nazir, 1997). FIDIC (2011) later stated that it is important for the client to make the right call in choosing the professional and consultant since each project is unique and has its own challenges. In the selection of the professional services it is always difficult to specify and assess any suitable non-price criteria (Sporrong, 2011). Choosing the right professionals is one of the pillars of project success. The success of any project depends on the ability to obtain the most appropriate expertise available in terms of skill, knowledge, past experience, managerial abilities and reputation (FIDIC, 2011). Additional services demanded in this green industry would require these professionals to have an added forte beside their traditional skills. It is rather biased to say other conventional projects would be less account for competent professionals, but the uniqueness of the green projects; its technological advancement, distinctive designs, and importantly the environmental maneuver sets aside the critical skills needed by the professional in spurring the activities in green construction industry.

## 4. Fee of the consultant

Price or fees is one of the elements that are often highly looked up upon even though there is a discrete arguments in which the price or fee imposed from the professional does not reflects high quality in work performance (Hattan & Nazir, 1997). Wong, Holt, & Harris (2001) also stated that low bid selection does not guarantee the overall lowest project cost upon project completion. However, the

price or the fees should be an important matter since it can be one of the determining factors. This research reflects to the challenges or difficulties in obtaining the best value for money of the professional services in green construction. Per say, Azizi et al. (2015) have provide a guidelines on the fees of these professional services. The total payment for the consultants; which is the regular professional team i.e. Architect, Civil and Structural Engineer, M&E Engineer, and Quantity Surveyors is usually 6 to 8 percent of the overall project cost. Supplementary services which are required in green construction such as Green Building Specialist; are subject to the scale of fees authorized by GBI, ranging from 0.15% to 0.40% of total project cost. Green Building Certifier in the other hand is said to be significantly expensive as it is relative to the project size and green certification level aimed for the project. This fee or prices charged by the professional will influence the decision maker in propelling for green imperatives. The higher fee imposed from the green professional is also a subjective measures as their competence and education on green construction that a normal professional would not possess is one of the factors on it. However, this 'higher' fee resulted in the poor implementation of green construction since not many developers realize that it is the price to pay for the green professional competency level.

## V FUTURE WORK

This conceptual framework only focuses on the issues that are merely on the sight of any developers. Four general issues have been highlighted by researchers' world widely. Stakeholders in construction industry should realize that to have a sustainable construction and to create livable cities, they should first and foremost take into consideration the managerial issues underlying in the pre-construction process. Engagement of professionals therefore should be extensively prominent towards having a better management of cost in a green construction. The issues address in this paper is only a mere challenge for the developers to face. A real life challenges would be much more intricate and complex. Further researchers are suggested to investigate the importance of the right engagement of professional and its impact towards soft cost of the project.

## VI CONCLUSION

One of the elements in soft cost which is the professional engagement can determine the success of a project. It is believed that by having the right team to achieve the green objectives, the cost and other aspects in the green construction can be managed appropriately and hence will attract more attention by the developers towards implementing green construction. Green construction is no longer a hurdle to face but it is one of the aspects that can ensure the viability and sustainability of tomorrow's future.

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## FIELD INVESTIGATION OF THERMAL COMFORT IN LARGE AND SMALL MOSQUE BUILDINGS IN SAUDI ARABIA

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### ABSTRACT

Achieving and maintaining indoor thermal comfort is a crucial factor for energy saving and human health, especially in heavily occupied public buildings, such as mosques. This study is the outcome of PhD research, which aimed to investigate to what level thermal comfort is achieved in mosque buildings in two climatically and geographically distinct locations in Saudi Arabia. One of the investigated locations is Riyadh city, which has a hot arid climate and Abha city, which has a moderate/cold mountainous climate. The research involved different assessment methods, including field survey using questionnaires and monitoring instruments. The outcome showed some discomfort due to heat loss in winter and heat gain in summer.

**Keywords:** Thermal Comfort; Thermal Sensation; Mosque Buildings.

### INTRODUCTION

Saudi Arabia has the second-largest crude oil reserves in the world, with 22.2% came after Venezuela with 24.8% (OPEC, 2010). Therefore, Saudi Arabian's government has subsidised oil and electricity prices inside Saudi Arabia, which has resulted in low prices for petrol and electricity in Saudi markets. This fact, coupled with the shortage of enforceable law and regulations, the lack of awareness of environmental issues among the public, and before that, the harsh and extreme climate that Saudi Arabia has, have caused high electricity consumption in Saudi Arabia. Air-conditioning systems consume around 65% of electric energy in order to maintain the acceptable level of thermal comfort for the occupants in all types of buildings in Saudi Arabia compared to some of developed countries, such as the United Kingdom with a percentage of around 22%, and 21% in the United States and Australia (Alajlan et al., 1998).

As the current study investigates mosque buildings, particularly those in Saudi Arabia and one could argue that Mosques as types of buildings form the minority compared to the other types of buildings, such as residential. Budaiwi et al. (2002) stated that mosques as a sector have a minority of electric energy consumption at 1%, compared to the majority residential sector at 49%, and the industrial sector at 24% respectively. However, that fact gives no excuse from investigating that minority, for several reasons. One of the most significant reasons is that since the end of the 20th century, sustainability scientists, experts, and the Agenda 21 (Rio De Janeiro Summit, 1991) have

called for all sectors worldwide, without any exclusion, to take seriously all the issues of sustainability and environmental protection including energy efficiency and the reduction of carbon dioxide through achieving thermal comfort. Another reason is that the results from the literature review showed that other sectors, especially the residential sector in Saudi Arabia, have been extensively over-investigated and studied, unlike mosque buildings. Thus, and in order to contribute to discovering and suggesting suitable environmental solutions for different sector problems, mosque buildings as a sector of buildings has been targeted and adopted in this study.

## LITERATURE REVIEW

It seems that studying mosque buildings in terms of thermal comfort and energy conservation is a new topic compared to other types of buildings. As interest in this topic, started around two decades ago back to the very end of the 20th century. A study started during 1998 and published in 2003 investigated different sizes of 20 mosque buildings in hot, arid areas in Saudi Arabia, 19 of which were considered as air-conditioned mosques, and one of which was using a passive and evaporative cooling system by using wind catchers. The aim of the study was to investigate the influence of outdoor weather and temperature ( $T_{out}$ ) on the energy consumption in the selected mosque buildings in shadow of using different types of air-conditioning systems, including window units, chilled water units, central units, and wind catchers. The researcher utilized a number of assessment methods including questionnaires, interviews, observations, and secondary data collection to gather electricity bills for those mosque buildings as well as the  $T_{out}$  for the year 1998. The result of the study was that all of the air-conditioned mosque buildings were consuming significant energy when the  $T_{out}$  increased, regardless of size, unlike the one, which used a passive cooling system of wind towers (Alhemiddi, 2003).

In another study, which aimed to investigate energy use and thermal comfort conditions in three mosque buildings in the hot, humid city of Dammam in Saudi Arabia, the researchers monitored the energy use of the selected three mosque buildings by using special instruments and gauges to record the energy used by air-conditioning systems, fans, and lights for the year 2002. Another 15 instruments were used to monitor indoor temperature ( $T_{in}$ ) and relative humidity (RH) in all of the selected mosque buildings for the same whole year. The results revealed that mosque buildings that showed high-energy use were not necessarily achieving better and acceptable thermal comfort levels, particularly uninsulated ones, unlike insulated ones, which showed lower energy use and better thermal comfort (Al-Homoud et al., 2009).

In addition, six of Friday (Juma'ah) prayer air-conditioned mosque buildings from different provinces in Kuwait, which were classified by the researcher as hot, arid areas, were investigated during 2007 in terms of indoor climate and thermal comfort of the selected mosque buildings in another study. The researcher used specific instrument stations to measure  $T_{in}$ , RH, air velocity ( $V_a$ ), and operative temperature ( $T_{op}$ ), as well as questionnaires to examine the influence of the main factors affecting the acceptable level of thermal comfort for worshippers inside mosque buildings. The result of the study revealed that actual mean vote (AMV) was 26.1°C, while predicted mean vote (PMV) was 23.32°C, which gave an underestimation of around 2.8°C. It is also found that the  $T_{op}$  of 26.1°C showed significant and considerable energy savings when applied on mosque buildings in Kuwait (Al-Ajmi, 2010).

Another simulation study was conducted to investigate thermal performance of a typical mosque building and energy conservation in Kuwait by using visual DOE 4.1. About 72% of potential



energy savings was obtained when applying improved fabrics and when applying operational strategy (Al Anzi & Al-Shammeri, 2010).

Moreover, a different study examined the effects of the operational zoning strategy on energy consumed by the HVAC systems in many mosque buildings in the hot, humid Eastern province of Saudi Arabia. Visual DOE as simulation software, instruments to monitor energy use, and instruments to record  $T_{in}$  were used as evaluation methods for the selected mosque buildings. The result revealed that significant annual reductions in energy could be obtained when operating A/C properly, with around 36% of potential annual energy reduction for uninsulated mosque buildings and about 23% for insulated ones. Another finding was that there was a significant annual energy reduction shown when oversizing and operating A/C an hour before each prayer time and before the arrival of worshippers to perform prayers with an average percentage of around 30% (Budaiwi, 2013).

However, the efforts that have been shown by the previous studies were considered as inadequate and limited, especially for the studies investigating thermal comfort and energy conservation in mosque buildings, and when compared with the other building types. In light of the above, it is found that mosque buildings in hot, humid climates were intensively investigated compared with the other types of weathers. In addition, there are several variables and factors that can influence the acceptable level of humans' thermal comfort and thus energy use, to which previous researchers have not paid enough attention. Therefore, this study aims to focus on different methods of assessments, different types of thermal comfort scales, thermal performance of mosque buildings' envelope, occupants' locations inside the mosques, inside and outside surfaces' temperatures, and the effect of solar radiation. As well as, considering different types of climates in one study to allow more comparisons, and thus make a considerable addition to this field and topic.

## RESEARCH FRAMEWORK AND METHODOLOGY

Two major field studies by using monitoring instruments (physical measurements) and questionnaire methods (subjective measurements) were carried out. The first field study targeted the peak period of winter 2012/2013, while the second one targeted the peak of summer 2013. These major field studies were carried out for the selected six mosque buildings in two cities (Riyadh and Abha) in Saudi Arabia that have different types of climate (Table 1). The subjective study involved data collection with the use of questionnaires, which were distributed at each worshipper's place prior to the prayer times. Worshippers then were asked to fill out and leave them on the spot to be collected later by the research's team. This occurred for all mosque buildings, in Riyadh and Abha. This method helped to determine exactly the participants' locations, and then discover the problems easily. In addition, questions were translated into Arabic for the more thorough understanding of the participants.



Figure 1: The instruments used in the field studies in different mosque buildings.

While the participants were filling in the questionnaires, a number of physical measurements were conducted using different types of instruments for measuring air temperature ( $T_a$ ); air velocity ( $V_a$ ); RH; WBGT; and the surface temperatures (Figure 1). The participants consisted of 100% males. Based on the results of the pilot field study, which showed that the worshipers would remain seated most of the time inside the mosques, therefore all of the indoor climatic data for both mosques were gathered at around 1.2m above floor level for seated persons, as stated by ASHRAE 55/2004 and ISO 7726.

After worshippers finished the current prayer, the Imam or the researcher gave a short talk, describing briefly what to do to complete the survey and explaining the purpose of the instruments, which were located in a suitable place in the middle of the participants and for all mosque buildings (Figure 4). The questionnaires were distributed over two times, targeting the afternoon prayer for the first time (when RH is lower), and the other time during the evening prayer (when RH is higher) for both days in the winter and the summer in each mosque building. To reach the steady state of thermal balance for the participants with their surroundings, around 15 minutes were taken into account before asking the worshippers to fill in the questionnaire voluntarily. In that period, the majority of the participants performed the current prayer and then the mosques' Imams or the researcher explained the procedures of the field experiments in each mosque, as explained earlier.

The data collection period for measurements persisted for at least 24hrs in the winter and another 24hrs in the summer, for each mosque building, especially for the data logger instrument, which measures temperature and humidity. For heat stress and hot wire anemometer instruments, the measurements continued with an average total of around 12hrs in the winter day and another 12hrs in the summer day for each mosque building. Since the data collection period using these instruments runs from at least 30 minutes before the afternoon prayer started and remains until the last worshipper leaves the mosque building after finishing the evening prayer. With regard to the infrared thermometer for measuring surface temperatures, worktables and plans for each façade's points and levels to show the team the exact places, which need to be measured on each of the facades and fabrics from inside and outside for each mosque building, have been prepared. The measurements have been taken every around 30 minutes intervals in the winter and the summer days for each mosque building. The last instrument is a pyranometer to measure solar radiation. This instrument was fixed horizontally on the top part of each mosque building to record the solar radiation from dawn to dusk for both days in the winter and the summer. During all of the experiment days, video pictures were taken for documentation reason and to collect data needed by the observation method.

Table 1: Details for the selected case studies of mosque buildings in both selected cities in Riyadh and Abha.

	Mosque Name	Mosque Image	City	District	Type of Mosque	Capacity (People)	Area (m <sup>2</sup> )
1	Prince Sultan (PSR-1)		Riyadh	Al-Morooj	Regular for five daily prayers	515	30x16= 480
2	Al-Hassan Ibn Ali (HAR-2)			Al-Mansura	Juma'ah or Friday prayer + Regular	1075	40.8x27.2= 1110
3	Al-Sheikh Ishaq Al-Hajri (IHR-3)			Al-Kharj Residence	Regular for five daily prayers	630	22.8x24.12 = 550
4	Al-Sheikh Ali Al-Hayyani (AHA-1)			Al-badee	Regular for five daily prayers	375	20x20= 400
5	Noor El-Eeman (NEA-2)			Assamer	Juma'ah or Friday prayer + Regular	650	25x25= 625
6	Al-Qudse (QA-3)		Abha	Hijlah	Regular for five daily prayers	155	15x12= 180

With regard to the case studies, six of large and small mosque buildings in Saudi Arabia were selected and investigated in this study. Three of which were located in Riyadh city (two daily prayers mosques and one Juma'ah or Friday mosque), while the other three were in Abha city (two daily prayers mosques and one Juma'ah or Friday mosque), as seen in Table 1.

## RESULTS

### 1. General Statistics of the Questionnaires' Outcomes (Subjective Measurements):

The number of questionnaires' copies were distributed in all six mosques in both seasons was around 5,017 copies. There were numbers of cancelled copies, which were sorted out either in the site when collecting or later during the stage of analysis. A total of 1,619 returned and completed questionnaires were received, encoded, and analysed by using SPSS and Excel. The number of completed questionnaires from all of the three Riyadh mosque buildings is 909 copies with 56.15%, and 710 completed questionnaires with 43.85% from the other three mosque buildings in Abha (Table 2).

Table 2: General statistics about the number of distributed and completed questionnaires for all mosques.

City	Mosque	Season	Prayer	Number of Distributed Worshipers	of Distributed Questionnaires	Completed Questionnaires	Completed (%)
Riyadh mosque buildings	Prince Sultan (PSR-1)	Winter	Assr	200	210	56	28%
			Esha	300	214	59	28%
		Summer	Assr	200	200	33	17%
			Esha	300	300	53	18%
	Total or %			1,000	924	201	23%
	Abha	Al-Hassan Ibn Ali	Winter	Juma'ah	1050	450	234
Esha				300	240	66	28%

Abha mosque buildings	(HAR-2)	Summer	Juma'ah	1050	610	204	33%
			Esha	300	250	64	26%
		Total or %			2,700	1,550	568
	Ishaq Al-Hajri (IHR-3)	Winter	Assr	65	106	25	38%
			Esha	176	170	47	28%
		Summer	Assr	70	110	28	40%
			Esha	175	170	40	24%
		Total or %			486	556	140
	Al-Hayyani (AHA-1)	Winter	Dhuhr	50	61	21	42%
			Esha	50	61	27	54%
		Summer	Dhuhr	45	65	26	58%
			Esha	65	65	32	49%
Total or %			210	252	106	51%	
Noor El-Eeman (NEA-2)		Winter	Juma'ah	650	592	197	33%
			Esha	70	113	33	47%
		Summer	Juma'ah	650	610	231	38%
	Esha		200	200	55	28%	
Total or %			1,570	1,515	516	37%	
Al-Qudse (QA-3)	Winter	Assr	20	45	15	75%	
		Esha	30	45	16	53%	
	Summer	Assr	60	65	32	53%	
		Esha	70	65	25	38%	
Total or %			180	220	88	55%	
Total or %			6,146	5,017	1,619	39%	

The average percentage of completed questionnaires is around 39% in all mosques in both seasons. The lower percentage is for the Riyadh mosque (PSR-1) during Assr (Afternoon) prayer of 17% with 33 participants out of 200 worshipers in the summer, whereas the higher percentage is for the Abha mosque (QA-3) during Assr (Afternoon) prayer of 75% with 15 participants out of 20 worshipers in the winter (Table 2).

## 2. The Outcomes of Thermal Sensation Scale (TSV) Vs. Thermal Comfort Scale (TCV):

According to the ASHRAE standard 55 (2004), BS EN ISO 7730 (2005), and the CIBSE guide A (2006) the acceptable indoor environment for an individual on the 7-points thermal sensation scale should be within the ranges of  $-1 \leq PMV \leq +1$ . However, the most broadly used limits are to be within  $-0.5 \leq PMV \leq +0.5$  and to ensure the best thermal comfort in an environment for entire occupation groups in which the potential maximum group of occupants would feel thermally comfortable. Therefore and in order to obtain accurate results of whether or not thermal comfort is achieved in all six mosque buildings, both 7-points scales of thermal sensation and thermal comfort were utilized in this field study. Participants were asked to vote and to rate their thermal feelings on both scales in different times during the days (afternoon and evening prayers) of experiments and in both seasons (winter and summer), as explained earlier. The next tables 4 and 5 discuss that as followings.

Table 3: It shows descriptive statistics for participants' thermal sensation votes (TSV) on thermal sensation 7-points scale (based on field survey involving 1619 subjects) for all six Mosques.

City	Riyadh Mosque Buildings						Abha Mosque Buildings					
	Prince (PSR-1)		Sultan Al-Hassan Ali (HAR-2)		Ibn Ishaq (IHR-3)	Al-Hajri	Al-Hayyani (AHA-1)		Noor El-Eeman (NEA-2)		Al-Qudse (QA-3)	
Season	Win	Sum	Win	Sum	Win	Sum	Win	Sum	Win	Sum	Win	Sum
TSV +3 (%)	0.9	2.3	0	2.6	0	0	0	0	0	1.0	0	0
	6.1	4.7	1.0	6.3	5.7	1.5	4.2	1.7	3.0	5.9	6.5	3.5

+1	43.5	4.7	13.3	25.4	28.6	5.9	22.9	10.3	27.8	21.3	16.1	10.5
0	41.7	47.7	27.7	48.9	22.9	41.2	37.5	50.0	47.4	58.7	38.7	59.6
-1	7.8	25.6	35.3	11.6	21.4	35.3	25.0	25.9	17.8	11.2	38.7	24.6
-2	0	14.0	17.3	5.2	15.7	11.8	10.4	12.1	3.9	1.7	0	1.8
-3	0	1.2	5.3	0	5.7	4.4	0	0	0	0	0	0
Min.	-1	-3	-3	-2	-3	-3	-2	-2	-2	-2	-1	-2
Mean	+0.50	-0.36	-0.71	+0.24	-0.30	-0.64	-0.15	-0.36	+0.09	+0.24	-0.09	-0.10
Max.	+3	+3	+2	+3	+2	+2	+2	+2	+2	+3	+2	+2
Std. D.	0.77	1.12	1.09	0.99	1.35	0.97	1.04	0.88	0.84	0.82	0.87	0.72
Participants no.	115	86	300	268	70	68	48	58	230	286	31	57

The outcomes revealed that all six mosque buildings are within the acceptable thermal comfort limits ( $-1 \leq PMV \leq +1$ ), which formed a percentage of around 82% of satisfied participants. However, when considering the most broadly used limits are to be within  $-0.5 \leq PMV \leq +0.5$ , the outcomes revealed some discomfort because of coldness or warmness. Since the minimum TSV was -0.71 in HAR-2 mosque in the winter, which is close to a slightly cold category (-1), while the maximum mean of TSV was +0.5, which is close to a slightly warm category (+1) in the PSR-1 mosque during the winter (Table 4).

This scale (TSV) gives some indicators of the problems that these mosques buildings may face, unlike the other scale's results (TCV), which was not precise enough to give reliable evaluations. The tendencies to feel a bit warmer or colder inside the investigated mosques buildings by using the TSV were the indicators of the existence of some possible problems in these mosque buildings including potential problems of heat gain and heat loss.

The possible explanation for the mosque buildings of which their tendencies were warm during the winter, especially for the PSR-1 (+0.5) and the NEA-2 (+0.09) mosques where no heating systems were used during the winter experiments, lays on the heavy clothes that participants were wearing coupled with the low air movement inside those mosque buildings. Another reason is the heat produced by the number of worshipers inside the mosques, which were highly occupied by worshipers, especially for the NEA-2 mosque that was fully crowded. In addition, shopkeepers, labours, and builders who were doing difficult activities just before participating in this survey and for some cases they walked a long distance to arrive to some of the selected mosques, although they voted that they were performing the current prayers before filling out the questionnaires. Therefore, they felt warm when they entered inside those mosques of higher indoor temperatures compared to the low outdoor temperatures during the winter, especially for those who did not allow time for acclimatization. On the other hand, for those mosque buildings in which participants felt a bit colder in the summer, the results could be because of high performance of air conditioning in shadow of light summer clothing that participants were wearing (Table 3).

Table 4: It illustrates descriptive statistics for participants' thermal comfort votes (TCV) on thermal comfort 7-points scale (based on field survey involving 1619 subjects) for all six Mosques.

City	Riyadh Mosque Buildings						Abha Mosque Buildings						
Mosque	Prince Sultan (PSR-1)		Al-Hassan Ali (HAR-2)		Ibn Ishaq (IHR-3)		Al-Hajri (AHA-1)		Noor El-Eeman (NEA-2)		Al-Qudse (QA-3)		
Season	Win	Sum	Win	Sum	Win	Sum	Win	Sum	Win	Sum	Win	Sum	
Sum	7 (%)	28.7	27.9	26	16.4	30	17.6	33.3	29.3	22.6	24.1	19.4	21.1



6	33.9	50	48.3	43.7	38.6	48.5	41.7	39.7	46.5	46.5	48.4	54.4
5	11.3	11.6	10.3	20.5	11.4	23.5	12.5	17.2	16.1	14	12.9	5.3
4	13.0	8.1	6.3	6.7	10	2.9	8.3	6.9	8.7	8.7	6.5	8.8
3	8.7	0	5	7.8	7.1	2.9	4.2	5.2	4.3	2.8	9.7	7
2	4.3	1.2	2.7	2.6	1.4	0	0	1.7	1.3	2.8	3.2	0
1	0	1.2	1.3	2.2	1.4	4.4	0	0	0.4	1	0	3.5
<b>Min.</b>	2	1	1	1	1	1	3	2	1	1	2	1
<b>Mean</b>	<b>5.5</b>	<b>5.9</b>	<b>5.7</b>	<b>5.3</b>	<b>5.7</b>	<b>5.5</b>	<b>5.9</b>	<b>5.7</b>	<b>5.7</b>	<b>5.7</b>	<b>5.5</b>	<b>5.6</b>
<b>Max.</b>	7	7	7	7	7	7	7	7	7	7	7	7
<b>Std. D.</b>	1.46	1.10	1.32	1.39	1.40	1.32	1.09	1.16	1.16	1.26	1.32	1.40
<b>Participants no.</b>	115	86	300	268	70	68	48	58	230	286	31	57

On the other hand, on the thermal comfort scale (TCV), this depends on participants' physiological states. In comparison with thermal sensation scale (TSV), the acceptable thermal comfort limits of individual on the thermal comfort scale should range from slightly comfortable (5) to very comfortable (7). Since neutral (4) category means an individual would feel neither warm nor cold when voted neutral, however it is not necessary to feel comfortable. Therefore, it is excluded from the limits with the other uncomfortable categories 1, 2 and 3.

The outcomes revealed that all of the six mosque buildings are within the acceptable thermal comfort limits ( $5 \leq 6 \leq 7$ ). However, this scale's (TCV) results were less accurate to give reliable assessments than the previous scale (TSV), since the scale of thermal comfort (TCV) gives almost the same outcomes in all six mosques buildings in both seasons (winter and summer). The minimum mean votes of TCV was 5.3, which is close to slightly comfortable (category 5) in the HAR-2 in the summer, while the maximum mean of TCV was 5.9, which is close to comfortable (category 6) in the PSR-1 mosque in the summer and in the AHA-1 mosque in the winter (Table 4).

## CONCLUSIONS

This paper investigated a number of small and large mosque buildings in term of thermal comfort in two climatically and geographically distinct locations in Saudi Arabia. A number of assessment methods were used to achieve the aim of this study including field survey (subjective measurements).

Based on the subjective measurements (questionnaires), it is observed that heat sources, such as uninsulated exit doors (with high conductivity materials of stainless steel), windows, uninsulated walls that exposed more to direct solar radiation, and heat produced by the occupants and lights (internal gains) were significant reasons behind that a number of participants experienced discomfort because of warmness in the investigated mosques during the summer days. Therefore, these heat sources could be problems that need to be addressed.

In term of thermal sensation scale (TSV), the results revealed some discomfort because of warmness or coldness when considering the most broadly used limits are within  $-0.5 < \text{comfortable} < +0.5$ . Since, the minimum TSV was -0.71 in HAR-2 mosque in the winter, which is close to a slightly cold category (-1), while the maximum mean of TSV was +0.5, which is close to a slightly warm category (+1) in the PSR-1 mosque during the winter.

This scale (TSV) gives some indicators of the problems that these mosques buildings may face, unlike the other scale's results (TCV), which was not precise enough to give reliable evaluations. This could be referred to worded problems of thermal comfort scale and unlike thermal sensation scale, which was well worded. The tendencies to feel a bit warmer or colder inside the investigated mosques buildings by using TSV scale were the indicators of the existence of some potential problems in these mosques buildings including the possible problems of heat gain and heat loss.

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## POLLUTION STUDY FOR CLAN JETTY, PENANG

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### ABSTRACT

Water villages are unique residential areas found along the coastal areas in Malaysia. One such water village is Clan Jetty in Penang. As there is no sewerage facility at Clan Jetty, human waste is directly disposed of into the sea. As a place of historical interest and a tourist destination, seeing the human waste floating on the water surface and smelling the dirty water is not good for tourism. Rapid development in Penang has impacted negative environmental impact to the marine zone. Marine zone of the Penang is heavily polluted due to the activities of land reclamation and the direct sewage discharge into the sea. The Water Pollution Study confirmed that the most polluted area is the stretch which are the main drains leading into Clan Jetty shore. The organic loads, measured in terms of BOD, COD, Oil & Grease, Suspended Solids are highest along these strips followed by the shoreline strip. The high E Coli concentrations along these strips confirmed that there is fecal contamination most probably from the partially treated sewage emanated from the septic tanks from the unsewered Lebuh Chulia and Lebuh Pantai/Pengkalan Weld enclaves. This pollution is made worse by the sewage direct disposal into the sea by the Clan Jetty community due to the nonexistence of any sewerage system whatsoever.

**Keywords:** Pollution; Clan Jetty; sewerage

### 1. INTRODUCTION

The environmental health issue is a challenge for the government in order to create a pollution-free environment and preventing and controlling infectious diseases to the community. The pollution from sewage and solid waste contribute to the negative impact on the environment. Apart from the environment, humans residing in polluted areas will be exposed to the infectious illnesses like Hepatitis A and E, cholera, dysentery, malaria and typhoid fever. Hepatitis E is a disease of developing countries with improper sewage disposal and unclean water supplies (Riaz Shah, et al., 2012). In addition, according to Hall & Lobina (2008), cholera and diarrhoeal diseases kill about two million children a year in low and medium-income countries. Therefore, in the face of increasing demand for potable water supply to domestic and commercial needs, and the consciousness of the pollution potentials of

improper sewage management to water bodies and the consequent spread of infectious diseases; the sanitary design, monitoring and maintenance of sewage facilities becomes imperative to prevent and control associated health problems (L, Tamunobereton-ari, et. al., 2013).

Wastewaters entering a water body represent a heavy source of environmental pollution in Malaysian rivers. It affects both the water quality as well as the microbial and aquatic flora. With competing demands on limited water resources, awareness of the issues involved in water pollution, has led to considerable public debate about the environmental effects of effluents discharged into aquatic environments. Wastes containing high concentration of microbial nutrients would obviously promote an after-growth of significantly high coliform types and other microbial forms. Organic pollution is occasional discharge of raw sewage through storm water outlets. Waste effluents rich in decomposable organic matter, is the primary cause of organic pollution. Hence, this study will review the options of sewerage system for Clan Jelly and its pre-estimated cost as a basis of developing a proper sewerage system. It is aimed at providing the necessary impetus for a wholesome planning and become the catalyst for improvements of wastewater management in always evident and the pollution is made worse by land-based sources such as the Clan Jetty. In order to achieve the above concept, Jabatan Perkhidmatan Pembentungan has recommended a comprehensive study to be conducted to outline the immediate needs, short term requirements and long term plans to be carried-out in Clan Jetty. A proper sewerage system is vital for the Clan Jetty as a part of the World Heritage Site because as Hugo (1862) quoted;

"The sewer is the conscience of the city"

## 2. LITERATURE REVIEW

### 2.1. History of Clan Jetty

Clan Jelly is located at Weld Quay, George Town area in Penang. Georgetown, the state capital of Penang has been named after Britain's King George III. It was founded on 11 August 1786 by Captain Francis Light, a trader from the British East India Company. Weld Quay was one of Penang Island's economic activities to which ships from all over the world came to trade. After the opening of the Suez Canal in 1869, Penang was the first port of call east of the Indian subcontinent (Penang Economic Monthly January, 2010). Historically, the jetties were built by Chinese immigrants in the mid-19th century, when the British colonial masters actively encouraged Chinese to migrate to Malaya to fill the labour force (Lewis, 2005). The majority were coolies employed to unload goods in the port; others oversaw the production and sale of coal; and some ferried people and goods, particularly between the island and mainland (Bideau & Kilani, 2009). When they arrived they did not have money to buy land and so decided to build their own villages, hence the jetties. (Linssen, 2012).

Prior to 1882, there were references that waterfront coolies lived in attap roofed, stilt houses immediately behind the original seafront (Heng, 2002). This environment would gradually be incorporated into the construction of individual family homes as marriages occurred or wives joined husbands in Penang. When the jetties were established in the mid-19th century everybody who lived on the same jetty had the same surname because they all came from the same fishing village in China's Fujian Province (Linssen, 2012). According to Bideau & Kilani (2009), towards the end of the 1960s, there were eight of them: Lim, Tan, Chew, Lee, Mixed, Yeoh, Peng Aun and Koay.

After Penang lost its free port status in 1974 the port became very quiet and the people who lived on the jetties had to find other ways to make a living. The demise of the Penang free port status also marked the breakdown of the communities' communal (clan) organization although there have been various attempts of reconstitution to maintain its survival (Chan, 1980). The decision to demolish the Koay jetty was precipitated in 2003 after a fire ravaged about fifty houses on the Noordin Street



Ghaut, located right next to the jetty (Bideau & Kilani, 2009). Penang Economic Monthly (January, 2010) reported that currently, only six main Clan left under surname Lim, Tan, Chew, Lee, Yeoh and Mixed Clan which totaling about 200 households.

## 2.2. Tile Importance of Sewerage System in Clan Jetty as UNESCO World

Georgetown, Penang has been selected as the World Heritage Site Status. The outstanding universal value for Georgetown is the place as a historic colonial town on the Straits of Malacca which is formerly functioning as a trading port linking East and West. Due to European colonial powers for almost 500 years, the town developed successfully over a long span of time and even plan of Fort Cornwallis became the town planning from British colonial initiated.

With George Town on the UNESCO World Heritage Site list, they are turning to tourism (Penang Economic Monthly January, 2010). In affordability to continuously recognize as the World Heritage Site, the Penang Investment Tourism Office must retain authenticity of the city while making it more tourist-friendly besides the state government stresses its cultural and ethnic diversity reflected in the language, costume, custom and cuisine and its historic links with the neighbouring countries such as Singapore and Indonesia (OECD, 2011).

## 3. RESULTS AND DISCUSSION

Samples were tested for temperature, pH value, BOD (Biochemical oxygen demand), COD (Chemical Oxygen Demand), NH<sub>3</sub>-N (Ammoniacal nitrogen), NO<sub>3</sub>-N (Nitrate nitrogen), Suspended Solid Test (SST), Oil & Grease, Phosphorus, E. Coli Count (by MPN Method) and Dissolved Oxygen.

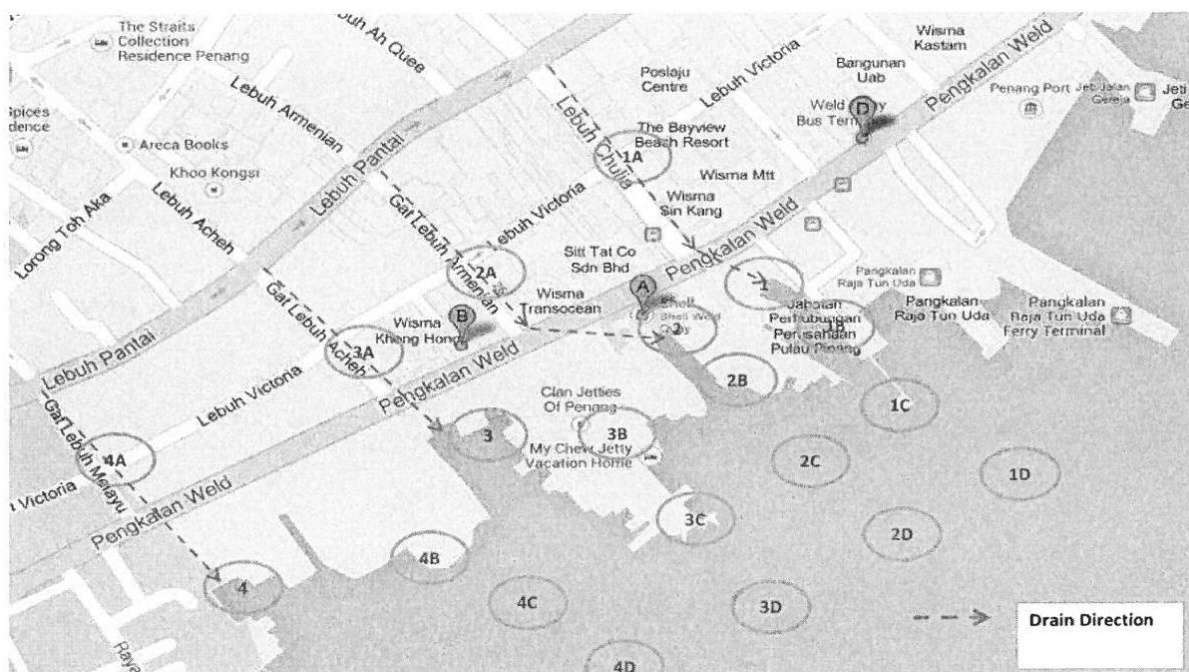


Figure 1: Sampling Points

The results of this Water Sampling exercise are shown in Tables 1-4. The most important graphical results of this Water Sampling exercise are shown in Graph 1-2.

PARAMETERS	Storm Water 1	Storm Water 1A	Marine Water 1B	Marine Water 1C	Marine Water 1D
*TEMPERATURE, °C	28	28	28	28	28
pH VALUE	6.5	4.6	7.5	8.1	8.1
B.O.D.(5 DAYS @ 20°C) /mg/L	410	2790	10	4	2
C.O.D /mg/L	778	5824	438	398	478
AMMONICAL NITROGEN, /mg/L	24.7	45.3	N.D(<0.3)	4.4	N.D(<0.3)
NITRATE NITROGEN,mg/l /mg/L	0.6	5.2	1.0	1.1	0.6
SUSPENDED SOLIDS,mg/l /mg/L	376	2734	159	216	166
OIL & GREASE, mg/l /mg/L	16	214	2	1	1
PHOSPHORUS, mg/l /mg/L	17.4	40.8	2.9	0.2	1.3
E.COLI COUNT /100ml	2.1x10 <sup>6</sup>	4.3x10 <sup>5</sup>	1.5x10 <sup>3</sup>	40.0	90.0
DISSOLVED OXYGEN mg/L	N.D(<0.01)	0.04	4.15	6.70	6.30

Table 1: Results at Sampling Points 1

PARAMETERS	Storm Water 2	Storm Water 2A	Marine Water 2B	Marine Water 2C	Marine Water 2D
*TEMPERATURE, °C	28	28	28	28	28
pH VALUE	7.0	6.6	7.6	7.8	8.1
B.O.D.(5 DAYS @ 20°C) /mg/L	831	474	29	1	4
C.O.D /mg/L	3013	1546	577	458	438
AMMONICAL NITROGEN, /mg/L	254.2	49.5	N.D(<0.3)	2.7	N.D(<0.3)
NITRATE NITROGEN,mg/l /mg/L	0.8	1.0	1.3	1.1	0.7
SUSPENDED SOLIDS,mg/l /mg/L	1926	1134	804	161	120
OIL & GREASE, mg/l /mg/L	242	422	2	2	2
PHOSPHORUS, mg/l /mg/L	40.2	11.6	1.2	0.7	0.2
E.COLI COUNT /100ml	2.3x10 <sup>5</sup>	9.0x10 <sup>4</sup>	4.0x10 <sup>2</sup>	N.D(<30.0)	40.0
DISSOLVED OXYGEN mg/L	N.D(<0.01)	N.D(<0.01)	4.98	5.68	6.77

Table 2: Results at Sampling Points 2

PARAMETERS	Storm Water 3	Storm Water 3A	Marine Water 3B	Marine Water 3C	Marine Water 3D
*TEMPERATURE, °C	28	28	28	28	28
pH VALUE	6.8	6.8	7.2	7.8	8.0
B.O.D.(5 DAYS @ 20°C) /mg/L	72	76	17	4	2
C.O.D /mg/L	249	105	338	557	478
AMMONICAL NITROGEN, /mg/L	18.3	28.6	N.D(<0.3)	N.D(<0.3)	N.D(<0.3)
NITRATE NITROGEN,mg/l /mg/L	0.4	1.4	0.5	0.8	1.0
SUSPENDED SOLIDS,mg/l /mg/L	30	32	493	153	40
OIL & GREASE, mg/l /mg/L	10	4	1	2	2
PHOSPHORUS, mg/l /mg/L	2.7	2.7	N.D(<0.2)	0.2	0.2
E.COLI COUNT /100ml	4.3x10 <sup>5</sup>	9.3x10 <sup>5</sup>	3.9x10 <sup>3</sup>	90.0	40.0
DISSOLVED OXYGEN mg/L	N.D(<0.01)	0.05	N.D(<0.01)	5.19	6.23

Table 3: Results at Sampling Points 3



PARAMETERS	Storm Water 4	Storm Water 4A	Marine Water 4B	Marine Water 4C	Marine Water 4D
*TEMPERATURE, °C	28	28	28	28	28
pH VALUE	6.8	6.3	7.8	8.1	8.2
B.O.D <sub>5</sub> (5 DAYS @ 20°C) /mg/L	58	540	5	2	2
C.O.D /mg/L	103	1497	438	418	358
AMMONICAL NITROGEN, /mg/L	25.8	29.1	4.4	N.D(<0.3)	N.D(<0.3)
NITRATE NITROGEN,mg/l /mg/L	0.3	1.0	1.4	0.9	1.0
SUSPENDED SOLIDS,mg/l /mg/L	24	1272	208	52	56
OIL & GREASE, mg/l /mg/L	8	524	44	N.D(<1)	1
PHOSPHORUS, mg/l /mg/L	1.4	27.7	0.2	0.2	0.2
E.COLI COUNT /100ml	1.5x10 <sup>6</sup>	9.3x10 <sup>5</sup>	90.0	40.0	40.0
DISSOLVED OXYGEN mg/L	0.01	N.D(<0.01)	4.80	6.27	6.94

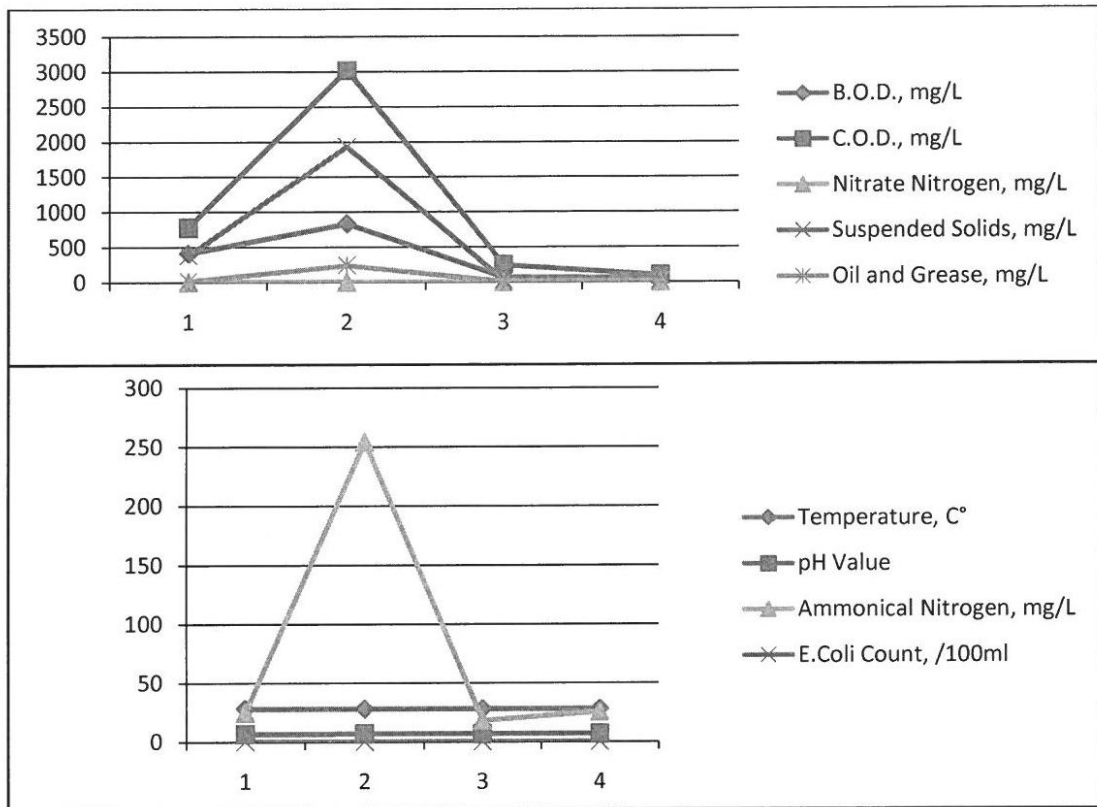
Table 4: Results at Sampling Points 4

Parameter	I	II	III	IV	V
BOD	<1	1-3	3-6	6-12	>12
COD	<10	10-25	25-50	50-100	>100
NH <sub>3</sub> N	<0.1	0.1-0.3	0.3-0.9	0.9-2.7	>2.7
DO	<7	5-7	3-5	1-3	<1
pH	>7	6-7	5-6	<5	>5
SS	<25	25-50	50-150	150-300	>300
WQI	>92.7	76.5-92.7	51.9-76.5	31.0-51.9	<31.0

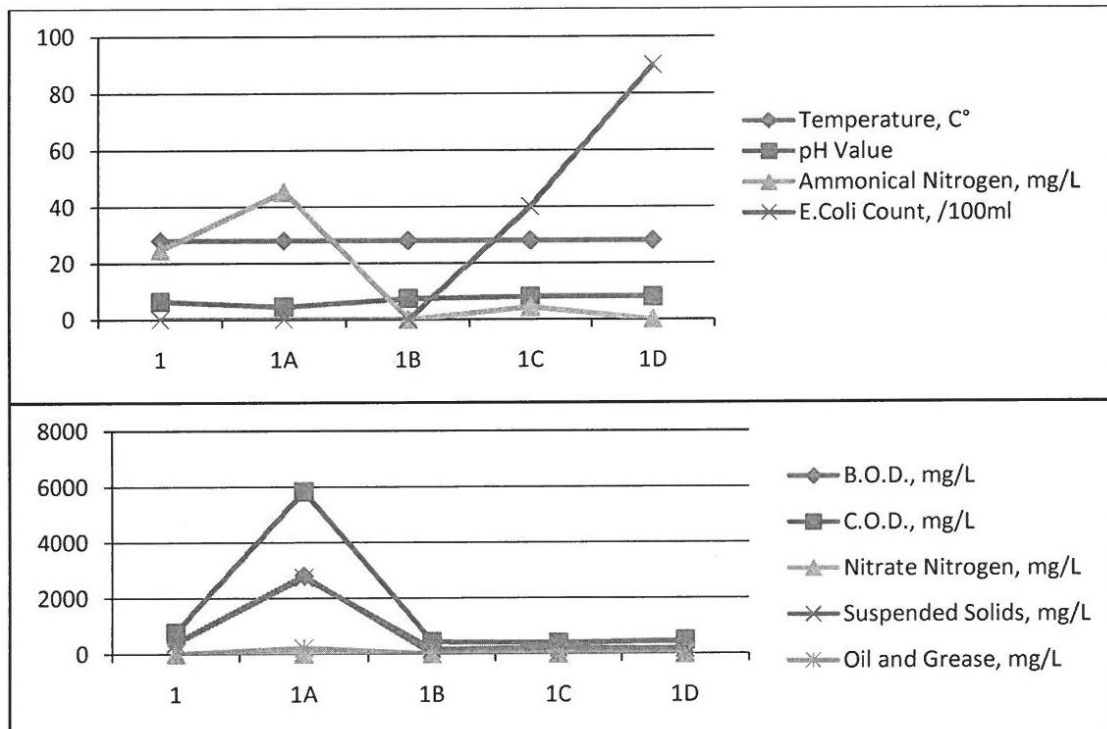
Table 5: National Water Quality Standards for Malaysia (NWQSM)

The existing water quality is compared with the Environmental Quality Act 1974 (EQA), National Water Quality Standards for Malaysia (NWQSM) (Table 5) and the water quality status will be rated from Malaysia Water Quality Index (WQI).

The Environmental Quality Act of 1974 and other environmental laws are administered by the Division of Environment of the Ministry of Science, Technology, and Environment. Discharge of untreated sewage has contaminated the nation's water; the most heavily polluted areas are along the west coast. Malaysia's water pollution problem also extends to its rivers, of which 40% are polluted. The nation has 580 cubic km of water with 76% used for farming and 13% used for industrial activity.



Graph 1: Strip 1 - 4



Graph 2: Strip 1A - 4A

#### 4. DISCUSSION

Both the BOD and COD values were in descending order from upstream to downstream. The BOD and corresponding COD values in all the four inlet drains (STRIP 1A\_4A) all recorded very high values, with the maximum BOD/COD values for drain 1A: Lebu Chulia with 2790/5824 mg per liter. The BOD and corresponding COD values in all the four sea sampling points (STRIP 10\_40) all recorded the low values, with the minimum BOD/COD values for sampling point 20 are 4/438 mg per liter.

The Suspended Solids (SS) values were in descending order from upstream to downstream, in line with the BOD/COD/O&G parameters. The SS values in all the four inlet drains (STRIP1A\_4A) all recorded very high values, with the maximum SS value for drain 1A: Lebu Chulia was 2734 mg per liter. The SS values in all the four sea sampling points (STRIP 10\_40) all recorded the low values, with the minimum SS value for sampling point 4 was 24 mg per liter.

The dissolved oxygen (DO) concentrations were found in descending order from upstream to downstream. There are no DO detected in all the inlet drains (STRIP 1-4) and almost no DO detected in the shoreline (STRIP 1A-4). The highest concentration was detected at upstream stretches (STRIP IC-4C and STRIP 10-40), the maximum being 6.94 mg/l: Sample 40.

The O&G values are highest along the stretch IA-4A, which are the main drains leading into Clan Jetties shores. These are the drains along Lebu Chulia (1A: 214mg/l), Gat Lebu Armenian (2A: 422mg/l), and Gat Lebu Melayu (4A: 524mg/l).

In concurrence with the maximum pollution along the street drains and shoreline the maximum E Coli counts are along Strip 1-4 and Strip IA-4A with the maximum level at Sampling Point I along Lebu Chulia with E Coli 2.1x 10<sup>16</sup>/100ml. This clearly show that there are quite severe fecal pollution entering the study area.

#### 5. CONCLUSION

It can be concluded that most polluted area is the stretch IA-4A, which are the main drains leading into Clan Jetty shores. These are the drains along Lebu Chulia, Gat Lebu Armenian, and Gat Lebu Melayu. The organic loads, measured in terms of BOD, COD, Oil & Grease, Suspended Solids are highest along this strip followed by the shoreline strip. The high E Coli concentrations along these 2 strips confirmed that there is faecal contamination most probably from the partially treated sewage emanated from the septic tanks from premises adjacent to the Clan Jetty shore. This pollution is made worse by the sewage direct disposal into the sea by the Clan Jetty community due to the non-existence of any sewerage system whatsoever.

The implementation of sewerage system must be provided as soon as possible and may be implemented in phases based on the budget and by doing in phases, the workability of the new system can be improved and upgraded in the subsequent phases. Since the houses are built on the ocean floor, one suitable system to tap the sewage flow from the houses is the vacuum sewer system.

#### ACKNOWLEDGEMENT

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## INVESTIGATING THERMAL COMFORT OF TRADITIONAL ARCHITECTURE IN THE ARABIAN GULF REGION, EMPLOYING A NEW COMPUTER SOFTWARE

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### ABSTRACT

The relative shortage of knowledge, awareness professionals and property developers, about passive design principles and human thermal comfort resulted in the wide spread of energy demanding skyscrapers, throughout the Arabian Gulf region. Thus, the need to redefine thermal comfort is essential to cope with the climate change challenges. Although, passive design strategies were widely successful in providing thermal comfort without the air-conditioning systems, these techniques are not given the importance they deserve in the Arabian Gulf area as the fossil fuels abundance encourages the reliance on AC systems. However, taking into account the hot climate of this region, this dependence on AC systems could inevitably result in huge electricity consumption, which may contribute to global warming and other relevant environmental problems. In order to break this chain, there is a need to recall traditional passive design strategies. However, occupants' thermal comfort cannot be achieved by applying passive design strategies to the buildings alone; rather they should also be integrated at the urban level. Hence, this paper attempts to investigate thermal comfort potential of traditional architecture of the Arabian Gulf region within the current climatic context.

Key Words: Thermal comfort, THERCOM, Arabian Gulf, Traditional Architecture, Riyadh, Muscat

### INTRODUCTION

Thermal comfort is a multi-discipline topic, which is reflected by its several definitions. For instance, defining thermal comfort as 'that condition of mind which expresses satisfaction with the thermal environment and is assessed by subjective evaluation' (ASHRAE, 2009, p.2) reflects its psychological nature. A physiological approach defines it as the minimum reaction from the thermal receptors to the temperature or its change (Mayer, 1993). Moreover, Fanger provided a physical definition for the thermal comfort as 'a state reached when heat flows to and from the human body are balanced and skin temperature and sweat rate are within a comfort range, which depends only on metabolism' (Fanger, 1972 in Hoppe, 2002).

As known, the thermal comfort is determined by six factors from which two are personal and the other are environmental. The personal are the metabolism (activity) and insulation (clothing) levels, whereas the environmental are the air temperature and speed, water vapour pressure, and the mean radiant temperature. Usually, the water vapour pressure is determined by measuring the relative humidity and the mean radiant temperature is determined by the black globe temperature. Generally, these environmental parameters are defined by the climatic type within which the concerned buildings

are located. However, they are in continuous interaction with the site and buildings' features, which affects their values. As a result of a good design, their effect on the thermal comfort is moderated at both levels of the building and neighbourhood.

Today, in most areas of the Arabian Gulf region, designers tend to ignore the traditional passive design strategies and principles, or at least not giving them the attention they deserve. The abundance of the oil and natural gas enable building high skyscrapers that consume huge amounts of energy in order to provide the required thermal comfort. The link between the global warming and the consumed energy in the construction sector, particularly for heating and cooling requirements, highlights the importance of implementing and integrating the passive design strategies, which are capable of providing thermal comfort without, or with a lower, energy consumption.

It is important to remember that the climate has changed during the last years due to the consequences of the global warming and the Arabian Gulf is not an exception. Thus, even implementing the passive design strategies may not be capable of providing the same levels of thermal comfort they were able to provide previously under different climatic conditions. Another factor contributes to this is the change in the peoples' expectations about their thermal environments. Nevertheless, it is good to approximate the potential that the passive design strategies can provide under the current climatic conditions through the quick investigation provided by this paper. This investigation depends on comparing the thermal conditions before and after changing the layout of a neighbourhood.

## LITERATURE REVIEW:

### Glance about the Arabian Gulf region:

Formed in May 1981, the Gulf Cooperation Council (GCC) consists of six countries, namely Oman, Saudi Arabia, Kuwait, Bahrain, Qatar, and UAE. These countries form the main parts of the Arabian Peninsula. They are also known as the Arabian Gulf countries because of their location at the Arabian Gulf as depicted in figure (1).

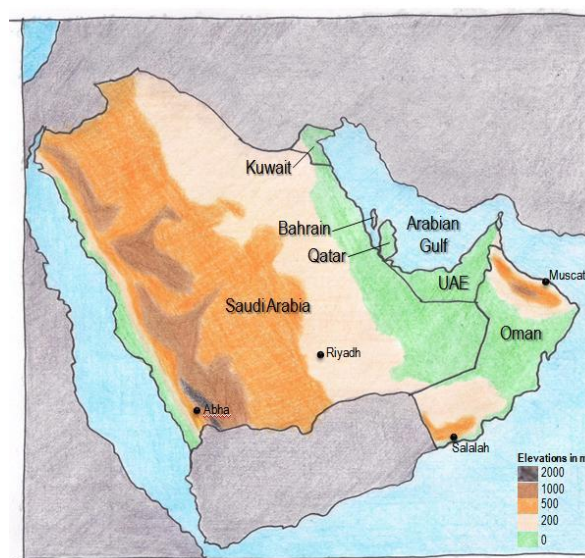


Figure (1): The physical map of the Arabian Gulf states [reproduced from (Owen, 2015)]

According to the Koppen-Geiger climate classification, the dominant climate type in this region is the arid desert hot climate, which is characterised by its high mean annual temperature and small amounts of precipitation that are not sufficient to support most plants (Rubel and Kottek, 2010). Generally, a hot season is dominant in alternation with a relatively cooler one. In the hot season, the mean maximum temperature can reach up to 45 C and 25 C during day and night times respectively. On the other hand, during the cooler season it can range between 20 C and 30 during day and night respectively. As for the humidity, the region is characterised by low relative humidity that ranges from 20% to 40% with the exception of the maritime areas where high levels up to 90% of relative humidity are normal (Konya and Vandenberg, 2011).

However, some areas within the Arabian Gulf countries have modified climatic conditions because of their special nature. This nature can be the proximity from water bodies like the case of Muscat (Oman) and Jeddah (Saudi Arabia) cities for instance that have maritime climate. Other cities such as Salalah (Oman) and Abaha (Saudi Arabia) are distinguished by their relatively cooler climatic conditions. The former is subjected to the monsoon winds from the Indian Ocean and the latter has a mountainous nature.

### 'Modern' architecture of the Arabian Gulf:

Flourished through hundreds of years, the traditional architecture was able to provide the thermal comfort for the occupants passively through the buildings' scale and layout, the conscious implementation of the thermal mass effect, and the integration of the passive cooling strategies (Hawker, 2008). Figure (2) illustrates some of these strategies found in the Omani architecture. It has been reported that similar systems to those illustrated by the figure were capable of reducing the indoor C and 10 C to 20 C air temperature by up to 10 C approximately (Damluji, 1998).

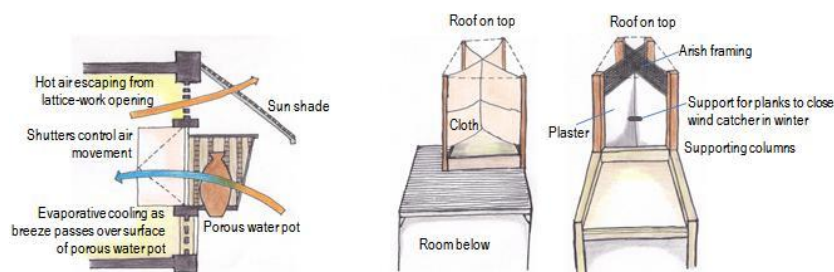


Figure (2): Passive cooling strategies: (a) Evaporative cooling system in al Zawawi (Mughabb) House in Muscat, (b) Cloth and plastered wind catchers in Muhammad Sharif Abdullah House in Sohar [reproduced from (Damluji, 1998)]

With the oil discovery in commercial quantities in the Gulf State countries, and the resulted developments, the traditional architecture lost its popularity gradually. At the beginning, the traditional construction materials like mud bricks, palm fronds, coral, and stones were replaced by concrete blocks and the air conditioning systems were introduced. However, the traditional design principles, like the space divisions between visitors according to their gender, were followed. Then, with the commercial developments in the Arabian Gulf in the 1980s, these principles were widely replaced by the western design principles (Hawker, 2008). For instance, the narrow streets, where shade is provided by the surrounding buildings, were replaced by the wide streets that respond to the heavy traffic demands but unfortunately lack shades (Ragette, 2012). This is resulted in uncomfortable thermal conditions for the pedestrians. Indeed, few streets in the Arabian Gulf area are designed to be used by pedestrians. This may be considered as a contributor to the heavy dependence on cars regardless of the distances,

which is clearly observed in all Gulf countries. Consequently, this design problem can add to the health problems as it prevents people from walking even if they are willing to.

In addition, the attached houses were replaced by the villas, which are forms of the detached houses (Ragette, 2012) and the courtyard houses lose their popularity (Hawker, 2008). Moreover, most of the residential houses are surrounded by paved areas unlike the case in the past where the bare ground mostly surrounded the houses. It is known that the ground cover is one of the parameters that affect the microclimate and consequently the indoor thermal conditions. Additionally, airtight glazing towers become normal in many Gulf cities including Dubai, Abu Dhabi, Riyadh, and Doha for example. Indeed, these glazed towers reflect the modern image of these cities.

### **Consequences of 'modern' Arabian Gulf architecture:**

As a result for implementing these imported types of architecture and planning approaches, which were not modified to match the climatic conditions of the Gulf region, poorly adopted buildings existed. For instance, importing clear glazing systems created lighting and thermal problems that can be observed in some of the UAE's glazed towers (Aboulnaga, 2006). The energy consumption in Abu Dhabi compared with the international average is around 10 times per household (Masdar and Schneider\_Electric, 2011). A major reason for this high consumption of energy is the typical image of the air conditioning systems as essential appliances in all buildings' types (Qader, 2009). Moreover, the increase in the energy consumption is related to the increase in the greenhouse gas emissions (Boluk and Mert, 2014; de Dear and White, 2008). In the Gulf region, these emissions are mainly because of the fossil fuels extraction and converting them into electricity (Qader, 2009).

### **Climatic analysis of Riyadh and Muscat cities:**

Both Riyadh and Muscat cities were selected for this investigation as they represent the dominant and modified climates in the Gulf region; the former represents the hot arid and the latter represents the maritime climate. The average precipitation, average minimum and maximum temperatures, and relative humidity (morning and afternoon) are presented by figure (3).

In Riyadh, the hottest period extends approximately from April to October including both. The average diurnal temperatures fluctuate between 12 C in December and 18 C in both August and October. Besides, the relative humidity has a wide range extending from 75% in December morning to as low as 19% in both July and August afternoons. The maximum precipitation occurs in April with an average of around 25 mm with a dry period from June to December including both.

On the other hand, Muscat has its hottest period from April to November including both with a narrower maximum diurnal temperature of around 7C in May, June, October, and November. Additionally, as can be noted from the figure, the average temperature in December is constant during day and night at 20 C. The maximum precipitation occurs in January of around 28 mm with a dry period extending from May to September including both and excluding June.



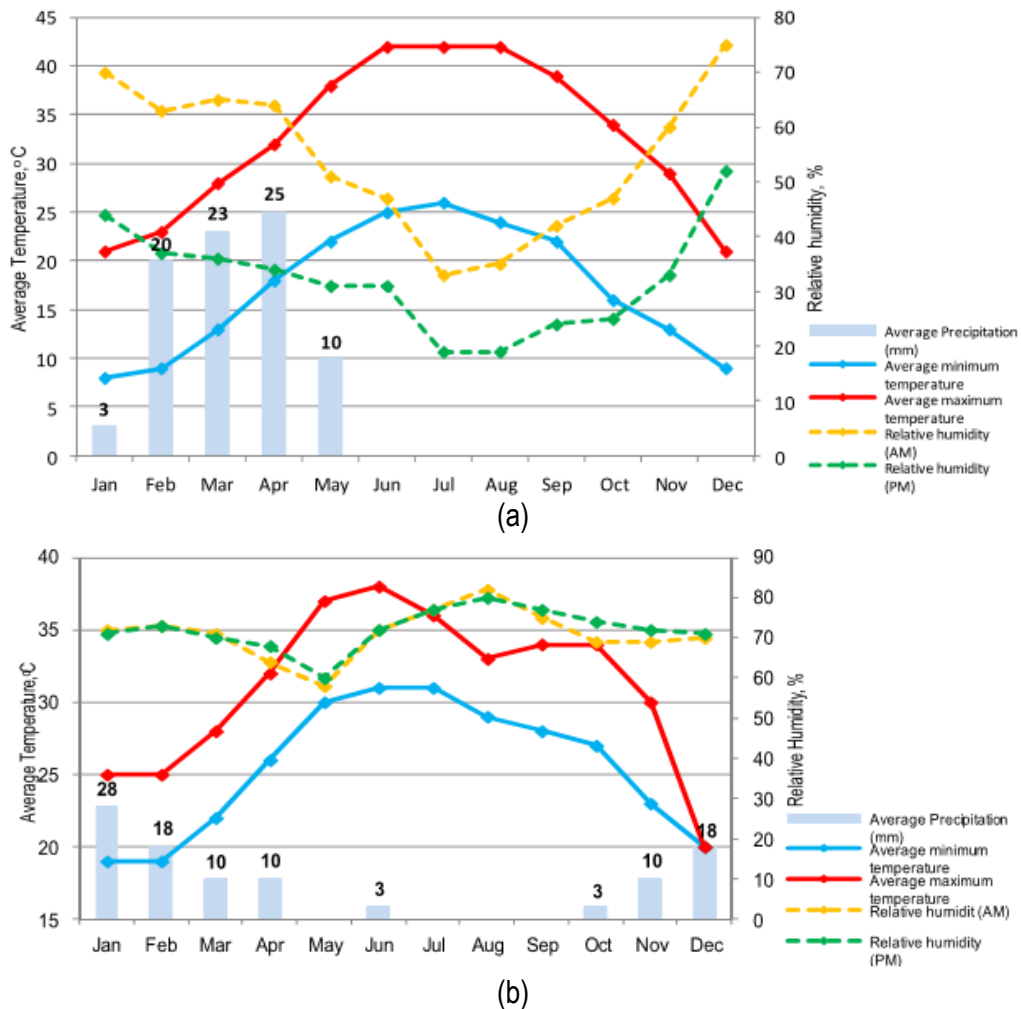


Figure (3): Average precipitation, average minimum and maximum temperatures, and relative humidity (morning and afternoon): (a) Riyadh, and (b) Muscat [reproduced from (BBC, 2015; BBC, 2015)]

**METHODOLOGY:**

Using Google maps, a residential neighbourhood with an area of 12,000 m<sup>2</sup> approximately was selected randomly in Muscat, specifically in Al-Mubaila, as depicted in figure (4). The neighbourhood consists of 12 villas surrounded by an asphalt street that has a length of around 480 m and width of 6 m. As can be noted from the figure, the street separates the neighbourhood from the surrounding residential buildings.

A schematic model that represents the selected neighbourhood was constructed in ECOTECT programme in order to obtain the indoor temperatures. Each house was considered as a zone and the construction materials were unified and selected from the integrated library of the programme. The model was simulated in order to obtain the indoor temperature of the houses before and after changing the neighbourhood layout under the climatic conditions of Riyadh and Muscat cities. These temperatures were needed to predict the thermal comfort inside the buildings using the selected indices from THERCOM programme. Obviously, unifying the construction materials and using those from the programme library without modifications may be considered as error sources, but the results' analysis considered the reduction in the indoor temperature as discussed later.

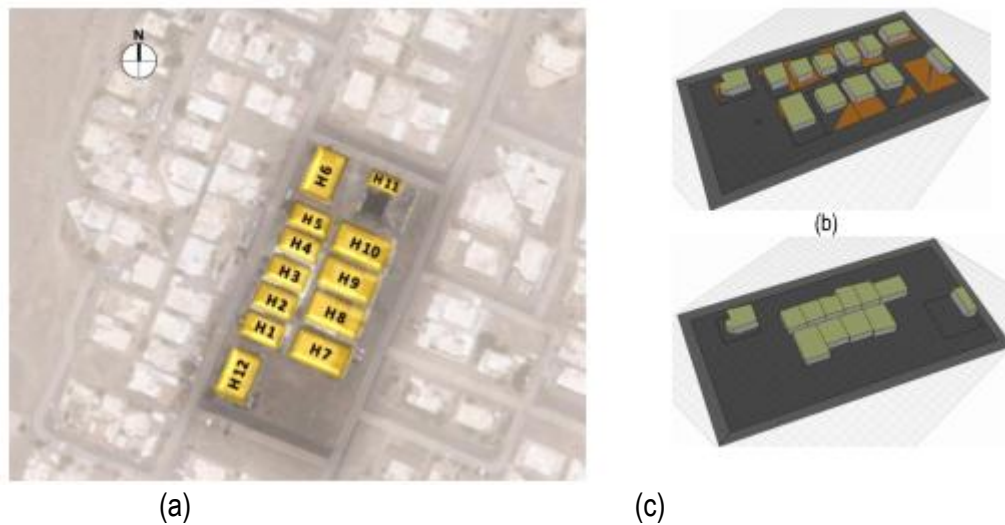


Figure (4): The selected neighbourhood: (a) from Google maps, (b) Schematic model before, and, (c) after changing the neighbourhood layout

The principle author developed THERCOM programme in 2013 as a thermal comfort prediction tool for the free running buildings. In addition, it is capable of predicting the outdoor thermal comfort conditions. The default data can predict the thermal conditions in three climatic types, namely equatorial, arid, and warm temperate climates. Besides, the thermal conditions can be predicted according to seven indices from which three are indoor. The integrated indoor indices are the adaptive model for thermal comfort, tropical summer index, and wet bulb globe temperature, whereas the outdoor are the wet bulb globe temperature, wind chill index, discomfort index, and heat index. A trail version of THERCOM is available at [www.nottingham.ac.uk/~lazmbg/MScREA/](http://www.nottingham.ac.uk/~lazmbg/MScREA/)

The thermal conditions of the selected neighbourhood were investigated in both Riyadh and Muscat for the 48 hours of the hottest and coldest days. In Riyadh, these days were 28 July and 5<sup>th</sup> December, whereas in Muscat they were the 9 July and 24 January. Moreover, the indoor thermal predictions were performed for each house, whereas the outdoor prediction was estimated for the whole neighbourhood. These predictions were estimated for the original and modified layouts. Additionally, both heat and wet bulb globe temperature indices were used to generate these predictions based on the match between the cities climatic conditions and the indices climatic boundaries. These boundaries are summarised in table (1).

Table (1): The climatic boundaries of the integrated indices in THERCOM programme

	Index	Climatic boundaries
Indoor	Adaptive model of thermal comfort (Humphreys equation)	5 ° C < Monthly mean outdoor temperatures < 32 ° C
	Tropical summer index	Equatorial and arid climates with sufficient air velocity and relatively low radiant flux
	Wet bulb globe temperature (Indoor)	Hot and warm environments
Outdoor	Heat index	Air temperature > 20 ° C
	Wet bulb globe temperature (Outdoor)	Hot and warm environments
	Discomfort index	For equatorial climate
	Wind chill index	Air temperature < 10 ° C

## ANALYSIS OF RESULTS

Despite that the houses' indoor temperature decreased in both cities because of the change in the neighbourhood layout, there were some exceptions during the hottest day. For instance, the indoor temperature of house (6) was constant during hours (18) and (19) in Riyadh. Similarly, house (7) in Muscat had a constant indoor temperature for five hours starting from (16) to (20) including both. Additionally, there was a minor constant increase in the indoor temperature of around 0.1 C in house (6) in hours (16) to (21) including both with an increase of 0.2 C during hour (17). This may be due to the orientation of house (6) that has east and west main facades.

Moreover, the mean of the indoor temperature reduction was plotted in figure (5) from which it can be noticed that the layout change was more effective in Riyadh compared with Muscat. In addition, the overall mean of the indoor temperature reduction was calculated as -1.3° C and -2° C in Riyadh and -1.0 C and -1.8 C in Muscat for both the hottest and coldest days respectively. The mode of the hottest and coldest days respectively. Indeed, these relatively low values in Muscat were expected as its thermal conditions, which are characterised by high humidity levels, are usually modified by cooling ventilation strategies. Moreover, despite that houses (11) and (12) were not altered, there was a reduction in their indoor temperatures. The relatively good performance of house (11) in both cities may be due to its orientation. As noticed from figure (4), it has an east-west longitudinal axis that minimises its east and west facades compared with the other houses.

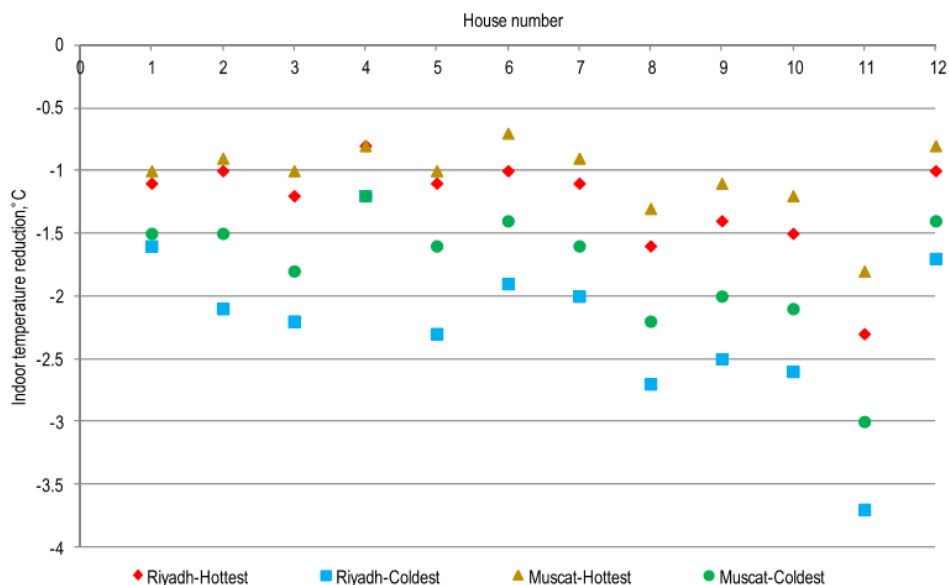
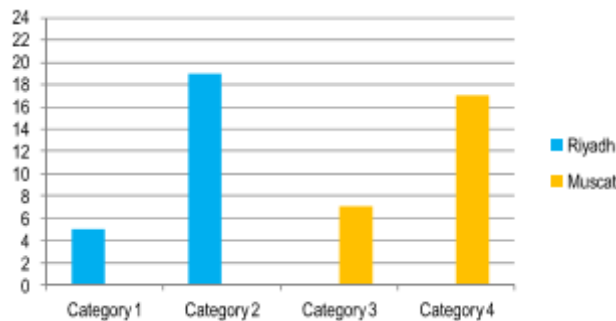


Figure (5): Mean indoor temperature reduction for each house in both cities

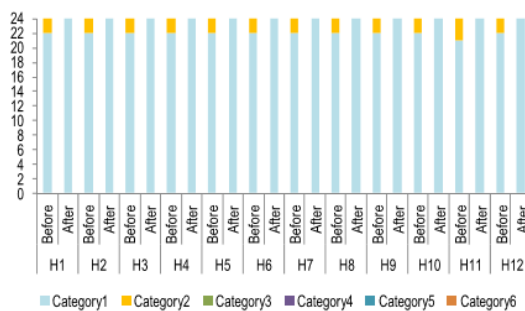
Besides, the thermal comfort conditions were estimated using THERCOM programme as depicted in figure (6). The outdoor thermal conditions in Riyadh require caution during hours (3) to (7) and extreme caution during the rest of the hottest day according to the heat index. During the periods that require caution, exposure to the outdoor conditions alone or accompanied with physical activities may lead to fatigue, whereas sunstroke, muscle cramps, and heat exhaustion are possible under similar conditions during the extreme caution periods. In Muscat, the conditions were worse as most of the day hours fall within the danger category with the hours from (6) to (22) including both considered as extreme danger. In the former, sunstroke, muscle cramps, and heat exhaustion are likely to occur

and heat strokes are subjected to the length of the exposure and the physical activity type. In the latter, the heat strokes are likely to occur.

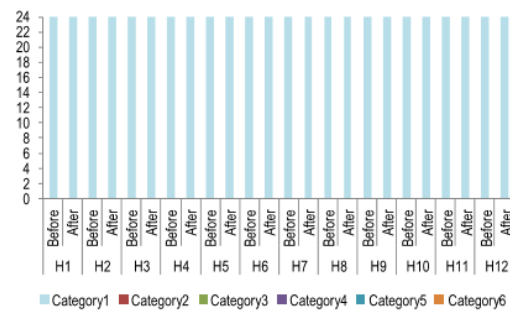
Additionally, for the hottest day, and considering the original layout, precautions are required in Riyadh during hours (12) and (13) in all houses with an additional hour, namely (14), in house (11). These precautions include drinking at least 0.5 liters of water per hour and taking a rest of around 10 minutes for each 50 minutes of work. More water intake and longer rest times may be required for non-acclimatised people. However, the changed layout reduces the wet bulb globe temperature in all houses to less than 26 C that does not require any precautions. In Muscat, on the other hand, the wet bulb globe temperatures in the twelve houses are greater than 32 C considering both layouts, which require deferring all heavy activities. In the case of light activities, a rest of not less than 20 minutes is required after each 40 minutes of work. For the coldest day, the indoor thermal conditions in both cities do not require any precautions.



(a)



(b)



(c)

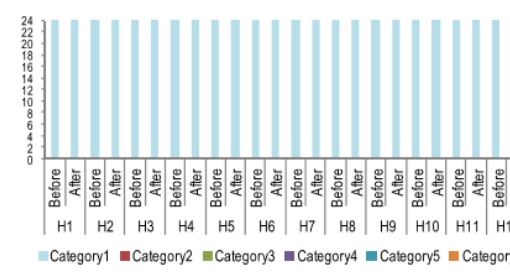
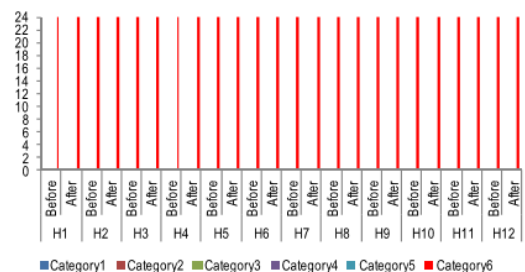


Figure (6): Thermal comfort predictions: (a) outdoor during the hottest day, (b) in Riyadh during the hottest day, (c) in Riyadh during the coldest day, (d) in Muscat during the hottest day, and (e) in Muscat during the coldest day

As presented in figure (5), house (4) in Riyadh and house (6) in Muscat had the lowest mean values for the indoor temperature reduction during the hottest day. Therefore, their thermal conditions were explored for the whole year as illustrated by figure (7) by investigating these conditions during one day monthly. The results showed that for house (4) in Riyadh, no precautions were required except in

June when each 50 minutes of work should be followed by 10 minutes of rest accompanied with drinking not less than 0.5 to 1 liter of water per hour in the worst conditions. Similarly, no precautions are required in Muscat for the period from December to February including both. In both November and March, a 10/50 rest/work cycle should be followed almost in the afternoon hours. The water intake should be increased to not less than 1 to 1.5 liters of water per hour with 15 minutes rest for each 45 minutes of work. The worst conditions occur in July when all the demanding activities should be suspended and each 20 minutes of light activities for acclimatised people should be followed by a rest of 40 minutes with water intake of at least 2 liters per hour.

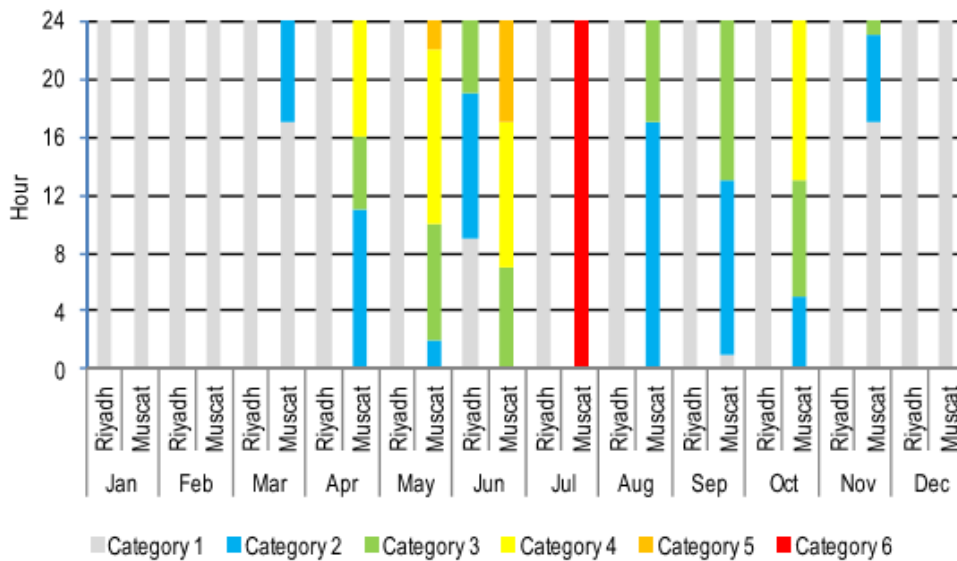


Figure (7): Thermal predictions for house (4) in Riyadh and house (6) in Muscat during the whole year

It should be noted that in the attempt to create a clustered neighbourhood, some design and social issues arise. For instance, each house loses at least one façade, in most cases they are two, which should be reflected in the distribution of the inner spaces. Additionally, people may not welcome the shift from villas as villas are considered as a sign of prosperity. However, increasing the social awareness of the sustainable issues as well as highlighting the potential savings resulted from decreasing the cooling energy and the cladding materials may accelerate this shift. Indeed, it would be beneficial to investigate the people opinion about such changes in the planning principles.

## CONCLUSIONS

This paper attempts to shed some light on the benefits of applying the concepts of the traditional architecture in the Gulf region, in particular compactness. Results showed general reductions in the indoor temperature of the investigated houses with a mean reduction of  $-1.3^{\circ}\text{C}$  and  $-2^{\circ}\text{C}$  in Riyadh and  $-1.0^{\circ}\text{C}$  and  $-1.8^{\circ}\text{C}$  in Muscat both during the hottest and coldest days respectively. Despite that changing the neighbourhood layout reduces the wet bulb globe temperature inside the investigated houses, the thermal conditions were not improved significantly. Thus, further investigations considering the construction materials currently used in the Gulf region are required. This is due to the direct effect of the thermal properties of the construction materials on the indoor thermal conditions. Nevertheless, the quick investigation presented in this paper explores the potential reduction in the indoor temperatures as a result for the change in the neighbourhood layout solely.



Moreover, considering the current challenges and the major social changes in the Gulf region, copying the principles of the traditional architecture is neither acceptable nor possible. Yet, a balanced architectural blend that benefits from the present's technologies and past's lessons can serve the region better as it combines the benefits of both. This paper is a quick glance at the potentials of the traditional architecture from the comfort thermal point of view. Its results should be considered with caution, as further research is required. Indeed, it is recommended to explore the potential of applying other passive strategies such as orientation and ground cover in addition to compactness on the newly designed projects. Comparing the required cooling energy resulted from the current design trends with that required by integrating the passive strategies may increase the awareness and interest of the property developers about the traditional architecture and passive strategies in the Arabian Gulf region.

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## THE IMPACT OF EMPLOYEE'S BEHAVIOR ON CUSTOMERS' SATISFACTION, AN ONLINE HOTEL REVIEW

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### ABSTRACT

This study aims to examine the impact of employees' behavior on customers' satisfaction. The study relied on text mining and content analysis of 3000 online travelers' review, covering 3 star hotels. For the purpose of this research the available data retrieved from [www.agoda.com](http://www.agoda.com). All available information on each hotel such as hotel attributes (e.g number of rooms, facilities, V), and reviews in English were recorded. The data was analyzed using Nvivo 7. The content analysis of reviews indicated that nicely, warm greetings everyday, fast check in, carrying the customer luggage, being patient, giving friendly advices about the city, fast response to guest inquiries, arranging cheap trips, equal behavior will guests, regular timing for house keeping and finally strong communication skills and the ability to speak English fluently could positively affect the customers' satisfaction.

**Keywords:** Customers' satisfaction, receptionists' behavior, 3 star hotels, Middle East

### 1. INTRODUCTION

Hotel receptionists are the first people often travelers meet upon their arrival. Accordingly, they have a very important role in the overall impression of the hotel. The front desk staffs' responsibilities includes check in and check out, taking hotel reservations by phone or email and dealing with the customers' complaints or requirements. The hotel staffs might meet various customers from different nationalities during the day. Their behavior has a key role on customers' total image and revisit. But what are the most appreciated behaviors of staffs from customers' perspective? In the other word, what are the behaviors that positively affect the customers' satisfaction. The current study is an attempt to answer this question by concentrating on the customers' reviews of 3 star hotels in Middle East, which were retrieved from agoda website ([www.agoda.com](http://www.agoda.com)).

## 2. REVIEW OF LITERATURE

### 2.1 Customer satisfaction

There are a diverse range of factors that affect customer satisfaction in the hospitality sector. Overall, there is a significant relationship between satisfaction of hotel services and intention to return to the same hotel (Usta et al 2011).

The quality of service often has the highest correlation with overall guest satisfaction (Stringam, Gerdes, & Vanleeuwen, 2010; Poon & Low, 2005; Heung, 2000). Other attributes that are considered fundamental are the availability of personal care, room quietness, reliable wake-up call, availability of in-room safety box, helpfulness of the information desk, and hygiene and cleanliness of the premises (Heung 2000). Studies have also indicated that there is a correlation between a hotel's star-rating and guest satisfaction with a correlation between a higher star-rating with greater customer satisfaction (Bulchand- Gidumal 2013).

On the whole, past studies also support the notion that safety, external leisure environments, and accurate and fast professional service contributes to travellers' satisfaction (Lin et al. 2011) and acknowledge the differences in perception between gender: men and women's judgment of various aspects of services are significantly different (Suki, 2014). Perceptions also differ across travellers of different geographical regions. Poon & Low (2005) found that Asian travellers are highly influenced by pricing compared to Western travellers who are more influenced by safety and security measures. Despite various perceptions, the quality of service can be considered as the most significant contributor to customer satisfaction. Hence, service staff plays a major role towards the rating of a hotel. According to He, Li, & Lai (2011), service climate which includes employees' perception of all organisational policies, practices, and rewards system could encourage offering high quality service among hotel staff.

Service climate is made of three major components: managerial support, work facilitation, and customer orientation. When the components are balanced and coordinated, it leads to employee commitment and results in satisfactory service and satisfied customers. Studies have supported the notion "that all employees' behaviours, either negative or positive, are highly correlated to the customers' overall satisfaction" (Kattara et al. 2008).

Li, Ye, & Law (2013) grouped elements that affect customer satisfaction of hotels in the following categories: logistics, facilities, reception services, food and beverage management, cleanliness and maintenance, and value for money. Logistics refer to convenience and transportation, while facilities refer to physical nature of the hotel and reception services such as checking-in and out procedures and other front-desk services. Cleanliness and maintenance refers to the overall hygiene level of the entire hotel.

### 2.2 Service quality

Service quality refers to the various types of service and different service providers in different disciplines. The evaluation of services is often subjective because some kinds of services are intangible and not usually standardized (Tsaur & Lin 2004). Consumer perception and expectation of service quality are also bound by cultural background which makes it difficult to set a universally accepted

standard and definition (Ueltschy et al. 2007). Thus, determinants of service quality cannot be always generalized and universalised (Chowdhary and Prakash 2007).

However, there are a number of proposed models and frameworks to measure different attributes of service quality; because hotels can increase competency by increasing service quality (Tsauro and Lin 2004). One of the widely used models to measure service quality is SERVQUAL. It consists of five dimensions: tangibles, reliability, responsiveness, assurance, and empathy. The differing scores on each dimension indicate the perception towards service quality (Zeithaml et al. 1988). Chowdhary & Prakash (2007) found that reliability is the most influential dimension affecting overall perception of service quality.

In the case of the hospitality sector, quality is the major focus and often poses a challenge to hotels as services can be easily affected by other factors such as employee satisfaction. Hence, quality in service is highly dependent on every employee (Brown et al 1998), making employee behaviour management an important aspect in ensuring quality in service (Tsauro and Lin 2004).

### 3. RESEARCH METHODOLOGY

The study relied on text mining and content analysis of 3000 online traveller reviews covering 3-star hotels. The online reviews utilized in this study were extracted from Middle East category of Agoda.com which had in its list a total of 12 Middle Eastern countries during the time of review.

The initial data gathering process involved the extraction and transfer of the online reviews into a single manageable document. The data was subsequently exported into the Nvivo 7 qualitative data analysis software. The comments on each hotel were categorized in terms of satisfactory and dissatisfactory feedbacks. Based on this comment the staff behaviors that affected the customers' satisfaction were identified.

### 4. DATA ANALYSIS

Reviews on hotels are a great source of information on both the positive and negative behaviours of employees. It also sheds light on the behaviours that are appreciated or reported displeasing by hotel guests. One of the interesting findings of this study is the fact that customers tend to generalize an act or behaviour of an employee as an indicator of their personality as the following example shows:

- a. *"The front office male was rude and unsympathetic"*
- b. *"He never smiled and he was not helpful at all"*

The construction of the sentence signposts and important customer linguistic behaviour – the reviewer did not write *"he didn't behave politely"* or *"he behaved rudely"* in reference to a specific incident; instead he/she made a conclusion that the receptionist was rude and unsympathetic in general. In conclusion, a customers' perception of an employee might come from a mere visit and a second opportunity might not exist to compensate any wrong behaviour.

In describing the negative behaviours of hotel employees, reviewers labelled them as "rude", "unsympathetic", "impolite", "unhelpful", "slow", "unwelcoming while the positive attributes were "polite", "helpful", "responsive", "friendly", and "attentive". Staff and receptionists' behaviour during guest arrivals



have a great influence on their total perception of the staffs' hospitality. Being greeted nicely, having their luggage attended to upon arrival, fast check in, and warm and friendly greetings were among the attributes that were highly appreciated.

Guests also expected to be treated fairly in comparison with other guests during arrival and check-in, often comparing staff's difference in attitude and behaviour between different guests. Some reviewers have indicated that other guests received more assistance with the luggage upon arrival and this has been negatively reviewed. This is also evident in a comment by one reviewer who stated that the hotel receptionists in a particular hotel were unhelpful and unkind while another reviewer indicated that they had been very helpful.

Naturally, when the reality exceeded travellers' initial expectation, they were very pleased. For example as indicated in Table 1, a customer who booked a single bed was delighted when he was provided a room with a queen-sized bed. In all the reviews there were few complaints about the gym or entertainment facilities.

The following table displays the data related to employees' behaviour that was extracted from the reviews.

Table 1: Analysis of comments on employees' behaviour

Comments	*Satisfactory behaviour **Dissatisfactory behaviour
"once arrived in the hotel we were nicely greeted and all	*Warm greeting upon arrival
"We were greeted warmly in reception and the check-in process was over in minutes"	*Warm greeting upon arrival
	*Fast check in
The reception staffs are slow and unwelcoming	** slow check in
"Check in time is at 14 but we waited to get to our room for 30 minutes"	
my luggage were picked up immediately by the bell boy"	*carrying the customers' luggage
even though we arrived early at 9 Am, before check in time, they invited us to have the breakfast"	*In breakfast before check in time
"Hotel desk staffs answered all my 100 questions"	*Being patient with the guests
First thing the staffs did was the dos and don'ts whilst in Istanbul.. he also gave some tips on where to shop"	*Friendly advices about the city
	*Advising about where to shop
"Some customers were assisted with their luggage but I wasn't helped"	**Unequal action in picking up the guests' luggage
"I stayed here for three nights and every day I felt welcomed like it was my first day"	*Repeated warm greetings and behaviour everyday
"We were greeted every morning and evening with a warm smile and friendly chat"	
They checked with us often to see that were happy"	

"The kitchen was closed already, but they opened it up just for us so we could try some local food."	*Opening kitchen in un promised hours
Staff were friendly and they quickly respond to our requests.	*Quick response to the guests' inquiries
"Friendly staffs organized us a cheap trip to petra"	*Arranging a cheap trip
Hotel desk staffs answered all my 100 questions	*Being patient with the customers' questions
"Hotel staffs are able to speak English"	*The ability to speak English
"housekeeping do not clean the room if I didn't call"	**Not regular house keeping
"we stayed 4 days they never fill the tea bag or coffee"	**Not filling the coffee bags
"to remind them each 15 mins or you will never get anything"	**Requiring several reminder
...the fourth day room service came at 19.00 when we were in the room, the fifth day they came at 9.00 in the morning when we were still asleep and rang the bell many times until I finally opened.	** Irregular timing for services

As indicated in the above table, the guests' comments during their hotel stay mostly revolved around the staff responsiveness to enquiries, their services and behaviour. Customers expected the staff to be efficient, and to be able to meet their requests quickly. When this expectation wasn't met signs of dissatisfaction often appeared. For instance, when housekeeping staff did not ensure the room was tidied up daily and the complimentary tea/coffee was not replenished automatically, they were irked.

On the other hand, staff's friendly demeanour such as a warm smile or greeting and responses to questions and requests made the customers very happy.

## 5. DISCUSSION AND CONCLUSION

The current study aimed to examine the impact of employees' behavior on customers' satisfaction. The result of this study indicated that 1) fast response to guest inquiries, 2) Regular timing for house keeping, 3)arranging cheap trip, 4) equal behavior with all guests, 5) fast check in, 6) strong communication skills and the ability to speak English fluently, 7) nicely, warm greetings every day, 8) Carrying the customer luggage, 9) giving friendly advices about the city, 10) being Patient were the most mentioned behaviours that affect customers' satisfactions with 3 star hotels in Middle East (see figure 1).

A hotel's success and growth is determined by its ability to understand and cater for the needs and expectations of the customers. Accordingly it is crucial that studies such as this are conducted to elucidate important information on customers' perception on the hotel's performance. The study is particularly significant as it studied the expectations and satisfaction levels of actual users of the hotels which were gleaned from the online reviews which provided the researchers with a rich source of data.

Such data can be utilised by hotel managers and others who work in related industries like construction to improve the hotel industry; the hotel industry like any other business requires customers to buy their services and understanding their needs and expectations is the first step to improve performance. It is not an overstatement to state that customer satisfaction is the key as satisfied customers will be attracted to stay at the hotel again in the future. They are also expected to recommend the hotel to other travellers if they are satisfied. Hence, it is important that the findings of this and other studies are used by the industry.

On the whole, this study posits that travellers not only expect a comfortable place to stay with various amenities but also expect to be serviced by staff members who are warm and friendly and willing to cater to their requests. As such, it can be argued that employees who contribute to the guests' positive hotel experience also contribute significantly towards customer satisfaction. This study has also indicated that content analysis is a viable research tool for online review of texts in relation to this study. It provided a framework for an in-depth linguistic exploration of these comments to gain a clearer picture on the global expectations of the reviewers who were guests of the 3 star hotels.



Figure 1: The employee's act and behavior that affect the customers' satisfaction

## RESIDENTS' PERCEPTUAL ANALYSIS ON LIVEABILITY IN THE PLANNED HOUSING ESTATES OF NIGERIA: EMPIRICAL EVIDENCE FROM NIGER STATE

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### ABSTRACT

The government of Nigeria and the state government of Niger in particular, are committed to the development of housing, especially for the low-income group in the state. The housing estates as popularly called have housed many families of the low-income group in the state, however, till to date no effort have been made to understand the perception of the beneficiaries about the liveability of their housing estate. This paper intends to focus on the state of liveability of three public low-income housing estates in Minna, Niger State, Nigeria and the investigation used data derived from a pool of household surveys with 366 respondents. This paper used survey research design to unveil the challenges confronting the residents of the selected housing estates. The residents' perception of liveability was assessed through five dimensions - housing unit characteristics, economic vitality, security, neighbourhood facilities and social interaction. Data elicited from the structured questionnaire administered were subjected to descriptive statistics, factor analysis and structural modelling. The results show that the respondents were dissatisfied with most of the neighbourhood facilities in the housing estates. Hence, to improve the liveability of these housing estates, this paper recommends rehabilitation of the neighbourhood facilities in these housing estates. Also, the neighbourhood facilities management strategy should be put in place by the appropriate authority in collaboration with the residents of these housing estates.

**Keywords:** Neighbourhood environments, Liveability, Planned Housing Estate, Household Survey

### INTRODUCTION

The Nigeria population growth rate is one of the highest in the world. Recent available data shows an annual population growth rate of 5.8 percent. By projection, it has been estimated that over 60% of the total population of Nigeria will live in urban areas by the year 2025. Over the years, there has been a continuous increase in the proportion of the Nigerian population living in the cities. This results in Nigerian cities ranking among the fastest growing in the world. However, the population increase has escalated the housing demand while housing supply shortfall of 17 million units (Yari, 2013). Evidently, Nigerians are under housed and the pressure on the available housing has increased



the rate of environmental deterioration and as a result, Nigerian cities were ranked among the lowest liveability index in the world (Mercer Human Resource Consulting, 2011; Economists Liveability Report, 2012). In putting the situation under control, the Nigeria governments at all levels have since acknowledged housing as universal basic needs of man. Housing as defined in the National Housing Policy of Nigeria (2012) is the process of providing safe, comfortable, attractive, functional, affordable, secure and provided with a healthy environment with infrastructure services at affordable cost. This is in tandem with the objectives of the United Nations Habitat Agenda 21 (UN-Habitat, 2006). In other words, housing remains a global affairs and it is seen as a fundamental human right. The implication of this, is that, everyone should have access to housing well develop with the require infrastructure that make it functional and liveable. The non-existence of any of the essential infrastructure will make the so call planned housing estates inhabitable for human life. Public housing projects across the world are developed for the main purpose of improving the living conditions of citizens in the different countries. In Nigeria for instance, the goal of the current housing policy is to ensure that all Nigerians own or have access to decent, safe and sanitary housing in a healthy environment with infrastructural services at affordable cost, and with secure tenure (National Housing Policy, 2012). In pursuance of this goal, governments at the federal and state levels in Nigeria have developed large-scale public housing for the citizens. In view of the fact that public housing schemes in Nigeria and other countries are implemented within the context of the existing housing policies, therefore, there is a need to examine the current situation of housing stock in Nigeria and in particular Niger State and how such housing schemes have achieved the goal of meeting housing needs of the target population. Given the above scenario, this study, therefore, focuses on the state of liveability of the planned housing estates in Minna, Niger State, Nigeria. The study is guided by the following objectives;

1. To examine the state of the living environment of the planned estates
2. To explore the perception of the residents of the planned estates
3. To test and validates the hypothesized model
4. To provide recommendations that will help improve the liveability of the housing estates.

## LITERATURE REVIEW

### Government Mass Housing Intervention in Nigeria

Government housing intervention in Nigeria predates independence, although the provision was limited to the staff quarters and staff housing loans to government workers. In the late 60s, the government housing interventions were extended to the direct housing construction for the public and provision of site and services. Thus, between 1972 and 1973 the federal government planned to construct 54,000 housing units at different locations in Nigeria under the supervision of the Federal Housing Authority (FHA). The numbers of housing unit were shared as 60 percent for the low-income groups, 25 percent for the middle-income and 15 percent for the high-income group (Olayiwola *et al.*, 2005). It can be inferred in the plan that the low-income group was given top priority in the housing scheme. This recognition continues in the government successive housing program in the country till now as Nse (2012) observed that low and middle income groups represent 65% of Nigeria's population. In the Third National Development Plan (1975-1980) the government pledge to provide housing for "all income groups" although the number of housing units targeted was not achieved still a mass unit of 28,280 was constructed. However, the Fourth National Development Plan (1981-1985) was a giant stride under the second democratic government of Nigeria, which constructed 64,000 housing units across the 19 states and Abuja before the government was toppled in 1985 by the military (Olotuah and

Bobadoye, 2009). Housing provision for the public was neglected for the period of 1985-1991 (Olayiwola *et al*, 2005; Ifesanya, 2012). The ultimate goal of the National Housing Policy of 1991 was to guarantee that all Nigerians would own or have access to decent housing accommodation at affordable cost by the year 2000. Unfortunately the same year marked the technical end date for the policy (Ndubueze, 2009). Following the 1994 Federal government new housing scheme (National Housing Fund) to build housing units in the state capitals, evidence shows that 1,114 housing units were completed (Olotuah and Bobadoye, 2009). However, the return of democratic government in 1999 ushered in the 2002 National Housing Policy for the country which was private driven for the provision of housing units resulted in high cost of houses and far beyond the reach of the low-income of the society. Consequently, new synergy between the government and the private sector brought about the 2012 National Housing Policy which is public-private partnership targeted to cater for the low-income housing provision as well as other income groups. Both the federal and state governments are collaborating in the provision of housing for the citizens. Niger state has benefited from a federal government housing scheme about 660 housing units constructed in the state since its creation in 1976, a total of 1,381 housing units have been constructed before the year 2007. Moreover, the public housing profile in the state capital, Minna continues to increase for instance, the 500 housing units of M.I. Wushishi housing estate in eastern bye-pass Minna was completed and occupied in 2010. Another 500 unit's housing estate in Minna (Talba Housing Estate) was initiated in 2010 and currently beneficiaries are receiving their allocation. In addition, close to 4000 housing units are under construction presently at various cities of the state including the state capital Minna.

### Liveability Concept

Liveability is a relative term, of which the actual meaning depends on the place, time and purpose of the assessment, and on the value system of the assessor (Pacione, 2003). Pacione statement reflects liveability as a nebulous term in which almost everything fits such as quality of life/well-being, sustainability and residential satisfaction. Thus, various definitions, dimensions and indicators of liveability exist and similar to other concepts as its boundary is determined by the researcher's focus. Today, on a global level, the economic intelligent unit (EIU) and Mercer remained the internationally recognized bodies that conducted the liveability study of cities. For the EIU (2012), liveability assessed the living condition of locations around the world, and the living cost in the cities (Mercer quality of living survey, 2011). Partners for Liveable Communities (2002) defined Liveability as the totality of factors that combine to a community's quality of life as well as the built and natural environments, economic prosperity, social stability and equity, educational opportunity, and cultural, entertainment and recreation possibilities. Similarly, Balsas (2004) described Liveability as a series of elements that make a city liveable and is generally understood to encompass those elements of home, neighbourhood, and metropolitan area that contribute to safety, economic opportunities and welfare, health, convenience, mobility and recreation. Further, Heylen (2006) sees liveability as the perception of the environment from the subjective evaluation of the quality of the housing conditions. Kennedy and Buys (2010) sum up that liveability has been broadly defined as "the well-being of a community and represents the characteristics that make a place where people want to live now and in the future". Evidence from the extant literature shows there are different views about the dimensions that should be included to capture the concept. To a large extent, these different views stem from a different background discipline. However, on the empirical study, Heylen (2006) affirmed that liveability studies in Flanders and the Netherlands have been made operational through perception of four dimensions to include; Housing/dwelling quality, Physical environment quality, Quality of the social environment, Safety of the neighbourhood. Similarly, Omuta (1988) investigated the liveability of Benin City, Nigeria through six conceptual standards such as employment, housing, amenity, education, nuisance and

socio-economic dimensions. Chaudhury (2005) examined the liveability of Dhaka and Khulna, Bangladesh. The evaluation focused on consumer goods, utility services, housing affordability (rent), social security and environmental conditions. In his liveability study of Fairfield, Newtown in New Zealand and Churton Park in Canada, the measurement variables include; connectivity, accessibility, mixed use and density (Betanzo, 2009). Vuchic (1999) cited by Woolcook (2009) view urban liveability as “generally understood to encompass those elements of home, neighbourhood, and metropolitan area that contributes to safety, economic opportunities and welfare, health, convenience, mobility, and recreation”. From the above review, liveability is broadening in scope which depends both on the objects of measurement and the perspective of those making the measurement. For instance, the Mercer quality of living survey (2011) shows only three African cities, namely; Port Louis in Mauritius, Cape Town and Johannesburg in South Africa made it to the top 100 liveable cities out of 220 cities evaluated while others were found in the bottom 25. The cities were evaluated based on the following dimensions; Political and social environment, Economic environment, Socio-cultural environment, Health, Education (standard to include availability of international schools), Public services and Recreation, Consumer, Housing and Natural environment. Similarly, Economists Intelligent Unit (2012) liveability Report ranks Lagos, Nigeria 138th out of 140 cities surveyed. Following this backdrop, various liveability dimensions and indicators as found in the extant literature serve as a gateway to this study from which ideas are used to construct the study framework which stems from Heylen’s (2006) Model of the perception of the residential environment.

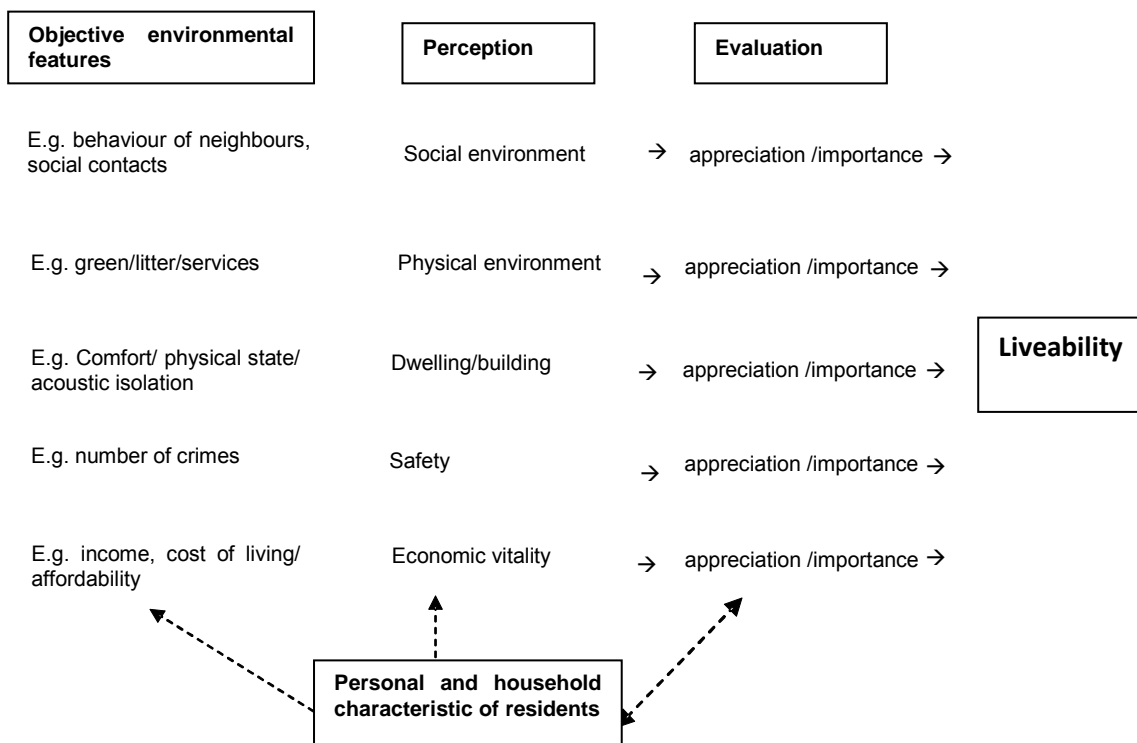


Figure 1: Model of the perception of residential environment  
Source: Modified after Heylen, 2006

## RESEARCH APPROACH

This research employs a questionnaire survey distributed in the three selected planned housing estates namely; M.I. Wushishi Estate, Bosso Estate and Tunga Low-Cost. The distribution was based on stratified random sampling in order to cover the types of housing units. A total of 400 questionnaires was administered, however, 366 valid questionnaires representing about 91.5% of the administered questionnaires were retrieved. The questionnaire instrument used was designed based on the findings from the review of literature. Based on the model (Fig. 1), a total of 40 objective liveability indicators comprising housing units' characteristics (sizes; house, living room, dining, bedroom, kitchen, and numbers of bathroom, toilets, garage, affordability, road network, estate cleanliness, housing condition and ventilation), neighbourhood facilities (children education, healthcare, shopping centers, garbage collection, portable water, open/green space, electricity supply, nature of roads, public transport, drainage system and community hall), safety environment (crimes, accidents, property theft, policing, fire-fighter service, vigilante and street lighting), economic vitality (income, transportation cost, loan effect on income, public transport accessibility, living standard) and social interaction (neighbours communication, pressure group and community activity) were used. The respondents were asked to rate the level of their satisfaction using a five-point Likert scale where 1 represent the least and 5 is the highest level of satisfaction. Data on the demographic profiles of those the survey questionnaires were administered to was also collected through the questionnaire.

Subsequently, data collected were analyzed using SPSS with AMOS version 22. The analysis includes; descriptive statistics on the percentages of the socioeconomic characteristics of the respondents and mean values of each of liveability indicators as assessed by the 366 respondents. For interpretation, values between 1.0 and 2.9 were considered to be within the region of dissatisfaction, while values between 3.01 and 5.0 were in the region of adequacy and satisfaction. The value point 3.0 is the neutral point describing uncertainty. A similar interpretation was adopted in previous studies (Salleh, 2008; Iben and Aduwo, 2013). The second type of analysis conducted was an exploratory factor analysis based on the principal component method with varimax rotation. This was conducted to explore the uni-dimensionality of the hypothesized model (see Fig.1).

The last analysis conducted was confirmatory factor analysis (CFA) to observe how well the measurement items reflect their respective latent variable in the hypothesized model (Zhu *et al.*, 2008). The criterion as found in the literature shows RMSEA value  $> 0.05$  indicates a good fit (Marques *et al.*, 2015), the CFI cut off should be  $> 0.9$  (Navabakhsh and Motlaq, 2009). However, the statistical assumptions required for conducting CFA were carried out. These include; checking for outliers, assess normality distribution – Skewness and Kurtosis, and Multivariate normality (Adul Malek *et al.*, 2012; Marques *et al.*, 2015).

## RESULT OF ANALYSIS

### Socio-Economic Profile

The respondents in the survey include males (79%) and females (21%). The result shows 94% attended a tertiary institution and about 83% are in the age of 31-60years. Further, average age stood at 43years, 85% are married, and the average household size is seven. Over two-third were gainfully employed and the majority 63% monthly income shows N100, 000.00 (US500). Besides, 76% represents owners' occupied, and 24% are renters, and 73% have stayed in the areas less than ten years. The above profile has shown the participants in the survey could be said to have enough

knowledge of their neighbourhood environment, and therefore, the data emanated from them could be regarded as reliable.

### Evaluation of Housing Estates Liveability

The analysis of the respondents' perception of their housing unit characteristics and economic vitality showed overall mean values of 3.40 and 3.41 respectively; suggesting that the respondents felt that this characteristic in all the three housing estates met their needs, expectations and aspirations. However, the respondents' perception of the other dimensions which include; neighbourhood facilities, safety environment and social interaction with the overall mean values of 2.71, 2.97 and 2.64 respectively shows that their needs, expectations and aspirations regarding these were not met (see Table 1).

Table 1: Mean satisfaction for the liveability dimensions

Liveability dimensions	M.I. Wushishi	Bosso Estate	Tunga Low-Cost	Overall Mean
Housing unit characteristics	3.10	3.54	3.58	3.40
Neighbourhood facilities	2.62	2.60	2.91	2.71
Safety environment	2.82	2.93	3.16	2.97
Economic vitality	3.18	3.37	3.71	3.41
Social interaction	2.65	2.70	2.57	2.64

The result of exploratory factor analysis of the data in this study shows absence of singularity of item(s), the data was free of multi-collinearity problem such that all correlations were  $< 0.9$  (Eugenie *et al.*, 2014). The Kaiser-Meyer-Okin (KMO) and Bartlett's Test for adequacy of sample size for factor analysis was achieved as the value of 0.917 was obtained for KMO as against 0.05 minimum criteria. Also, a Bartlett's significant value of 0.000 was obtained which satisfied the criteria of value  $< 0.05$ . Thus, four-factor were extracted, and the result indicates based on eigenvalues of 1, the total cumulative variance explained about 66.868%.

The confirmatory factor analysis (CFA) conducted confirmed the goodness of fit of four-factor for measuring the liveability of the planned housing estates (see Fig. 2).



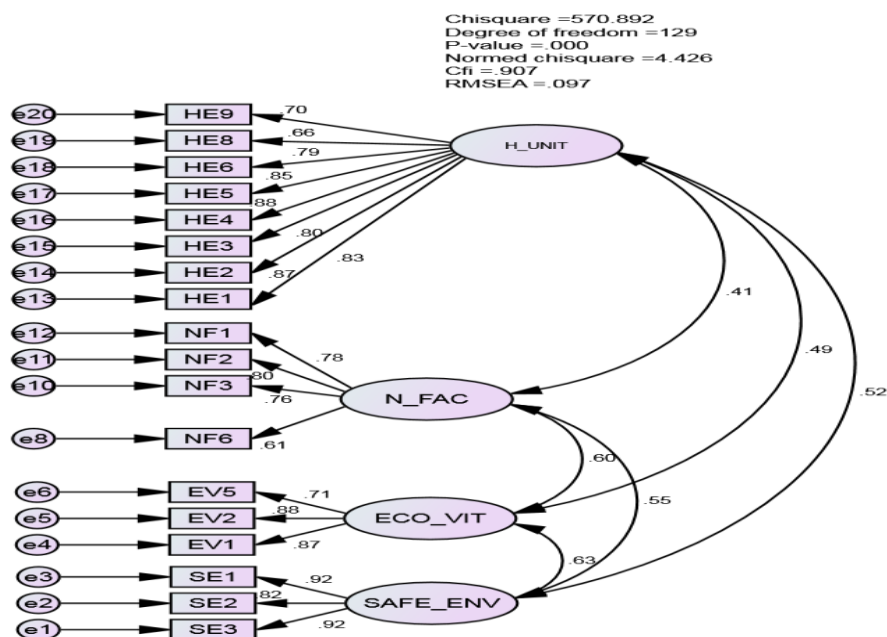


Figure 2.

Table 2: Measurement indicators

Constructs	Factor	Description
Housing characteristics (H_UNIT)	HE1	Housing unit size
	HE2	Living size area
	HE3	Dining area size
	HE4	Bedrooms size
	HE5	Kitchen size
	HE6	Toilet and bath size
	HE8	Housing unit ventilation
	HE9	Affordability
Economic vital (ECO_VIT)	EV1	Total monthly income
	EV2	Public transport accessibility
	EV5	Standard of living
Neighbourhood facilities (N_FAC)	NF1	Children's educational services
	NF2	Health care services
	NF3	Garbage collection
	NF6	Recreational facilities
Safety situation (SAFE_ENV)	SE1	Safety from crime
	SE2	Safety from accident
	SE3	Safety of properties

## DISCUSSION AND CONCLUSION

The respondents perceived their housing units' characteristics reasonably adequate and affordable. However, they express low satisfaction in relation to the safety situation; neighbourhood facilities and social interaction (see Table 1). Noticeably, the average household size in the study area stood at seven and average age stood at 43years. The policy implication of this is that, there is a need to provide for more access to housing because the access age of 43years is high compared to what is tenable elsewhere in the world. Also, an average household size of 7 implied that the current housing policy of the state of building more two bedrooms rather than three bedrooms may result to housing inadequacy. Therefore, it is recommended that the government should be pro-active in the provision of more housing in order to give more access as early as one desire. Also, government should consider building more three bedrooms and above given the average household size found in the study areas. Furthermore, adequate neighbourhood facilities and maintenance strategies should be in place. Also, on the safety situation, it is necessary for the inclusion of the security plan at the inception of conceiving such a planned housing estate. Conclusively, the CFA conducted in this study has validated the measurement indicators for the liveability assessment of planned housing estates.

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## DIAGNOSIS QUALITY MANAGEMENT SYSTEM IN CONSTRUCTION MILITARY ENTERPRISE

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### ABSTRACT

This paper illustrates how the diagnosis and evaluation the Quality Management System QMS in military enterprise which did not apply ISO 9000 according to quality gurus' visions and using Seven-Scale of ISO to check gap analysis in QMS of in Iraq Directorate of Military Works (IDMW). The QMS can be defined as the organizational structure, processes, procedures, and resources needed to implement, maintain, and continually improve the management of quality. Although, ISO 9000 QMS standards developed by the International Standards Organization (ISO), is widely used in the construction industry. However, no satisfactory proof was found about the improvement's positive reaction by ISO 9000 certified. There are many claims of construction organisations enjoyed the benefits and advantages of being an ISO 9000 certified are literally proven, the main objective of QMS implementation namely the achievement of stakeholders' satisfaction in the construction projects is not up to the required level. Applying ISO 9000 QMS in military enterprise still risky because of Correlation with the requirements of national security and its impact on mission performance of an army readiness. For example, Some American military (MIL-Q-9859) and NATO (AQAP-1) standards are the origins for ISO 9000.

**Keywords:** Total Quality Management, Quality management, ISO 9000

## PROBLEM STATEMENT

Total quality management (TQM) has been present in the military organization field since 1988 (McCarthy & Eishennawy, 1991). However, applying TQM in the military construction organization is highly complicated and inconsistent with the military methodology in certain cases. First, applying TQM is a common responsibility among senior management and employees of an organization. Second, TQM lacks specific goals. The improvement does not have a distinct path toward achieving certain goals. These reasons are apparently incompatible with the concept of chain of command and the pre-defined tasks in the military regime (Blomberg, Cotelleso, Sitzabee, & Thal, 2014; Radulescu, 2013; Winsor, 1996). Research results related to the construction of military projects are not disclosed to the public (McCarthy & Eishennawy, 1991). Hence, the establishment of a paved system to TQM, which is a quality management system (QMS), is promoted. The requirement of QMS is the first step toward the application of TQM in an organization (Quazi & Padibjo, 2006).

The military organization requires QMS to demonstrate that its processes are both operative and under control, and that procedures and systems are supervised effectively. The pressure to prove that systems and procedures are in place and functioning has induced the demand for quality assurance based on the development of QMS standards (Al-Khatib, 2008; Ilkay & Aslan, 2012; Sun, 1999; Tsiotras & Gotzamani, 1996). The QMS pertains to a network of processes consisting of responsibilities, authorities, relationships, functions, plans, policies, procedures, practices, processes, and resources. It aims to satisfy quality management requirements and to ensure customer satisfaction with the quality of products or services (ISO, 2005).

The International Organization for Standardization (ISO) submitted the first standard requirements for any organization, whether for profitability, service, or advisory purposes; moreover, it set the principles, process approach, and requirements for QMS through four specifications known as the ISO 9000 family (Cao, 2010). The ISO 9000 QMS has been recognized internationally and adopted by 250,000 companies in 163 countries (ISO, 2013).

Although the ISO approach does not achieve TQM, its application engenders other benefits. Applying ISO 9000 QMS in the construction firm strengthens the corporate image, develops operational procedures, increases competitive power, output, and communication among employees of the firm, reduces material waste (Ofori, Gang, & Briffett, 2002), protects the international market shares, facilitates the inclusion of new projects, and provides competitive advantage (Ahmed, Aoieong, Tang, & Zheng, 2005; Yates & Aniftos, 1997).

Regardless of the approach adopted toward the quality management maturity of the military construction organization, a business may need to demonstrate to the regulatory authorities that its processes are both effective and under control and that procedures and systems are supervised efficiently. In addition, an organization should identify the gap between the current QMS and the QMS standard because QMS requirements define a uniform meaning and agree with the principles and processes. The requirements do not harm businesses. They facilitate the assessment of their compatibility in an administrative perspective on a global level. This aspect prompted numerous military construction organizations to adopt QMS similar to QMS in ISO 9000, such as the American Military Standard MIL-Q-9858(a), the North Atlantic Treaty Organization Allied Quality Assurance Publications



(AEQP-As), and the Canadian Standards Association (CSA) CSA-Z299 (Dale, Van Der Wiele, & Van Iwaarden, 2007).

The majority of studies have focused on the process of evaluating and measuring the gap between the ISO 9001 requirements and the actual QMS within different industrial sectors as the basis for evaluating the effectiveness of their QMS (Abdullah et al., 2011; Llach, Marimon, & Bernardo, 2011; Sumaedi & Bakti, 2011).

## LITERATURE REVIEW

QMS can be defined as “A set of co-ordinated activities to direct and control an organization in order to continually improve the effectiveness and efficiency of its performance” (Al-Khatib, 2008, p. 264).

These coordinated activities interact and are affected by being in the system. Hence, the isolation and individual study of each activity in detail will not necessarily result in an understanding of the system as a whole. The major thrust of QMS is in defining the processes, which will induce the production of quality products and services, rather than in detecting defective products or services after they have been produced (Garvin, 2012).

A fully documented QMS will ensure that the following important requirements are met:

- 1) Customer requirements refer to the confidence in the capacity of the organization to consistently deliver the desired product and service, and thus meet needs and expectations (Olander, 2007).
- 2) Organizational requirements consider internal and external demands at an optimum cost and the efficient use of available resources, such as materials (Formoso & Revelo, 1999), human resources (El-dash, 2007), technology (Dogra, Sharma, Sachdeva, & Dureja, 2011), and information. These requirements can only be fully met if objective evidence is provided in the form of data (Falge, Otto, & Osterle, 2012) that support the system activities of the supplier to the customer.

ISO (International Organization for Standardization) was founded in 1946 in Geneva, Switzerland. It is an independent and non-governmental membership organization and the largest developer of voluntary International Standards because of membership comprising 163 countries that have national standard bodies around the world (Besterfield et al., 2012). The ISO Technical Committee 176 (ISO/TC 176) developed a series of international standards for quality systems. These standards were first published in 1987. The ISO 9000 series was intended to be advisory and developed for use in two-party contractual situations and internal auditing. However, with the adoption of the European Community (EC) and a worldwide emphasis on quality and economic competitiveness, the standards have become universally accepted. The fourth edition of ISO 9001 was released in 2008, and has replaced the third edition. ISO 9000 registration requires the third-party assessment of the quality standards and procedures of a company. Regular audits are conducted to ensure that systems do not deteriorate.

ISO 9001:2008 sets the criteria for QMS and is the only standard in the family that can be certified, although obtaining the certificate is not a requirement in ISO 9001:2008). This standard requirements in ISO 9001 can be used by any organization, regardless of its size or field of activity. In fact, ISO 9000:2008 includes eight clauses. Clauses 1, 2, and 3 are general requirements, whereas

clauses 4, 5, 6, 7, and 8 represent the fundamental clauses. The fundamental requirements clauses are briefly described as follows (Ilkay & Aslan, 2012).

- 1) Clause 4–Quality Management System: Sets the requirements for identifying, planning, documenting, operating, and controlling QMS processes, as well as continually improving the effectiveness of QMS.
- 2) Clause 5–Management Responsibility: Sets the requirements for top management for demonstrating its leadership and commitment to continually develop, implement, and improve QMS
- 3) Clause 6–Resource Management: Sets the requirements for determining, providing, and controlling various resources needed to operate and manage QMS processes, and thus continually improve QMS effectiveness and enhance customer satisfaction by meeting customer requirements.
- 4) Clause 7–Product Realization: Sets the requirements for planning, operating, and controlling specific QMS processes that determine, design, produce, and deliver the products and services of organizations.
- 5) Clause 8–Measurement, Analysis, and Improvement: Sets the requirements for planning, measuring, analysing, and improving processes that demonstrate product and QMS conformity and continually improve QMS effectiveness.

## METHODOLOGY

ISO 9001:2008 is the only standard in the ISO9000 series that sets the standard requirements for a QMS to obtain a certificate, although the certificate is not a requirement in ISO 9001:2008. The standard requirements can be used by any organization, regardless of size and field of activity. In fact, ISO 9000:2008 includes eight clauses. Clauses 1,2, and 3 are generally requirements, whereas clauses 4, 5, 6, 7, and 8 represent fundamental requirements. Gap analysis checklists are effective tools to compare current QMS to the requirements of ISO 9000:2008 (Al-Khatib, 2008; Al-Mustafa, 2001; Darwish, 2010; Hadi, 2006). The importance of the gap analysis checklist is to translate the questions of the checklists to expressions of quantity and to access to greater accuracy the analysis of the data contained therein.

The checklist is the standard requirement in ISO9001, but items need to be rewritten in question format. A well-designed checklist is available on the internet ISO website (Resources, 2015).The auditor uses the appropriate gap analysis scale for the checklist items. Hence, the gap analysis scale is an auxiliary tool used by the researcher to determine the extent of conformity with standard requirements. Nonetheless, the researcher can use different scales in the same checklist according to the purposes of auditing process. Many types of scales are used in the analysis checklist.

The first scale is called “binary scale,” where each checklist item is evaluated by “implemented” or “not implemented.” This scale is simple and easy to use, but is not accurate to provide precise descriptions of the conformity of QMS with standard requirements (Al-Mustafa, 2001). The second type is the “tripartite scale,” where each checklist item is evaluated by “existing,” “documented,” and “implemented.” “Existing” indicates the presence of checklist questions in the organization system either as documented and/or implemented or not. “Documented” indicates knowledge and proper procedural documentation of checklist items, irrespective of whether the item was implemented. “Implemented” indicates knowledge and practice of checklist items, even though

such an item was not documented. The need to develop this scale resulted from the confusion between “existing” and “implemented” when evaluating QMS (Al-Khatib, 2008; Al-Mustafa, 2001).

The Seven-Scale is widely used in the evaluation of gaps research and will be used in this study because of its high accuracy in gap diagnosis (Al-Khatib, 2008; Al-Mustafa, 2001; Darwish, 2010; Hadi, 2006). Each item of the checklist is evaluated based on seven criteria, as detailed below. The item will receive six degrees when “completely applied and completely documented” with standard requirements. The item will receive five degrees when “completely applied and partially documented” with standard requirements. The item will receive four degrees when “completely applied and non documented” with standard requirements. The item will receive three degrees when “partially applied and completely documented” with standard requirements. The item will receive two degrees when “partially applied and partially documented” with standard requirements. The item will receive one degree when “partially applied and non documented” with standard requirements. The item will receive zero degree when “non applied and non documented” with standard requirements. Table 1 illustrates the seven criteria, degree weights, and conformance description of the Seven-Scale.

Table 1 Seven-Scale checklist to determine actual implementation of standard requirements (Al-Khatib, 2008, p. 326)

Item	Degree's weight	Range	Desc*
Completely applied and completely documented	6	6	CON
Completely applied and partially documented	5	4-5.99	OFI
Completely applied and Non documented	4		
Partially applied and Completely documented	3	2-3.99	NNC
Partially applied and partially documented	2		
Partially applied and Non documented	1	0-1.99	JNC
Non applied and Non documented	0		

\* Conformance description:- "JNC" (Major Non Conformance), "NNC" (Minor Non Conformance), "OFI" (Opportunity for Improvement) , and "CON" (Conformance).

After evaluating the degree of conformity for each item of the checklist, the following steps are used to determine the percentage of the application standard requirements (Al-Khatib, 2008, p. 327):

- 1) Calculate the Weighted mean of checklist item using Equation (1);  

$$\frac{\sum (W_i \times D_i)}{\sum W_i}$$
 (1)
- 2) Calculate the % of the actual application by using Equation (2).  

$$\frac{\sum W_i \times D_i}{\sum W_i} \times 100$$
 (2)
- 3) Calculate the % of gap application by subtracting % application from 100, as shown in Equation (3).  

$$100 - \left( \frac{\sum W_i \times D_i}{\sum W_i} \times 100 \right)$$
 (3)

Conformance description is required to explain conformance degree according to the weighted mean of fundamental clause as shown in Table . The levels of scale score are classified as follows (Al-Khatib, 2008):

- If the weighted mean between 0 to 1.99 then conformance degree is “Major Non Conformance” (JNC) means the absence (omission, not addressed) or total breakdown (commission, failure, not implemented) of a system to meet a specified requirement. A number of minor non-conformities against one requirement can represent a total breakdown of the system and thus be considered a major non-conformity.
- If the weighted mean between 2 to 3.99 then conformance degree is “Minor Non Conformance” (NNC) means A non-conformity that, based on the judgment and experience of the auditor, is not likely to result in the failure of the management system or reduce its ability to assure controlled processes or products. It may be either: A failure in some part of the supplier's management system relative to a specified requirement. Or, a single observed lapse in following one item of a company's management system.
- If the weighted mean between 4 to 5.99 then conformance degree is “Opportunity for Improvement” (OFI) means a situation or condition of a management system that may be weak, cumbersome, redundant, overly complex, or in some other manner, may, in the opinion of the auditor, offer an opportunity for an organization to improve its current status. OFI do not require any action on the part of the organization; however, the organization should give them serious consideration in view of the auditor's knowledge and exposure to similar systems. An OFI may be an improvement to the management system or could prevent future problems
- If the weighted mean is 6 then conformance degree is “Conformance”(CON) means adherence with the standard requirements. No major or minor non-conformances found.

## RESULT AND ANALYSIS

### 4.1. Realizing QMS Standard Requirements

The first purpose, objective of this research is intended to extrapolate the reality of the performance of the QMS through analysis the data and information related to the fundamental clauses of ISO 9001 in IDMW to diagnose the strengths (the total application of certain items and an almost complete applies to others that could be improved later) and weaknesses (total absence application of certain items) of each clause and identify the gap in the application using the checklist in Appendix C. The checklist is divided into five subsections according to the numbers of the fundamental clauses of ISO 9001. The summary of analysis results for 252 items shows the gap between IDMW with ISO: 9001 (QMS standard requirements) in by 30.66 %. IDMW had obtained a weighted mean 4.16 out of 6, and this makes it into the category of "Opportunity for Improvement" in QMS standard requirements as shown in Figure 1 below.

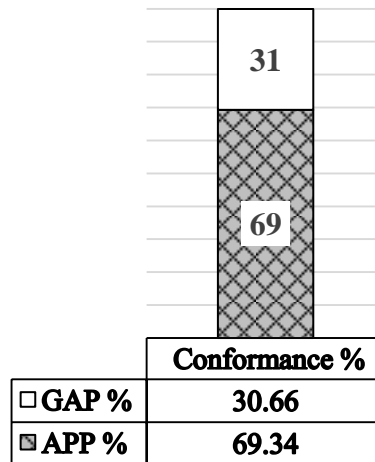


Figure 1. Standard Requirements Gap of QMS in IDMW

#### 4.2 QMS Standard Requirements

The checklist starts with the clause 4 of ISO 9001:2008 so that the numbering of all headers is synchronized with the ISO 9001:2008 version of the standard. While auditing, list documentation numbers of procedures and QMS Clauses that demonstrate compliance for each area. The checklist covers all clause areas through 32 items.

The analysis results show that the IDMW conformance percent this clause by 59.50%. IDMW had obtained a weighted mean 3.57 out of 6, and this makes it into the category of "Minor Non-conformance" in 4 th clause of standard requirements .

There are no completed conformance in any sub-clauses of this clause. The lowest conformance percent value is 16.67% in subclause 4.2.2 (Documentation requirements - Quality manual). Where , subclause 4.2.2 had obtained a weighted mean 1.00out of 6, and this makes it into the category of "Major Non Conformance". While, the highest conformance percent value is 83.34 % in subclause 4.2.4 (Documentation requirements - Control of records). Where , subclause 4.2.4 had obtained a weighted mean 5.00 out of 6, and this makes it into the category of "Opportunity for Improvement".

#### 4.3 Management Responsibility Clause

This clause covers management commitment, customer focus, quality policy and management review. This section will require participation from the top management and from the quality representative. The quality representative should be the best source for information about the management reviews. The checklist covers all clause areas through 38 items.

The analysis results show the conformance between IDMW with management responsibility clause in by 71.50 %. IDMW had obtained a weighted mean 4.29 out of 6, and this makes it into the category of "Opportunity For Improvement" in the management responsibility clause.

There are only one subclause (5.5.1 Responsibility and authority) out of eleven sub clauses is completely conformance with Standard requirements of ISO 9001. The lowest conformance percent



value is 44.50 % in subclause 5.6.3 (Responsibility, authority and communication). Where, subclause 5.6.3 had obtained a weighted mean 2.67 out of 6, and this makes it into the category of "Minor Non Conformance".

#### 4.4 Resource Management Clause

This Resource management clause covers infrastructure and work environment. This audit may require the attendance of the management representative, personnel, and a production or service manager. The checklist covers all clause areas through 21 items.

The analysis results show the conformance between IDMW with Resource management clause in by 57.50 %. IDMW had obtained a weighted mean 3.45 out of 6, and this makes it into the category of "Minor Non-conformance" in this clause.

There are no completely conformance in any sub-clauses of this clause. The lowest conformance percent value is 16.67 % in subclause 6.2.1 (Human resources - General). Where, subclause 6.2.1 had obtained a weighted mean 1.00 out of 6, and this makes it into the category of "Major Non Conformance". While, the highest conformance percent value is 91.67% in subclause 6.1 (Provision of resources). Where, subclause 6.1 had obtained a weighted mean 5.50 out of 6, and this makes it into the category of "Opportunity for Improvement".

#### 4.5. Product Realization Clause

The seventh clause of the internal audit checklist is very long and time consuming. It includes 97 questions covering several dissimilar areas. This checklist includes questions on product realization (production) and order entry including all customer contacts. It also includes design control, purchasing control, inventory control and control of measuring equipment.

This checklist includes questions on product realization (production) and order entry including all customer contacts. It also includes design control, purchasing control, inventory control and control of measuring equipment.

The analysis results show the conformance between IDMW with Product realization clause in by 81.34 %. IDMW had obtained a weighted mean 4.88 out of 6, and this makes it into the category of "Opportunity For Improvement" in this clause.

There were only six subclauses (7.0 Product realization, 7.3.3 Design and development-outputs, 7.3.5 Design and development-verification, 7.3.6 Design and development-validation, 7.3.7 Design and development-control of changes, and 7.5.4 Production and Service provision- customer property) out of twenty one subclauses are completely conformance with Standard requirements of ISO 9001. The lowest conformance percent value is 43.34 % in subclause 7.3.4 (Design and development-review). Where, subclause 7.3.4 had obtained a weighted mean 2.60 out of 6, and this makes it into the category of "Minor Non Conformance".

### MEASUREMENT, ANALYSIS AND IMPROVEMENT CLAUSE

Measurement, analysis and improvement clause of internal audit checklist is mainly focused on monitoring, measurement and analysis of quality data. Other key areas in part of the internal audit

include customer satisfaction, internal audits, non-conforming materials management and analysis of data. Analysing data about non-forming materials, inspection reports and final test result are all good forms of SPC.

The last clause is about continuous improvement. The key to showing continuous improvement is to have a good engineering change order system that builds record to demonstrate that the organization is doing corrections of known problems and performing preventive actions to make the products and the quality system better. The checklist covers all clause areas through 64 items.

The analysis results show the conformance between IDMW with Measurement, Analysis, and improvement clause in by 60.34 %. IDMW had obtained a weighted mean 3.62 out of 6, and this makes it into the category of "Minor Non-conformance" in QMS standard requirements clause.

There are only one subclause (8.2.2 Audit- Monitoring and Measurement of Product) out of ten subclauses is completely conformance with Standard requirements of ISO 9001. The lowest conformance percent value is 22.34 % in subclause 8.2.2 (Audit- Monitoring and Measurement of Processes). Where, subclause 8.2.2 had obtained a weighted mean 1.34 out of 6, and this makes it into the category of "Major Non Conformance".

Figure 2. Summarize the result of sub sections above and illustrates insufficiency the current QMS and a lot of intensifying efforts required to raise the response to the requirements of the standard quality management system.

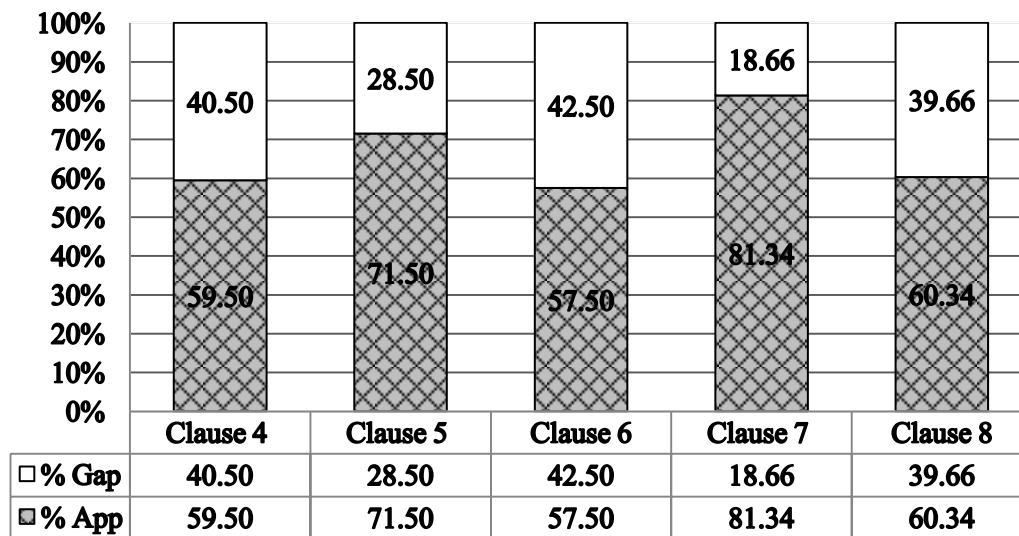


Figure 2: Conformance QMS Standard Requirements within IDMW

## CONCLUSION

The checklist has 252 items that covered the fundamental clauses 4, 5, 6, 7, and 8 of ISO 9001:2008 available on the internet ISO website (Resources, 2015). The results of the gap analysis checklist showed that the application gap of QMS in IDMW was 30.66 %, which falls into the category of "Opportunity for Improvement" under QMS standard requirements of ISO 9001. The 6th Clause (Resource Management Clause) recorded the lowest conformance of 57.50 % followed by the 4th clause (Quality Management System Clause) of 59.50% conformance and the 8th clause

(Measurement, Analysis and Improvement Clause) of 60.34 %. Conversely, the highest conformance was recorded by the 7th clause (Product Realization Clause) (81.34 %) followed by the 5th clause (Management Responsibility Clause) (71.50%).

Only 18 items from 252 items are totally absent within QMS. However, the organization should intensify efforts to treat the absent items as well as increase the response to the QMS standard requirements of ISO 9001. The result of this study is supported by previous studies (Al-Khatib, 2008; Al-Mustafa, 2001; Darwish, 2010; Hadi, 2006) but it is different in the treatment of bridging this gap. Previous studies suggested filling the gap through continuous improvement cycles of QMS standard requirements. However, previous studies had neglected the effect of a framework to guide senior management of organizations towards improved responding to the standard requirements which is known by QMPs and evaluating the quality processes (EQPs) that responsible for the implementation of those standard requirements. This study suggests that continuous improvement cycles must include QMPs and EQPs to avoid changing the path of QMS into a quality documentation system (Ahmed et al., 2005; Ofori et al., 2002; Yates & Aniftos, 1997).

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## EVALUATE THE QUALITY MANAGEMENT PRINCIPLES WITHIN THE MILITARY CONSTRUCTION ORGANIZATION

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### ABSTRACT

This paper illustrates how evaluation the Quality Management Principles (QMPs) which can be defined as a fundamental framework or beliefs for leading and operating an organization aimed at continually improving performance over the long term by addressing the needs of all stakeholders. The QMPs as a suitable environment for the application of Quality management system (QMS) approach which help an organization facing the contemporary requirements of the market. Where all most the Bureaucratic Organizations failed to meet market demands at the time dominated by the rapid changes and competition and sharp organizations raced to get market share and increase customer satisfaction. So the trend towards QMS in an organization is based on application QMPs to ensure the application, survival and improvement and achieve customer satisfaction and then stakeholders. The International Organization for Standardization (ISO) indicated eight principles of QMS in international Standardization ISO: 9000.

**Keywords:** Quality Management principles, Quality management system, ISO 9000

### PROBLEM STATEMENT

Iraqi Directorate of Military Works (IDMW) is the case study of this research. IDMW is the major organization responsible for preparing the architectural and construction drawings, details, and technical specifications, which are required in the contract documents for the construction of infrastructure projects of the Iraqi army.



The regulatory authorities in Iraq pointed out in their periodic reports a number of issues on the quality system of IDMW (Performance Report, 2013). For example, the performance report on June 25, 2013 for a particular project (i.e., building the self-sufficiency of the armed forces) indicated that the project budget was approximately US\$336 million and the project was supposed to be completed at the end of 2010. However, on the date of the report, the total percentage of completion was 88% and the extended duration increased by 175% from the contract duration of the project. The cost also increased as additional works expanded by 4.11%. Finally, the report enumerated a long list of non-conformity works, which have not been executed according to contract specifications. Despite the abundance of financial resources for military projects because the report above clearly indicates IDMW has failed to provide the basic requirements for quality management system

The majority of studies have focused on the process of evaluating and measuring the gap between the ISO 9001 requirements and the actual QMS within different industrial sectors as the basis for evaluating the effectiveness of their QMS (Abdullah et al., 2011; Llach, Marimon, & Bernardo, 2011; Sumaedi & Bakti, 2011).

Previous studies have suggested filling the gap through the continuous improvement cycles of the QMS requirements. They neglected to focus on the effect of a fundamental framework or beliefs for leading and operating an organization aimed at continually improving its performance in the long term by addressing stakeholder needs, which are known as quality management principles (QMPs). The continuous improvement cycles must be included in QMPs to avoid changing the path toward QMS into the quality documentation system (Ahmed, Aoieong, Tang, & Zheng, 2005; Ofori, Gang, & Briffett, 2002; Yates & Anifetos, 1997). This inclusion requires an investigation of the effectiveness of QMPs (ISO, 2012).

## LITERATURE REVIEW

The technical committee of ISO 176 (ISO/TC 176) derived eight quality management principles on which the standards of the revised ISO 9000:2000 series are based according to the collective experience and knowledge of international experts who participated in ISO/TC 176. These principles reflect the best practices and are designed to enable the continual improvement of the system. These principles can be used by senior management in guiding their organizations toward improved performance. The following eight principles are indicated in the literature reviews of QMS in the construction industry and management science fields:

### Customer Focus (QMP-CF)

Several quality gurus call for listening to the customer voice to increase revenue and market share. Obtaining ideas from customers engenders flexible and rapid responses to market opportunities, increased effectiveness in the use of organizational resources to enhance customer satisfaction, and improved customer loyalty leading to repeat business (Crosby, 1989; Deming, 1986; Kanji & Wong, 1998; Li, Zhao, & Lee, 2001; A. Rao et al., 1996). Every customer is a consumer, but not every consumer is a customer. To gain new customers, organizations depend on their customers and should understand current and future customer needs by researching and understanding needs and expectations (Kakkad & Ahuja, 2014; Kärnä, 2014).

### **Leadership (QMP-L)**

Dr. Deming and Dr. Juran conclude that the majority of quality problems (80%) are caused by leadership issues. Without leadership support, QMSs are merely slogans and are ineffective (Everett, 2002).

### **Involvement of people (QMP-IP)**

Jha and Iyer (2006) identified the essential factors in achieving good quality, namely, "human element rather than machinery" and "good communication among people." Construction companies are beginning to recognize the need to focus on people issues (e.g., employee satisfaction, empowerment, and involvement) to facilitate continuous improvement (Hoxley, 2000; Makulsawatudom, Emsley, & Sinthawanarong, 2004).

### **Process Approach (QMP-PA)**

"Process approach" refers to the systematic identification, management, and interaction of procedures employed within an organization.

QMP-PA is a critical success factor of business process management (Trkman, 2010). This approach systematically defines the activities necessary for obtaining the desired results (Kerzner, 2013) and the factors required for achieving success by establishing clear responsibility and accountability for managing activities (Cooper & Kleinschmidt, 2011).

### **System Approach to Management (QMP-SAM)**

QMP-SAM is the crucial principle for identifying, understanding, and managing interrelated processes. A system contributes to the effectiveness and efficiency of an organization by achieving its objectives (ISO, 2012). The chief benefits of a system approach are achieving the management integration and alignment of processes that will best achieve the desired results, enhancing the capacity to focus efforts on key processes, and providing confidence to interested parties in terms of the consistency, effectiveness, and efficiency of the organization (Oakland, 2014).

### **Continual Improvement (QMP-CI)**

According to source document 74 of the Construction Industry Institute, "TQM is often termed a journey, not a destination" (CII, 1989, vol. 74). Market requirements never end, and new goals should be achieved continuously. Therefore, no true destination is ever reached. The QMP-CI of the overall performance should be a permanent objective of the organization (Ortega & Bisgaard, 2000; Series, Management, & Hutchins, 2012).

### **Factual approach to Decision Making (QMP-FADM)**

Effective decisions are based on the analysis of data to achieve success in any discipline, particularly in the construction industry that requires large amounts of information and knowledge. Most construction processes and procedures are a compendium of several different tasks, processes, and requirements, involving a large variety of factors and aspects to consider. In this manner, making

decisions in such environments can often be arduous (Monghasemi, Reza, Ali, Fasae, & Adamowski, 2015).

### Mutually Beneficial Supplier Relationships (QMP-MBSR)

In the construction industry, prime contractors increasingly depend on their suppliers for realizing projects and achieving the required performance in these projects. Several studies have indicated that up to 90% of the project turnover of prime contractors are spent on buying goods or services (Bemelmans, Voordijk, & Vos, 2012; Lundin, Tryggestad, Martinsuo, & Sariola, 2015).

### METHODOLOGY

The questionnaire will be posed in the study to evaluate quality management system principles (QMPs). QMPs, is represented by eight factors with a total of 51 measurement items, including QMP-CF and QMP-IP, QMP-SAM, QMP-MBSR, QMP-PA, QMP-CI, QMP-L, and QMP-FADM.

### Population and Sampling

The questionnaire will be formulated to ensure that all branches of IDMW are included and surveyed based on stratified random sampling (Gay & Diehl, 1992). This section consists of the research population and sample for this study. The research population for this study are IDMW, which refers to “technical staff” (44 % of total staff) who are only throughout Iraq. This sample was chosen to ensure that study results would be generalizable (Fraenkel, Wallen, & Hyun, 2012). Theoretically, researchers could specify an even finer distinction of population, called “study population.” The population for this study for the quantitative method comprised IDMW from IMOD. The selected IDMWs were asked to fill in the present research questionnaires that were sent to both Administration and Training Department managers in selected IDMW.

As for research sample, Sandelowski (1995) added that any research sample could be a subset of the population being studied. The method includes the process of selecting a few (samples) from a bigger group (the sampling population) to become the basis for estimating or predicting a fact, situation, or outcome regarding the larger group. By contrast, the present research sample should be as large as possible. A larger sample means that study results are more likely to be representative and generalizable. Considering the impossibility of attaining information from every single individual in a particular population, sampling is performed instead. Sampling involves collecting data from a sufficient number of persons in the population to popularize the findings to the entire population (Hair, Black, Babin, & Anderson, 2010). Various ways are used to determine a sufficient sample size based on population number. The sample size can be calculated with the following formula (Yamane, 1967):

$$\frac{N}{n} = \frac{1}{e^2} \quad (1)$$

**Note:** n is the sample size, N is the population size, and e is the level of precision.

A total staff of IDMW includes all branches throughout Iraq, which number 1428 persons. The technical staff comprises 632 (N), who represent the “study population,” as shown in Table 3.17.

Table 1 Study Population in IDMW

	Branches of IDMW	No. units in Iraq	Support Staff	Technical staffs	Total staffs
1	(Headquarters)	1			
	Regional Department	4	83		
	Regional Sections	15	344		
	Resident Engineer	4	20		
	Warehouse	1	52		
	Training school	1	29		
	$\Sigma$			N=632	

When applying N & e values or 632 and 0.05, respectively, in Equation (1), the sample size will equal to 245.

### Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) was performed to assess measurement model adequacy. It statistically tests the ability of the hypothesized factor model to reproduce the sampled data. In other words, CFA measures the adequacy of the measurement model by assessing the model's goodness-of-fit to the data, as well as the convergent and discriminant validity of the study constructs.

### RESULT AND ANALYSIS

Quality Principle is an independent variable was represented by eight factors with a total of 51 measurement items, including QMP-CF, QMP-IP, QMP-SAM, QMP-MBSR, QMP-PA, QMP-CI QMP-L, and QMP-FADM.

The resulted of the reliability analysis revealed that it had very good Cronbach's Alpha 0.915. As a means of extraction, the following step was conducting an EFA using the PCA technique with the rotation method was Varimax with Kaiser Normalization to confirm that all items located in the expected factors and there is no overlap between constructs. During several step five of the fifty one items were eliminated because they neglected to have a main factor loading of 0.5 or above. After excluding the items that did not meet the criteria, the second iteration of EFA analysis with 46 items was conducted. Eight factors were extracted and reflective scale in this analysis as recommended by previous theoretical support. The factor results are shown in 9. Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy was 0.877 indicated a very good sampling adequacy, Bartlett's test of sphericity was significant ( $\chi^2 = 6752.229$ ,  $p < 0.001$ ), the degree of freedom was 1035. And the total variance accounted by eight factors was 66.84%. Moreover, the loadings of the items ranged from .748 to .823, above the cut off value of .50 as recommended by (Hair et al., 2010).

## Descriptive Statistics for Variables

To calculate the level of each single construct for measurement study purposes, descriptive statistics are required for this type of construct (Pallant, 2013). Two tests of descriptive statistics have been performed in this study. They are the mean and standard deviation. The mean of each variable range from 3.52 to 4.08. QMP-FADM has the lowest mean (3.56) and QMP-CF (4.08) has the highest mean. QMP-CF has the highest standard deviation (0.81) and the standard deviation value for QMP-IP (0.63) is considered the lowest value compared to other variables. The results revealed that the respondents displayed balanced levels of values in each scale, as shown in Table 2.

Table 2 Descriptive Statistics for Each Variable

No. Construct	Construct Name	Min	Max	Mean	Std. Deviation
1	QMP-CF	1.00	5.00	4.08	0.81
2	QMP-LE	1.00	5.00	3.52	0.81
3	QMP-IP	1.00	5.00	3.80	0.63
4	QMP-PA	1.50	5.00	3.77	0.71
5	QMP-SAM	1.00	5.00	3.74	0.80
6	QMP-CI	2.00	5.00	3.71	0.68
7	QMP-FADM	2.00	5.00	3.56	0.71
8	QMP-MBSR	1.00	5.00	4.05	0.76
	Overall QMPs	2.35	4.56	3.79	0.43

Descriptive Statistical analysis shows that overall QMPs ( $m = 3.79$ ,  $SD = 0.43$ ), this result reverses positively on the response to the standard requirements. These principles can be used by senior management as a framework to guide their organizations towards improved implementation standard requirements of ISO 9001 performance

## CONCLUSION

The major objective of the present study was to treat the gap of QMS for the military construction organization in Iraq, according to the standard requirements of ISO 9001. The existence of a gap refers to an imbalance in both of a framework to guide senior management of organizations towards improved performance, Briefly has known in QMPs. The dimensions of QMPs: Customer Focus, Leadership, Involvement of People, Process approach, System approach to management, Continual Improvement, Factual approach to decision making, and mutually beneficial supplier relationships. The next continuous improvement circles should focus on raising the evaluation application of QMPs percentage to enhance the response to the standard requirements and reducing the application gap as well as treatment items that totally absent within the QMS.

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## MODELING NEW URBAN WATERFRONT DEVELOPMENT OF EXTRACTING THE STRUCTURE PLAN FOR MELAKA, MALAYSIA

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### ABSTRACT

Currently, the Malacca waterfront area more focus to its river water edge rather than its sea front area. However, this study encourages the confluence of residential, commercial, recreational, and cultural uses located right to edge of the Straits of Malacca coastal line. The study introduces and extending the residential and commercial development located adjacent to existing historic Bandar Hilir areas providing a seafront housing area. At the same time, office buildings are mixed with commercial uses being proposed along the major pedestrian link between the old town and new waterfront development. This will improve public activities in this area and extend uses as 24 hours, all focused years. Furthermore, the UNESCO recognition on the historic city of Malacca in 2008 needs a recognizable public park with an easy access to the waterfront areas for the use of other Malacca citizen. The strong linkage of the old town center through the new mixed-use development towards the public waterfront helps to integrate the whole proposed development. The waterfront area should also be developed to promote daily recreational opportunities. The man-made peninsular which located around the lagoons contain shops, restaurants, recreational, and cultural uses. Shops which sell local hand-crafted goods; for example, could attract international and domestic tourists can be located around the new Malacca Harbor Plaza. The marina for yachts and boat rentals would also once again create activity in Malacca's harbor.

The paper explains how important is one waterfront development to the old city like Malacca should be planned using its structure plan to ensure its success. The paper try to indicate that the new proposed development must be well integrated within the existing old image fabrics of the historic town. Most of the new waterfront developments somehow lacking on connection in taking advantages on the rich historical images being implemented into the new waterfront features. Thus; this is what the paper try to get the audience understand the importance of keeping the old and enjoying the new townscape next to the tropical water.

**Keywords:** waterfront development, urban townscape, historic town, proposed waterfront, Malacca Malaysia

## INTRODUCTION

The project site of 159 acres lies on the shore of the Straits of Malacca by the town of Malacca – also spelled Melaka in Bahasa Melayu, the Malay national language. The town of Malacca, also the capital of Malacca State, is situated on the south-west of Peninsular Malaysia, about 93 miles south of Kuala Lumpur (the capital and the largest city in Malaysia) and about 155 miles from Singapore. Malacca is the one of the states that formed Malaysia. Moreover, this state is one of the smallest within Malaysia and it measure about 640 square miles. The land is generally flat and has only six hills over 1000 feet high.

The proposed development site is approximately 159 acres out of the 590 acres of Malacca Structure Plan with Waterfront Proposal Development. The 590 acres project stretching from Malacca River in the west to Parit Cina River in the east with its northern boundary the edge of the present reclamation sites and its southern boundary touching the central spine of Java Island. Some reclamation projects include Taman Kota Laksamana ( a residential area), Malacca State Development Corporation’s site, and Malacca Jaya Phase B which is mostly commercial with some residential area. For a start, please refer to Figure 1 below to understand the hierarchy of the Melaka urban governance in ensuring the said structure plan is in order.

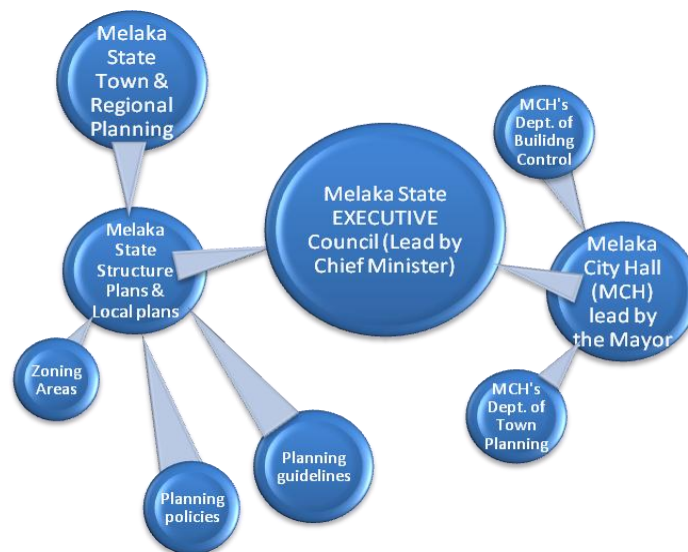


FIGURE1

Melaka project governance levels as summarize for easy understanding

The proposed project utilizes 159 acres of reclaimed land in front of Bandar Hilir Park on the Town’s waterfront area. This area stretches from Malacca Jaya to the old port. From the old coastline of the town, one can notice that the old town center flanks along the Straits of Malacca. The Malacca River meanders through the town center and at its river mouth, is the local port which is only accessible by small boats. The main roads converge at the town center and ring roads have been planned to alleviate the current traffic site will be on reclaimed land.

A key issue to consider when adding a new major urban development to the existing communication system is the establishment of a smooth and efficient traffic link from the new development to all major districts within and outside Malacca Town. Heavy congestion burdens all major streets of the town center and creates an environment characterized by a considerable air

contamination. One of the primary causes leading to the present traffic pressure is that most of the communication between the various outskirts of the urban area is through the narrow streets of the town center.

The new development will be linked to the major approach roads as shown in Figure 2. Links should, however, be established in the next few years in order to alleviate the present pressure on the town center and to established routes outside the town center for trunk traffic and other extraneous communication to and from the industrial estates and harbor area, the new city center and residential quarters.

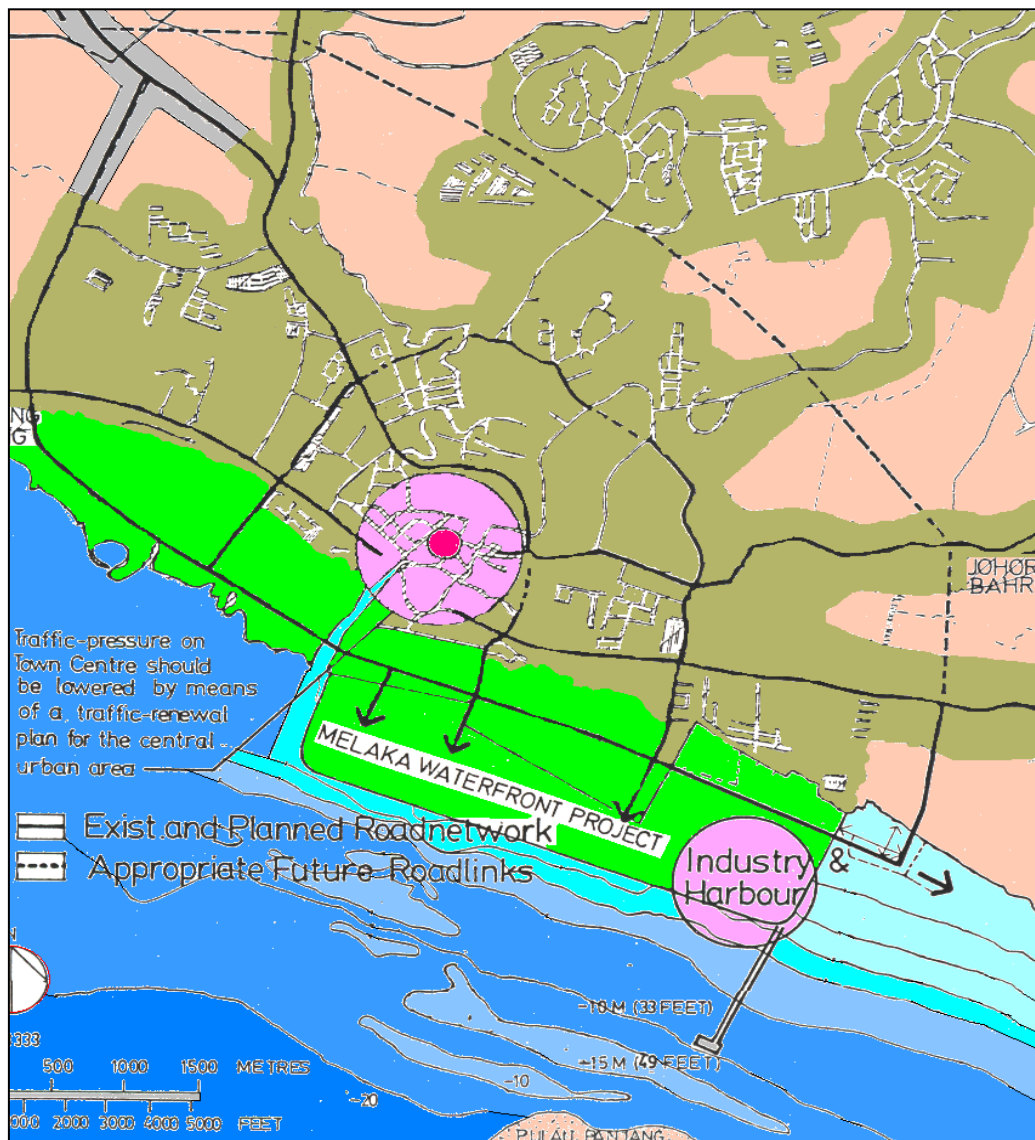


FIGURE 2

Existing road network links to Melaka Waterfront site (extracted from Melaka Structure Plan)

## RELATIONSHIP TO FUTURE DEVELOPMENT

The map (Figure 3) shows the conditions which influence any future development of the Malacca Waterfront site. The following are the constraints and potentialities of the project.



The project site (as label ① in the Figure 3 below) contains to 590 acres of reclaimed land. However, the proposed study project site contains only 159 acres out of the 590 acres project. The elevation of the reclaimed ground is +2.95 meters above sea level.

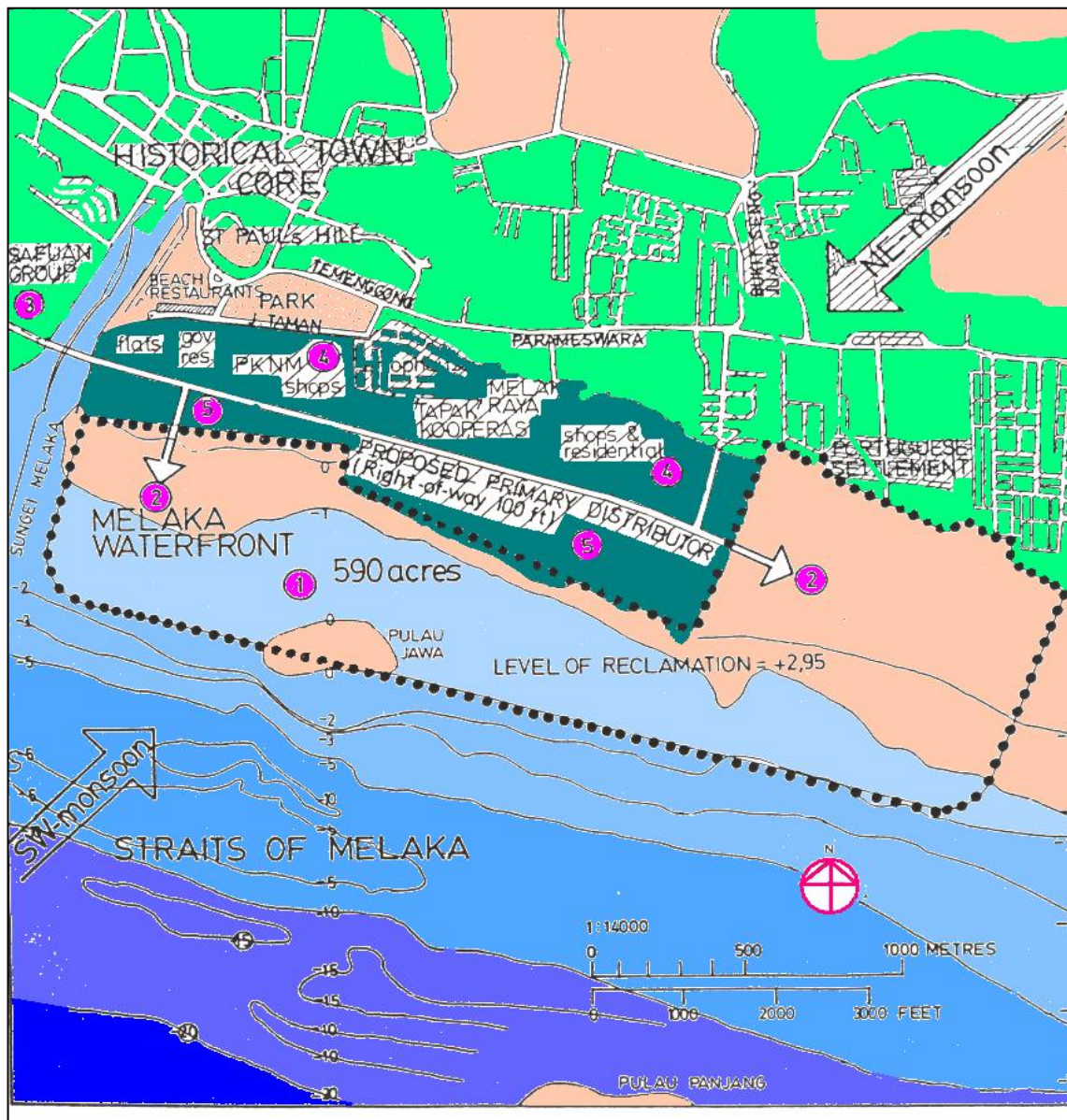


FIGURE 3

Map showing relationship to future development of Malacca Waterfront development

Next is the Access as indicated as number ② in the above plan. Main access can be established from the proposed Primary Distributor Road which is the main feeder link to the present development on the reclaimed land between Parameswara Road and the Malacca Waterfront site. For Adjacent development as indicated as ③ ④ and ⑤ north-west of the planning site is being developed by a private company, an integrated residential and commercial development ③ Furthermore, north of the proposed Primary Distributor a number of residential and commercial site plans have been prepared and construction work is in progress near Jalan Taman (Garden Road) as marked with ④ Site plan proposals or specific land use data concerning the areas south of the Primary Distributor are

not available at present (see 5). For local climate (see arrows → and ←); the planning site is exposed to the prevailing monsoons. A relatively cooling breeze comes from South-West between the months of May to September. If building densities of the Malacca Waterfront become high the advantages to the cooling South-West Monsoon will only be enjoyable to the inhabitants of the housing estates closest to the seafront. Thus, a majority of the future inhabitants and users of the new Malacca Waterfront Development have to rely on an open public recreational area along the shore line, where the cool and healthy sea winds are reliable.

## MATERIALS AND METHODS

### DESIGN DEVELOPMENT - MALACCA WATERFRONT RENAISSANCE: NEW IN THE OLD

Design Consideration can be drawn from the initial conclusions drawn from the preceding site analysis lead to a number of basic objective and ideas which could be named design consideration. (Refer Figure 4). These are the extension of Town Center toward the South as labeled as [A]. The existing town center is built-up with only a few vacant sites left. If the official policy of conserving historical buildings and street architecture is put into practice, distinct restrictions will have to be formulated concerning building heights, type of street elevations, number of parking spaces (to control traffic volumes) etc. This will limit the possibilities of major extension of city functions within the existing city core. Consequently a need for centrally located space to permit future town center expansion emerges.

The study proposed to provide a pedestrian link (as indicated as [B]) from Old Town Center to new seafront. A well designed landscape and well maintained walkway should link the 'Red Square' St. Paul Hill and the Fort Area to the new waterfront development. An additional pedestrian link could also be supplied along the Malacca River. A wharf will be reestablished emphasizing the historically coast line. The new attractive and peaceful pedestrian urban spaces will benefit all users and visitors of the town. The walkway should pass the Bandar Hilir Park, leading to the new City Park, and end at the new waterfront promenade (see Fig.5 for new waterfront development for comparison). Next, the plan is to have Waterfront Park. The public waterfront zone reaches from the city area in the West to the harbor in the East as indicated as [C]. Then as indicated as [D]; the Main Path System links all sub-areas of the development and offers pedestrian and bicyclists a safe and direct access to places-of-work areas, local public facilities and to the attractive waterfront park. The Harbor [E] is due to appropriate sea depths of 30-45 feet, the harbor should be located towards the East.



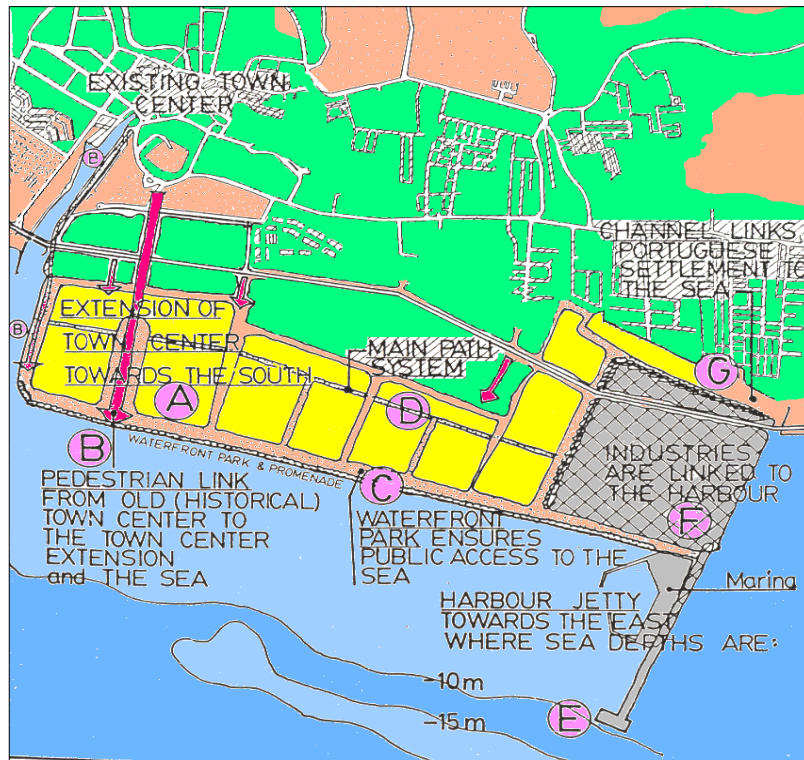


FIGURE 4 Design consideration proposal map for Malacca Waterfront Area (A, B, C, D, E, F, G)

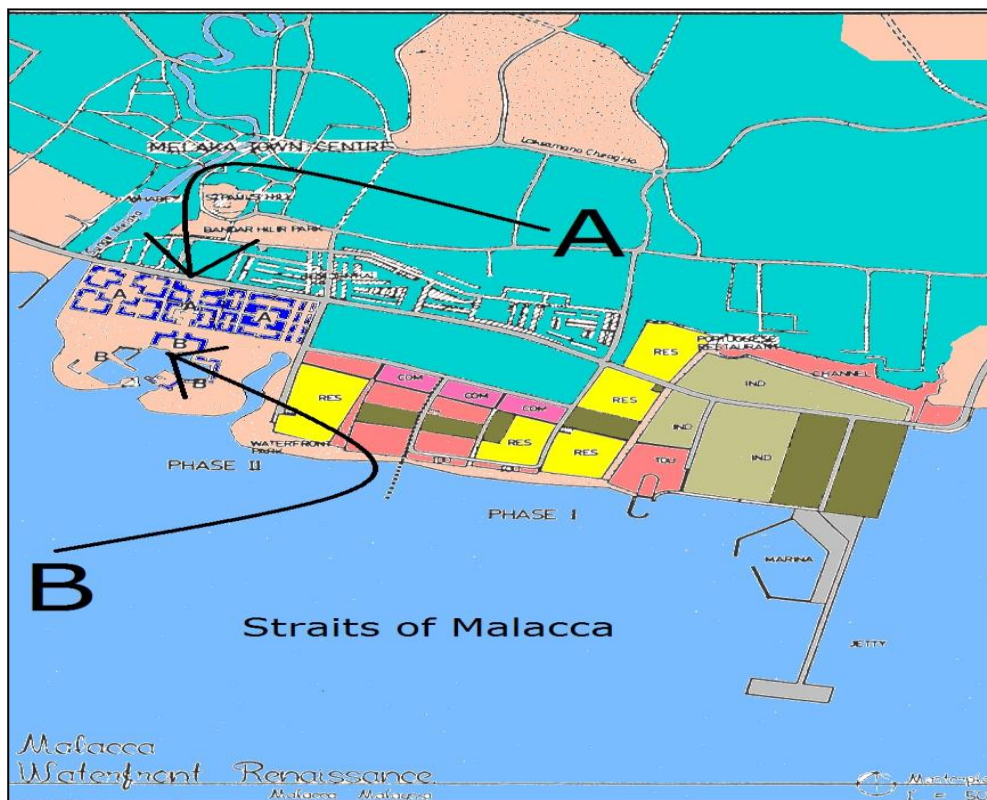


FIGURE 5  
Malacca Waterfront Renaissance master plan  
(A= Mixed-Use Development at Malacca Waterfront, B= Malacca Waterfront Area)

For [F] shows the Light Industrial Area. This light industrial area should be closely linked to the harbor. Parts of the sites can be utilized for harbor-related functions (storage, truck parking spaces and administration). The remaining parts are available for pure light industrial purposes. Lastly, [G] indicating The Portuguese Settlement Channel. The Portuguese Settlement plays an important role in the image of Malacca Town as a multi-cultural society. Fishing activities occupy a part of the Portuguese families, either as professional fishermen or as a part time. To ensure that fishing activities can be maintained and uninterrupted, the activity will be established between the Portuguese settlement and the industrial area. Along the channel's southern wharf line, a public accessible zone should be reserved to allow pedestrian movement all around the channel and the border of the industrial area.



FIGURE 6

Design consideration proposal map for Malacca Waterfront Area (H, J, K, L, M)

Next, label [H] indicating Primary Distributor Road (See Figure 6) where the Waterfront Development is given access from the Primary Distributor Road. Then, [J] represents Local Distributors

Roads. This street pattern is the loop system which gives good circulation and direct access to the clusters within each sub-area. The loop system frustrated fast and through-going traffic are directed to the Primary Distributor. [K] is for the Access Roads. In each sub-area access roads are provided with the needed internal circulation. Then [L] proposed a possible Amusement Park. An Amusement Park has been mentioned as an enterprise appropriate to in the Waterfront Development. The location on the waterfront makes activities like small joy boats and water bicycles feasible and as much, the Amusement Park will appear as a nearby point attraction to visitors. However, amusement parks can be rather noisy and cause nuisance to neighboring residential quarters. Therefore, an Amusement Park should be located apart from residential areas but still in close connection with Waterfront Parks and Promenade. [M] is for Marina. A yachting harbor (marina) can be established and can be sheltered by the jetty construction. The marina can harbor 300 pleasure boats. Lastly for this section, [M] indicates Landscaping around the Industrial Area. To create a physical environment as attractive as possible, a buffer zone of dense vegetation (trees, shrubs, and flower beds) should be planted along the northern, western and southern borders of the industrial area.

## DEVELOPMENT OF PROGRAM- STRUCTURE PLAN IN THE MALACCA TOWN CONTEXT

The structure plan is composed of a road and main path pattern and a number of sub-areas. The sub-areas can be utilized to be specific purposes which the market demand makes economically viable at the time of realization. In this way the Structure Plan is flexible in regards to land uses. (Refer Figure 7,8,9,10 and Table 1 for information).

TABLE 1  
Land use break-up from the Malacca/Melaka Structure Plan

NO.LAND USE	ACRE
1.COMMERCIAL *	41.59
2.COMMERCIAL *	10.00
3.COMMERCIAL *	11.13
4.TOURISM*	5.93
5.COMMERCIAL *	20.31
6. COMMERCIAL*	13.54
7.TOURISM*	5.93
8.COMMERCIAL	7.17
9.RESIDENTIAL	27.40
10.COMMERCIAL	5.93
11.RESIDENTIAL	23.23
12.COMMERCIAL	5.68
13.RESIDENTIAL	17.91
14.TOURISM	2.84
15.COMMERCIAL	5.68
16.RESIDENTIAL	17.05
17.TOURISM	1.28
18.RESIDENTIAL	17.64
19.RESIDENTIAL	22.54
20.RESIDENTIAL	16.01
21.INDUSTRY	38.55
22.INDUSTRY	14.28



23.TOURISM	15.55
24.INDUSTRY	71.83
25.INDUSTRY	29.16
<b>26.CITY PARK*</b>	<b>23.40</b>
<b>27.WATERFRONT PARK*</b>	<b>53.98</b>
28.MAIN PATH SYSTEM	17.41
29.DISTRIBUTOR ROADS	47.15
TOTAL (1-29)	590.00
30.MARINA -NOT INCLUDED IN THIS COUNTING	
31.JETTY-NOT INCLUDED IN THIS COUNTING	

\*included in the Malacca Waterfront Renaissance Study Project area as part of land use consideration. Most of the waterfront park is included in the project area.

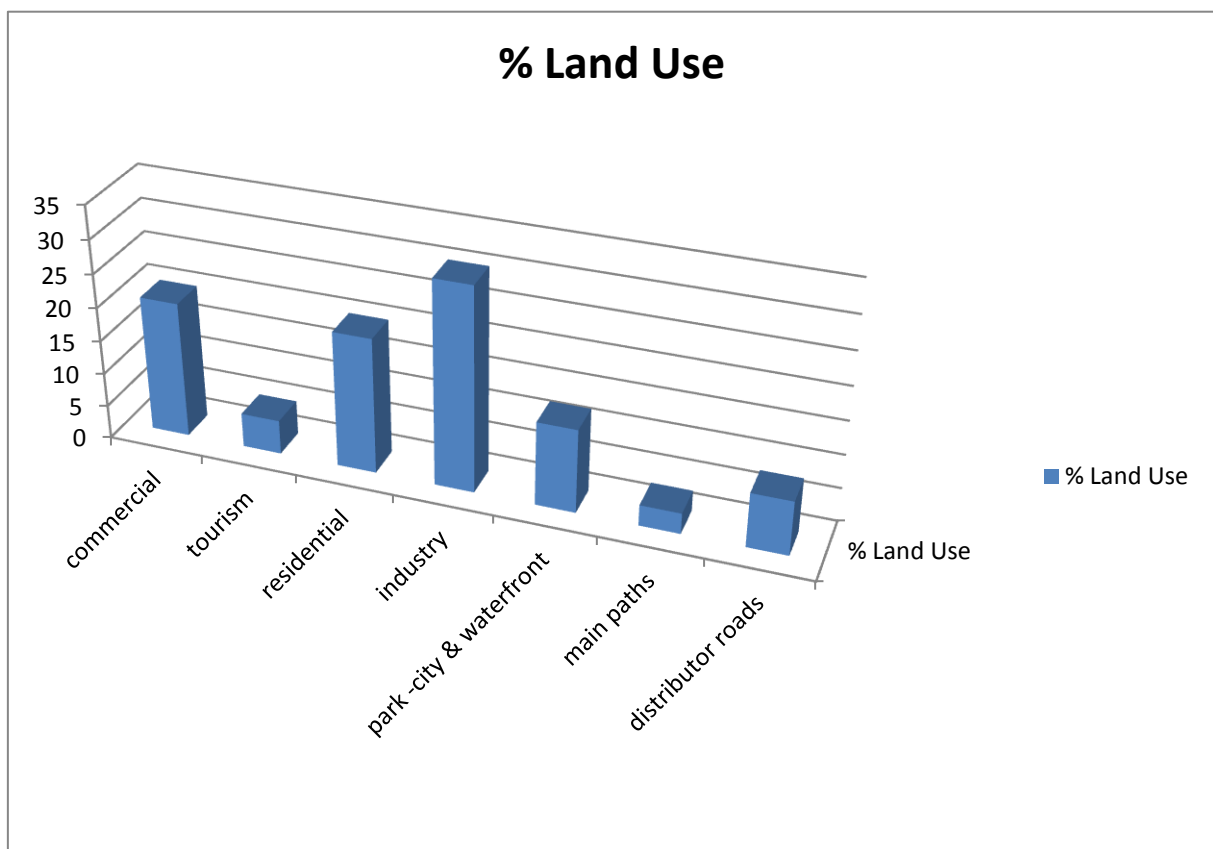


FIGURE 7  
Land use break-up percentage from the Malacca Structure Plan as in graph distribution. Note the highest chunk for the industry portion

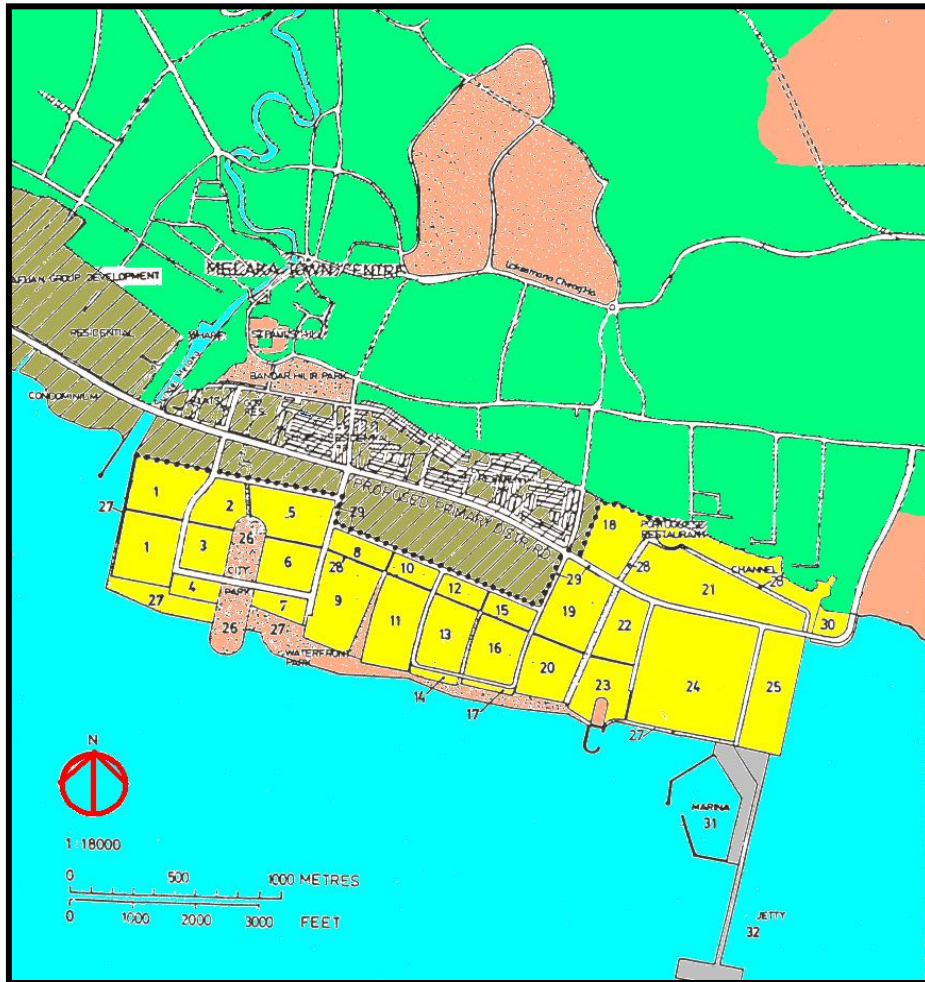


FIGURE 8  
Structure Plan for Malacca Town (Land use program.)

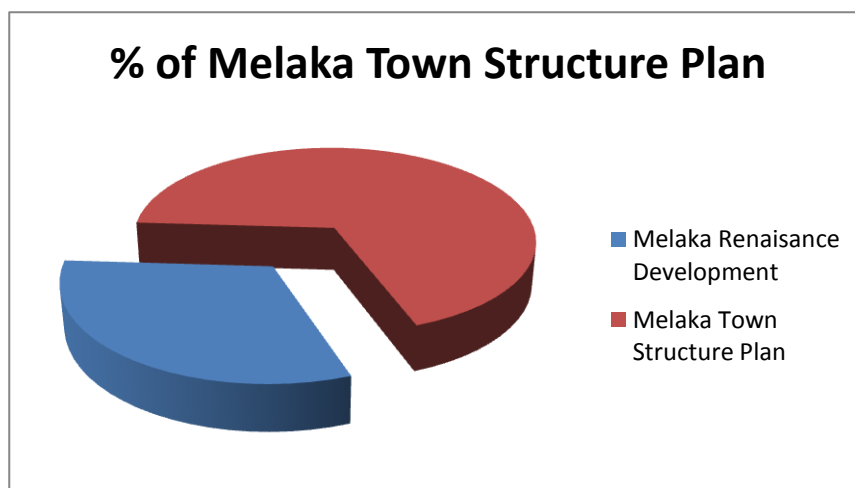


FIGURE 9  
Percentage of the land use indicates part of the structure plan area using for the proposed new waterfront project. Do compare the size of the original Melaka Town Structure plan prepared by the Department of Town & Regional Planning (JPBD) with the said project

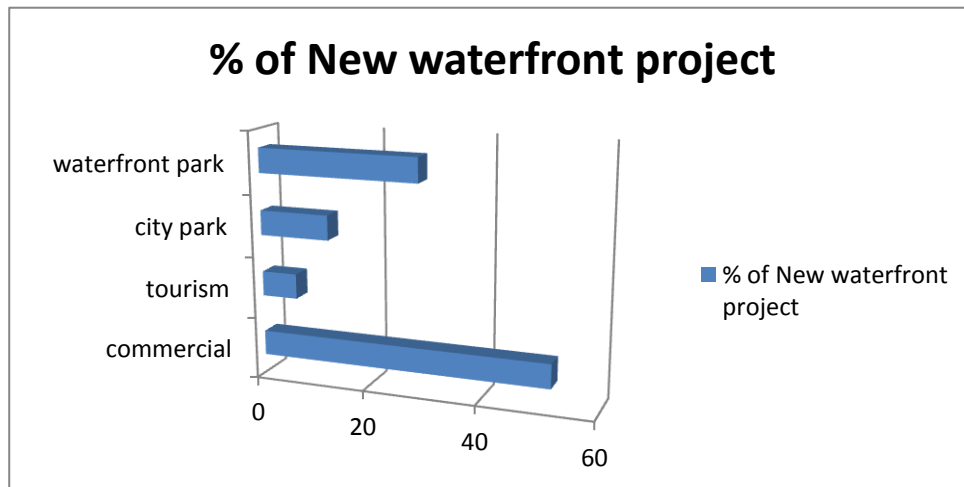


FIGURE 10

Graph showing percentage of the new waterfront project with 4 main usages in this initial planning

As far as the engineering aspects on land reclamation; the method of reclamation is where the method of sand fill reclamation has been adopted by the neighboring development and has proven to be fairly successful. The sand deposit along the off-shore from Malacca appears to have sufficient quantity for the sand fill for the proposed development. Sand would be dredged and pumped to the site which is a neat and clean way of reclamation. For shore protection, the shore line needs to be protected from waves and erosion. Heavy armor stone with a layer of filter cloth beneath would be required to protect the shore of the reclaimed land. Furthermore, for the foundation, no special engineering problem would be envisaged in putting up light buildings of three to four storey heights. But for tall buildings, careful consideration should be given to the type of foundation chose. Lastly, on wind condition, the South-West Monsoon is the predominant wind. The most significant squalls are the 'Sumatran' as mentioned earlier. These storms generally develop during the night or early in the morning and are of fairly short duration.

## RESULTS

The Malacca Waterfront project is a very important district in the Malacca Metropolitan area. The site encourages the confluence of residential, commercial, recreational, and cultural uses. The proposal continues the residential and commercial development located adjacent to Bandar Hilir Park providing a seafront housing area (see Figure 11 for axonometric). At the same time, office buildings are mixed with commercial uses along the major pedestrian link between the old town and new waterfront development. This will enhance activity in this area and extend its use as a twenty-four hour, all years focus (refer Figure 12 for site location).

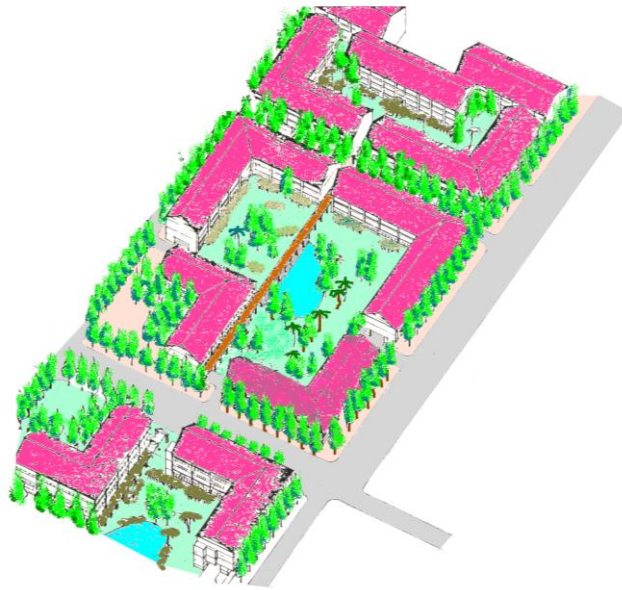


FIGURE 11  
Typical residential and office buildings axonometric

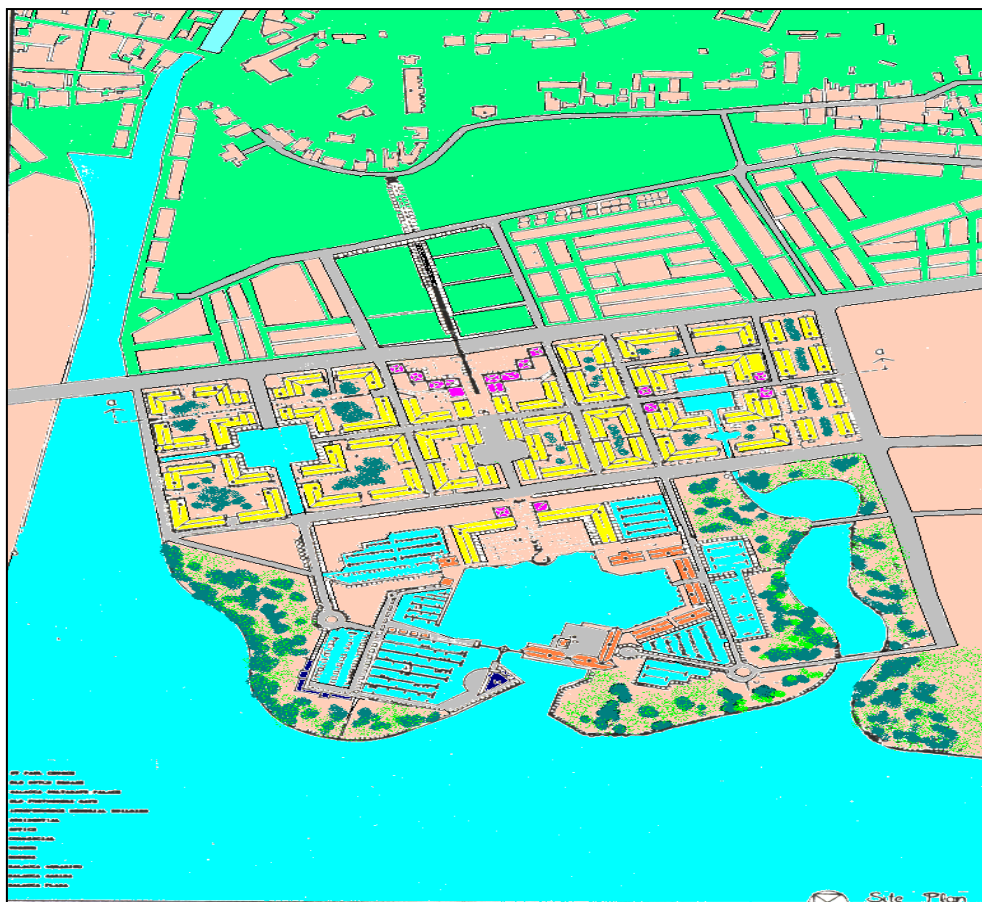


FIGURE 12  
Proposed Malacca Waterfront Renaissance project by adapting the Melaka Structure Plan; Seen here  
is the urban design concept plan





FIGURE 13

Natural landscape alongside the pedestrian walkway along the waterfront as in Bristol, UK



FIGURE 14

Character of the place found in Liverpool waterfront, UK

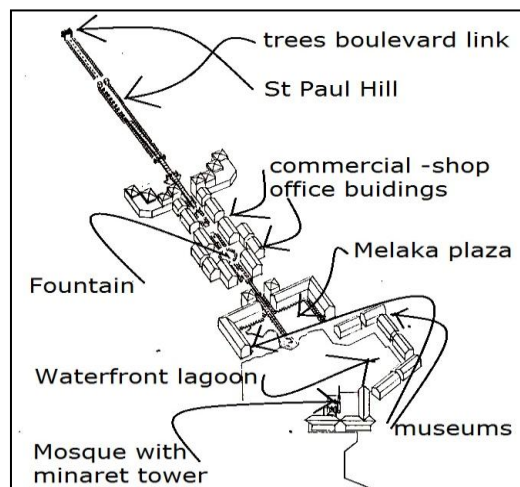


FIGURE 15

View from the historic St. Paul Hill towards the waterfront area



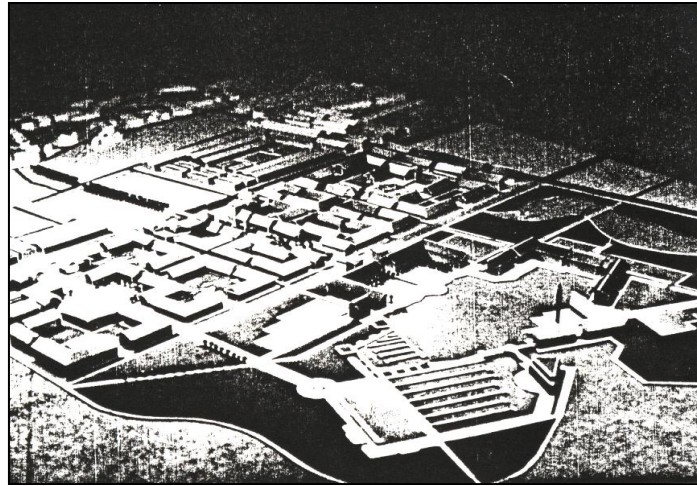


FIGURE 16 (right)

Photo of model showing the view of Malacca Waterfront development area from the Straits of Malacca

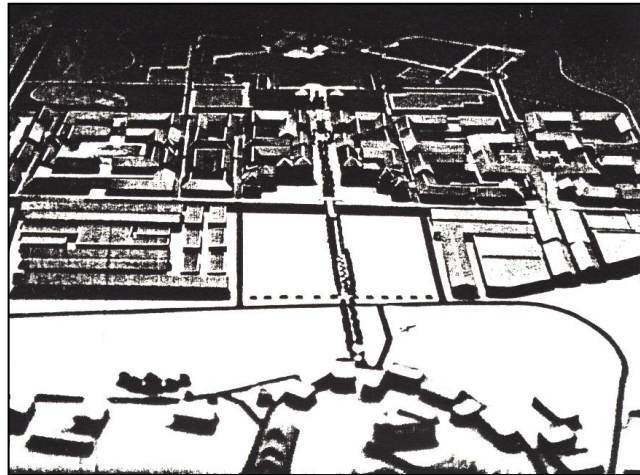


FIGURE 17

Isometric view showing the linkage between the old St. Paul Church and the new Mosque's minaret

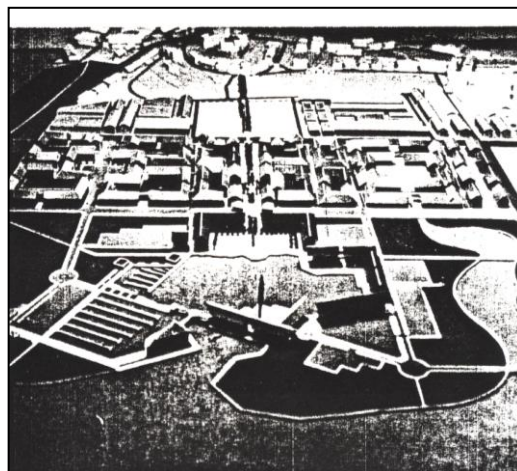


FIGURE 18

Malacca Waterfront Renaissance: model image. Case study on how local governance role is important in ensuring historical richness of the urban fabric been integrated into new urban development

Furthermore, Malacca needs a recognizable public park with access to the waterfront areas for the use of other Malacca citizen. The strong linkage of the old town center through the mixed-use development to the public waterfront helps to integrate the whole area. The waterfront area should also be developed to promote daily recreational opportunities (See Figure 13 and Figure 14). The man-made peninsular which located around the lagoons contain shops, restaurants, recreational, and cultural uses. Shops which sell local hand-crafted goods, for example, that could attract international and domestic tourists can be located around the Malacca Plaza. The marina for yachts and boat rentals would also once again create activity in Malacca’s harbor (see Figure 15 and Figure 16).

## DISCUSSION

### THE SEASIDE IMAGE

The close link between the historical city core and the beach and sea the most important single townscape features of the city (see Figure 17). They give Malacca Town its unique atmosphere and underscore her images as an old landing place for a succession of foreign cultures. The intimate and close connection between the historical urban fabric and the Straits of Malacca is what tourist expects to find and this is also the town image the new development plan concept.

### URBAN DESIGN CONCEPT

The urban design concept expresses the aspirations of public authorities and desires of private citizens. It seriously takes into consideration how new development along the waterfront can support, improve and strengthen the town’s unique heritage instead of ignoring and consequently damaging what fortunately has existed up until today. With the proposal for residential, commercial, office, recreational, and cultural uses shown here, new economic activities would be encouraged enabling the city to sustain itself for future changes and growth (see different angle of the model aerial view from the Strait of Malacca as in Figure 18). It is predicted that the rebirth of the Malacca waterfront will encourage growth within the entire city and region (see Table 2 and Figure 16 for project data).

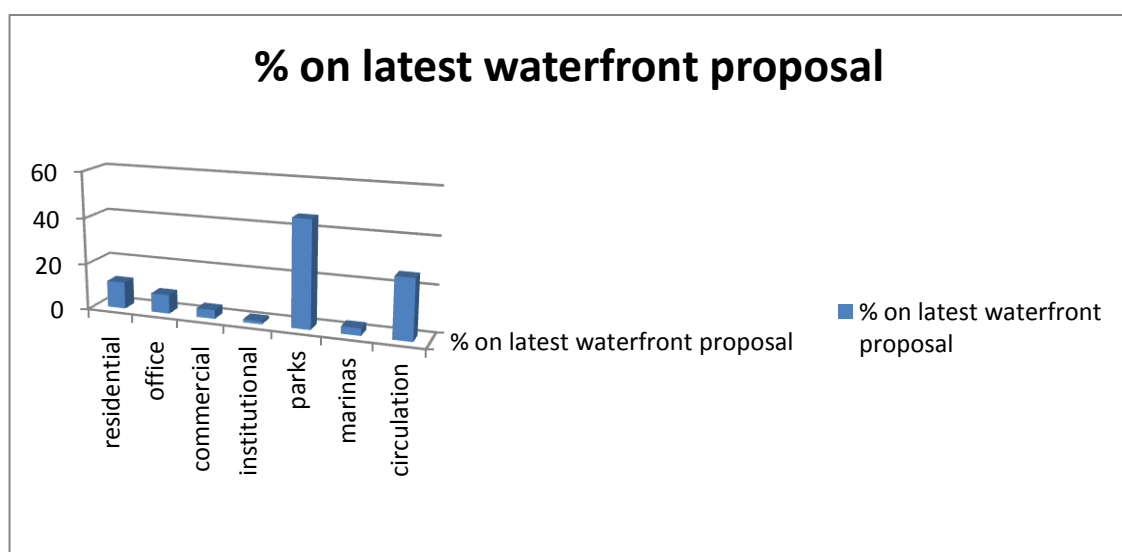


FIGURE 16

Graph showing the percentage of the land usages for the latest scheme on the what the project called the Melaka Renaissance Waterfront development proposal

TABLE 2

Detail data break-down on the proposed waterfront project for reference

<b>Project Data of Malacca Waterfront Renaissance Project.</b>	
<b>Land Use Information :</b>	
<b>Site Area :</b> 159 acres	
Land Use Plan:	
<b>Residential :</b>	
Type A : 4 Storey Apartment Building with parking on ground floor.	<b>9 acres</b>
Type B : 3 storey Apartment Building with parking on ground floor.	<b>9.5 acres</b>
	<b>18.5 acres</b> 11.6%
<b>Office :</b>	
Type A : 4 Storey Office Apartment Building with parking on ground floor. (This type include office towers range from 5 to 8 storey high)	<b>9 acres</b>
Type B : 3 Storey Office Building with parking on ground floor.	<b>4 acres</b>
	<b>13 acres</b> 8.2%
<b>Commercial :</b>	
Type A : 5 Storey Commercial Building (Location : Surround the Malacca Plaza)	
Type B : 3 Storey Commercial Building (Location : Surround the Inner Lagoon)	
	<b>6 acres</b> 3.8%
<b>Institutional :</b>	
a. Museum Complex (Malacca Malay Sultanate Museum, Portuguese Museum, Dutch Museum, British Museum and Modern Malaysia Museum)	
b. Mosque (With Minaret Tower)	
c. Malacca Aquarium (Tropical Type)	
	<b>2 acres</b> 1.3%
<b>5. Open Space and Parks :</b>	
a. Tropical Garden and Open Public Plaza	11 acres
b. Waterfront Park and Open Spaces	62 acres
	<b>73 acres</b> 46.0%
<b>6. Marinas :</b>	
(Includes piers, slips, and water areas)	

	<b>5</b> 3.1%	<b>acres</b>
<b>7. Circulation :</b> (Includes parking lots, pedestrian malls, verandah ways, and major and secondary streets)		
	<b>41.5</b> 26.0%	<b>acres</b>
Total	<b>159.0</b> 100%	<b>acres</b>
Gross area Information for Mixed-Used Development at Malacca Waterfront.		
<b>Residential :</b>		
<b>Building Type :</b>		
Type A = 479,000 s.f.		
Type B = 412,000 s.f.		
Total = 891,000 s.f.		
<b>Unit Type :</b>		
Type A = 870 s.f. = 2 bedrooms		
Type B = 780 s.f. = 1 bedroom.		
Type C = 880 s.f. = 1 bedroom with den.		
Type D = 940 s.f. = 2 bedrooms.		
<b>Office :</b>		
Building Type :		
Type A = 1,072,000 s.f.		
Type B = 472,000 s.f.		
Total = 1,544,000 s.f.		
<b>Commercial :</b>		
a. Retail on ground floor at residential and office area = 80,000 s.f.		
b. Building Type : (Refer land use information)		
Type A = 330,000 s.f.		
Type B = 180,000 s.f.		
Total a+b (A and B) = 590,000 s.f.		

## CONCLUSION

The study and proposal explain how important one waterfront development to the old city is like Malacca should be planned and well extracted of the city heritage to ensure its success. The paper try to indicate that the new proposed development must be well integrated within the existing old image fabrics of the historic town. There must be clear usage of the urban design elements being used from the ready Melaka Structure Plan to give positive impact on the new Malacca Waterfront Renaissance project as shown in this report. Even though only 27% of the area being used for the new waterfront development (called Malacca Waterfront Renaissance) from the 590 acres of the comprehensive

Melaka Structure Plan, the new proposal seems fit nicely into the existing old urban fabric well into the proposed structure plan as well.

It is hope that this study may benefits to create better urban waterfront image i.e. Baltimore Inner Harbor in Maryland, U.S.A., Milwaukee River dining, Wisconsin, U.S.A. or Cleveland's Flat revive waterfront in Ohio, U.S.A. as well as the riverfront development in Bristol or Liverpool waterfront in the UK.

There are clear similarities between the two proposal plans; the Renaissance Waterfront and the Melaka Structure Plan. In these cases, the findings from this paper reveals that the linkage from the old city is well established to ensure the establishment benefits the whole area as indicated in the bigger Melaka Structure plan scope. The present paper is hoped to be a contribution to the development of the vibrant Melaka City where future development may take full advantage of its location situated right next to the large body of water; the Straits of Malacca. Indeed the success of the Melaka River active usage of its assets, this paper may bring the authority on the important on having an ideal model of the waterfront development fit nicely into the well planned overall development. We surely do not want the new waterfront developments somehow lacking in taking advantages on the rich historical images being implemented into the new waterfront features. Thus; this is what the paper try to get the audience understand the importance of having on both old and new townscape next to water.

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## ENVIRONMENTAL FACTORS INFLUENCING WOMEN'S FEAR OF CRIME: A CASE STUDY ON THE USM MAIN CAMPUS

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### ABSTRACT

Fear of crime is a critical issue on university and college campuses. Although literature have shown that fear has many reasons, one reason for fear might be due to the environmental factors. Studies of fear of crime, however, have neglected the university campuses while the research in this settings can help to decrease fear of crime. This study sought to examine the environmental factors influencing fear of crime in women on USM campus. The findings of this study prove that respondents who occupy on campus residential areas demonstrate a higher fear of crime when compared to their counterparts who live off-campus residential areas. Furthermore, environmental factors including lighting and shrubbery showed relationship with fear of crime in women on USM campus. Knowing what factors cause persons to be afraid of being victimized on campuses can provide universities with ideas about how to address these fears and make campus users aware that crime on campus is an important issue to be taken seriously.

**Keywords:** fear of crime, environmental factors, USM main campus, women

### I. INTRODUCTION

Fear of crime is not an inherent characteristic of the individuals but rather something that may come and go, dependent on and influenced by one's experiences, especially as they relate to one's position in society [1]. One of most salient individual characteristics impacting fear of crime is gender [2,3]. Across fear of crime research, women have received a great deal of attention from researchers attempting to unravel why certain groups in society are more fearful of crime. Women are particularly interesting because they often report levels of fear of crime that are two to three times higher than men's, despite the fact that they have a lower victimization risk than men for almost all nonsexual crimes [3].

Fisher and Nasar [4] found that fear of crime on campus stems from fear in relation to low prospect, lack of escape, and high refuge, meaning that students on campus will be more fearful of crime when there is low prospect (such as lack of a clear open view of the area), lack of escape from a potential offender, and a high possibility of refuge for the offender to hide. Tseng, Duane, and Hadipriono [5] examined perceptions of safety in campus parking garages and note that it is the "dread

of violent crime in parking garages that instills fear in those who must routinely use public parking garages, especially late at night.”

## II. REVIEW OF LITERATURE

This section aims at describing previous research in the field of fear of crime through trying to review the relevant literature in this research area and describe how Environmental factors influence fear of crime.

### A. Fear of Crime and Physical Environment

Many researchers have examined how and why crime occurs, especially as it relates to the physical environment (reference). The link between the two is not new. Medieval and classical cities found refuge in defensible space, long before the term was even coined, which can be observed in the way they walled their communities and placed few entry gates.

Campus crime is indeed a serious issue of concern for current university students, parents of prospective students, campus law enforcement personnel, and the campus community as a whole (including faculty and staff). High campus crime rates may discourage prospective students from attending certain universities, and may similarly dissuade parents from paying tuition to send their children to institutions that could be regarded as unsafe [4]. Several variables were associated to crime in cities but two of such variables particularly stood out: land use and accessibility.

Not many studies have been conducted to explore the influence of the built environment on campus crime, and in those that did, land use and accessibility were never discussed [4,6,7]. It was only Long and Baran's [8] that noted the presence of highly connected streets as a factor in the occurrence of crime on campus. However, they concluded that land use variables are not important in analyzing crime in this setting. The researchers too observed that outdoor crimes on campus were committed close to buildings and roads where there was greater movement and more potential victims. Crime then is more likely to happen in places where there is a number of potential victims, and where physical features make it easy for criminals to commit crime [9]. These characteristics are known respectively as target attractiveness and spatial attractiveness.

Campus crime can also be seen as an issue that destabilizes the core principles of higher education itself, and according to Tseng, Duane, and Hadipriono [5] “criminal activities on campus not only undermine the quality of the learning environment, but also reduce the positive activities of people associated with the campus”.

Other research have shown that risk of crime and fear of crime on university campuses can be exacerbated by different features of the physical environment, including areas with dense foliage [10] and areas that are secluded [12].

One possible solution is increased street lighting, which works by enhancing surveillance and allowing people to see their environment more clearly. Nair, McNair and Ditton [12] found that increasing street lighting could considerably lessen fears. The other most pertinent factor resulting in feelings of vulnerability were enclosed spaces on campus, such as lanes or alleys which could lead to feelings of being trapped or isolated. This finding is echoed by Fisher and Nasar [4] who discussed how certain physical characteristics of the university campus environment, such as places of concealment,

can increase feelings of fear. Less vegetation was considered to improve visibility and remove possible places for potential offenders to hide.

In fact, the important factor that has been reported in previous researches is lighting which affects sighted individuals' ability to see a potentially dangerous environment. The researches have shown that lighting is a significant correlate and predictor of fear of crime, in part, because poor lighting does not offer adequate illumination to observe environmental cues to danger such as being physically attacked or having property stolen. Poor lighting in certain areas, such as parking garages that have perceptual tendency to be isolated, may have more pronounced effects on predicting fear than poor lighting in more public spaces such as sidewalks. Regardless of the exact place of the lighting, poor lighting on campus might have different effects on whether males and females are fearful [13].

Visibility of an environment is an important component of individuals being able to see what awaits them. At the core of the concept of lighting is the notion of individuals being able to see potentially threatening or harmful situations, including being able to see a hiding place for a predator. Studies have focused on understanding the relationship between the degree of illumination in the environment and fear of crime levels.

Other important environmental factor is Foliage, such as flowers, grasses, bushes, and trees, are widely planted to provide aesthetic beauty to environment. Consistent with the emphasis in the environmental criminology literature, the growth and density of foliage can also block visual views into spaces and provide hiding places for would be offenders and thus result in heightened crime-related fear [4,10,14].

Researchers have shown that foliage influences individuals' fear of crime because it provides refuge or hiding places for a predator who can surprise attack a victim or even walk from inside or behind the greenery. Foliage such as overgrown shrubbery might have a positive effect on fear for women because of their sexual and physical vulnerability and physical ability to thwart an attack [15].

## **B. Fear of Crime and Gender**

One of the most salient individual characteristics impacting fear of crime is gender [2,3]. Across fear of crime research, women have received a great deal of attention from researchers attempting to unravel why certain groups in society are more fearful of crime. Women are particularly interesting because they often report levels of fear of crime that are two to three times higher than men's, despite the fact that they have a lower victimization risk than men for almost all nonsexual crimes [3].

There are only two crimes for which women have higher victimization rates than men: rape and sexual assault. Several explanations for women's heightened fear of crime have been offered. One explanation is that women's higher levels of fear stem from their inherent vulnerability, meaning that they might be less able to defend themselves in the event of an attack and they might not have the financial resources to replace any property lost as a result of the attack [16]. Smith, Torstensson, and Johansson [17] have argued that this alleged vulnerability has both an objective and a subjective interpretation. Objectively, women generally tend to be less able to defend themselves due to lack of self-defense training and their physical size. At the subjective level, women might be more at-risk than men because of subtle or blatant reminders of their vulnerability and their "lower" status in a patriarchal society through verbal and visual harassment.

Another explanation for women's higher levels of reported fear of crime is rooted in a feminist framework. Feminist criminologists have explored the ways in which the gender gap in fear of crime might "reflect women's location in a gendered world" [18]. This line of feminist thought argues that gender plays a role in all aspects of our daily lives including how we act as workers, parents, and even criminals [19]. Thus, gender might also structure how an individual's behavior as a crime victim plays out [20]. By subscribing to these assumptions, women might have increased levels of fear because they believe that if they are ever in a situation where they are being victimized that they are going to be a helpless victim with no mechanisms for self-defense. A final explanation for women's elevated levels of fear of crime, and the explanation that is the crux of the present research, emerges from the belief that any personal victimization against a woman has the potential to escalate into rape or sexual assault [21]. Research has shown that women's rape and sexual assault rates are ten times higher than men's, and as a result of this elevated risk of victimization, they are more likely to be fearful of rape or sexual assault [2,21]. Several studies have concluded that women in various age groups fear rape more than any other crime, including murder [21,22].

Female students tend to limit their time on campus because of the direct threat of sexual assault victimization at a particular time and place [6]. These limitations can cause them to not get the full experience of campus life and to cause them to miss out on important events that occur on campus. Preventative strategies are more apt to create an environment that is more secure for campus life and at the same time also promotes students' participation in activities that are occurring on campus.

### **C. Theoretical framework**

This section has been an attempt to synthesize the relevant theoretical literature that applies to the impact on fear of crime.

#### **1) Environmental Criminology**

As a group, the theories under the environmental criminology umbrella attempt to predict crime based on elements such as target distribution, land use patterns, transportation pathways, and offender residence distributions [23]. Environmental criminologists have proposed models of decision making that lead potential offenders to specific targets and specific locations [24,25]. Mayhew [26] reviewed empirical data on crime in public places and called for an examination of how potential offenders search for and decide on a target to promote understanding of the crime rate. Bottoms and Wiles [27] both argued that neighborhood reputation and the consequences of ecological labeling have powerful effects on the urban crime pattern.

The criminality of place is most often connected to level of activity, ease of access, the presence of juveniles, and the presence of easy targets or victims. The sense of place is temporal by nature. People may feel fear in a dark parking lot at night, but completely safe in the same parking lot during the daytime. In essence, criminal places as well as criminal activities have a temporal dimension in accordance with environmental criminology [24].

#### **2) Defensible Space Theory**

Defensible space occurs when design characteristics of the physical environment have clear articulation of boundaries between public and private spaces. Such design characteristics then promote



feelings of territorial control and capability of surveillance of spaces [25]. If achieved, this approach would result in increased policing of residential neighborhoods by the residents themselves, and therefore would reduce opportunities for crime. Defensible space as a concept describes a residential environment designed to allow and encourage residents to supervise it themselves and be perceived by outsiders as being responsible for their neighborhoods [28]. The goal of defensible space is to release the latent sense of territoriality and community among residents in order to allow these traits to be translated into residents' assumptions of responsibility for preserving a safe and well maintained living environment [28,29,30].

In addition, the concept of defensible space increases the potential for residents to see and report likely offenders, thus enabling residents to control the physical environments in which they reside. Newman's ideas represented an attempt to reduce both crime and the fear of crime in a specific type of environment, by means of decreasing the opportunity for crime and fostering positive social interaction among legitimate users [28,29].

Newman's work assumed that physical space can be designed in such a way that it influences both residents' and offenders' perceptions of criminality. Residents feel a sense of ownership and responsibility by actively providing natural surveillance and reporting suspicious behavior. Offenders view the built environment as unsuitable for opportunities to commit crime and are deterred by the risks of apprehension [28].

Defensible space theory was the first to mention building design as an important factor in the causality of crime. Newman (1973) used empirical data and offered practice guidelines to reduce crime and as a result received a lot of attention and funding for his research [29]. His concepts came to be the core of most environmental design planning related to crime prevention, including a series of demonstration programs funded by the U.S. Department of Justice's Law Enforcement Assistance Administration during the 1970s.

### III. MATERIALS AND METHOD

This research is a quantitative study by using the structured questionnaire. In this study the cases under analysis are women who ply to USM every day that include: students and staffs. Indeed, current research expands on previous work in the field but differs in a crucial way: It explored the experiences of a variety of campus female users, and not just students. This was considered important because, although students comprise the majority proportion of campus users' and are indeed at higher risk of experiencing personal safety concerns, it was considered that a thorough measuring of fear of crime should take into account the range of different campus users, including staff and visitors. Some studies in the US have examined the issue of crime risk to faculty staff [31].

The data were processed using Statistical Package of Social Science (SPSS) computer software. The preliminary analysis focused on descriptive statistics mainly frequency distributions, cross tabulations and means while more rigorous analysis was done by using the independent sample T tests techniques.

A total of 250 randomly females were selected to complete the survey; of these women, a total of 243 completed the survey, which focused on fear of crime among USM women.

#### IV. RESULT AND DISCUSSION

The results are illustrated in following sections. The first section presents descriptive statistics of demographic profile, second section shows measuring the level of fear of crime in respondents. Thirdly the results of data analysis are presented to compare the mean and the existing correlations as well.

##### 1. Descriptive Statistics

Table 1 represents the results of the demographic profile of women participated in this study. These questions tried to reveal following specifications: The respondents' age, nationality, classification in USM, marital status, where they live.

The information shown in Table 1 reveals that out of 243 respondents 90.5% were local and 9.5% were international. The age distribution shows the age range of respondents is 18-60 and age mean equals 24 years. The age group of less than 25 occupied around 80% of the total sample. The data illustrate the majority of respondents were single (89.3%) and 10.7% were married. The table also shows only (10.3%) of the total sample were staff. Regarding current residency of respondents 79% and 21% were living on-campus and off-campus respectively. According to Table 4.1, 17.7% of respondents indicated that they work; with 58.1% of them were staff on USM campus. To get from one place to another on campus, 76 respondents, or 31.3 percent said they get bus, 21.0%, 18.9% and 7.0% of respondents drive, walk and ride a bike respectively. The remainder of the respondents either walk, ride the bus or ride a bike with friend on campus. Regarding walking on campus, 62.6 percent of respondents said they walk on campus alone during the day, compared with 28.4 percent who walk alone at night. From the students' data shown in Table 4.2 it can be seen that majority of students in the sample hold undergraduate degree (82.1%) and 17.9% of them hold postgraduate degree.

TABLE 1. DEMOGRAPHIC CHARACTERISTICS AND ROUTINE ACTIVITIES OF THE RESPONDENTS

Variable		Frequency	Percentage
Age	Mean = 24 Range = 18-60		
Nationality	Local	220	90.5
	International	23	9.5
Marital status	Single	217	89.3
	Married	26	10.7
Classification	Student	218	89.7
	Staff	25	10.3
Residency	On-campus	192	79.0
	Off-campus	51	21.0
Work	No	200	82.3
	Yes	43	17.7
Transportation around campus	Walk	46	18.9
	Bus	76	31.3
	Drive	51	21.0
	Motorbike	17	7.0
	Other	53	21.8
Walk alone on campus during day	No	91	37.4
	Yes	152	62.6
Walk alone on campus at night	No	174	71.6
	Yes	69	28.4
Total		243	100

## 2. Fear of Crime

Another self-report question that asked, “*How afraid* you are of being a victim of the following crimes *on campus*?” This question was divided into 11 measurements with specified crimes which asked respondents to indicate their level of fear of crime on a 5- point Likert-type scale ranging from 1 ‘Not afraid at all’ to 5 ‘Very afraid’. Computing these 11 questions give a variable that shows the level of fear in respondents while on campus. In terms of scale, this variable scores are ranging from 11 to 55, that means those who show score 11 are not afraid of being a victim of crime on campus ‘not at all’ while those’ score is 55 are ‘very afraid’ of being a victim of crime on campus, and others with score 33 are ‘moderately afraid’. Finally respondents with the scores of 12- 32 and 34-54 are ‘slightly afraid’ and ‘somewhat afraid’ of crime, respectively. Regarding to this variable, only n=9, 3.8% of respondents are not afraid of crime on campus not at all, whereas remainder of them (n= 234, 96.2%) are in different level of afraid of victimization. In general, mean of fear of crime in women while on campus equals 42.8 (between rang 11-52) which means the level of fear in women in USM campus is around 78%.

## 3. Environmental Factors

In this section the fear means are compared in order to three environmental factors which are residency, lighting and shrubbery.

### a) Residency

As it can be seen in Table 2, the level of fear of crime in respondents who live on campus (44.8) is higher than who live off campus (34.5).

TABLE 2. GROUP STATISTICS- FEAR OF CRIME AND RESIDENCY

	Residency	N	Mean	Std. Deviation	Std. Error Mean
fear	off campus	47	34.5957	18.20017	2.65477
	on campus	192	44.8490	11.84954	0.85517

As it can be seen in table 3, Sig value is 0.000. It means that the variability in the two conditions (on-campus and off-campus) is significantly different. Moreover, considering the Sig. (2-Tailed) value which is 0.001, it can be found that there is a statistically significant difference between the fear means of crime for on-campus and off-campus residents due to the residency manipulation not due to chance.

TABLE 3. INDEPENDENT SAMPLE TEST- FEAR OF CRIME AND RESIDENCY

	Levene's Test for Equality of Variances		t-test for Equality of Means		
	F	Sig.	t	Sig. (2-tailed)	95% Confidence Interval of the Difference

						Lower	Upper
fear	Equal variances assumed	37.5	.000	-4.73	.000	-14.524	-5.982
	Equal variances not assumed			-3.67	.001	-15.840	-4.665

**b) Lighting**

Respondents were asked whether they avoid areas on campus that have poor lighting. The statistics of this question is presented in Table 4. According to this table, fear mean of crime for women who avoid such areas is 43.8 while the same figure for women who do not avoid these areas is 39.7.

TABLE 4. GROUP STATISTICS- FEAR OF CRIME AND POOR LIGHTING

	Do you avoid areas on campus that have poor lighting?	N	Mean	Std. Deviation	Std. Error Mean
fear	No	58	39.7586	14.75331	1.93720
	Yes	181	43.8177	13.51850	1.00482

Table 5 shows the sig. value is .004 means that the variability in two avoiding and not avoiding such areas conditions is not same. Scientifically, it means that the variability in these two conditions is significantly different. So, we read from the second row in the table 5. Based on sig (2 Tailed) value= .006 it can be determined that the difference between fear means in women who avoid and who do not avoid poor lighting areas is statistically significant.

TABLE 5. INDEPENDENT SAMPLE TEST- FEAR OF CRIME AND POOR LIGHTING

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	Sig. (2-tailed)	95% Confidence Interval of the Difference	
						Lower	Upper
fear	Equal variances assumed	1.62	.004	-1.94	.053	-8.168	.0505
	Equal variances not assumed			-1.86	.006	-8.394	.2766

### c) Shrubbery

Another question was whether the respondents avoid areas on campus that have shrubbery. The fear mean for each group is displayed in Table 6. The fear mean scores for women who avoid such areas is 44.6 while the same figure for women who do not avoid these areas is 40.9.

TABLE 6: GROUP STATISTICS- FEAR OF CRIME AND SHRUBBERY

	Do you avoid areas on campus that have a lot of shrubbery?	N	Mean	Std. Deviation	Std. Error Mean
fear	No	118	40.9407	13.78237	1.26877
	Yes	121	44.6777	13.83427	1.25766

Table 7 offers the sig. value .511 that means the variability in two avoiding and not avoiding such areas conditions is about the same. Therefore, the variability in these two conditions is not scientifically significantly different. Then, by reading from the first row of table and considering sig (2 Tailed) value= .038 it can be determined that the difference between fear means in women who avoid and who do not avoid shrubbery areas is statistically significant. It means that the differences between these two means are not likely due to chance and are probably due to the independent variable manipulation.

TABLE 7: INDEPENDENT SAMPLE TEST- FEAR OF CRIME AND SHRUBBERY

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	Sig. (2-tailed)	95% Confidence Interval of the Difference	
						Lower	Upper
fear	Equal variances assumed	.432	.511	-2.09	.038	-7.256	-.2174
	Equal variances not assumed			-2.09	.038	7.256	.2176

## V. CONCLUSION

This study contributes to the literature by exploring fear of crime from the perspective of a unique segment of the population, women on university campus. In general, mean of fear of crime in women while on campus equals 42.8 (between rang 11-52) which means the level of fear in women on USM campus is relatively high (around 78%). In this study the fear means are compared in order to two main physical characteristics of USM campus which are lighting and shrubbery. It was found that the



mean of fear of crime for women who avoid areas on campus that have poor lighting and those places that have a lot of shrubbery is more than who do not avoid such places. Moreover, it was released that women who live on campus have more fear of crime in compare to those who live off campus.

A major step toward understanding what policies and programs to implement in university communities to address crime is to continue to study what causes fear of crime on campus, and to help university officials come up with viable ways to address this fear that makes campus users aware, without causing alarm. By knowing the level of fear that women experience, universities can determine the best approach to making their women population feel safer. Findings of this research should be interpreted in light of the some limitations. This study only focused on women in USM main campus in Pulau Pinang, the result may not be applicable to other campuses of USM. It is suggested that future researches see how true this research findings to other campuses.

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## EFFECTS OF THE EXTERNALLY REFLECTED COMPONENT ON THE DAYLIGHT FACTOR IN HIGH RISE RESIDENTIAL: THE VIEW CONDOMINIUM CASE STUDY

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### ABSTRACT

In a high rise residential building, units at top floors are brighter due to the day light that comes in through the sky component direct without any obstructions externally. Units on the bottom floors however, experience less day light when the external obstructions are more dominant from trees and surrounding buildings. The Daylight Factor (DF) is the accumulation of three components which are the Sky Component (SC); the Externally Reflected Component (ERC) and the Internally Reflected Component (IRC). This paper compares the natural illumination levels in terms of DF in the 4 rooms of typical condominium units called the View, located in Penang, Malaysia. Unit 1A is located at level 9, and has the DF in just SC and IRC; while Unit 1B, located at level 3, has DF in SC, IRC and ERC. Results show that the overall average %DF at Unit 1B is lower than Unit 1A by 1.7% to 2.8% DF, and this in tropical sky conditions, is very significant. The day lighting analyses uses the 10% minimum Window to Floor area Ratio (WFR) in the Malaysian Uniform Building By Law (UBBL) #39 for determining the WFR of each room. Results indicate that for Unit 1A, a maximum WFR of 20% is suggested to not make the spaces over lit. For unit 1B, due to the effects of ERC, maximum WFR suggested is 30% depending on the extensiveness of the ERC.

**Keywords:** Daylight factor %DF, Window to floor area ratio (WFR), Externally Reflected Component (ERC); Uniform Building By Law (UBBL); Sky Component (SC).

### 1. INTRODUCTION

The percentage daylight factor (%DF) is an established method to assess daylighting performance in a space. The relative value of %DF is considered constant under varying sky conditions.

The formula for %DF is derived as follows:

$$\%DF = E_i/E_o \times 100\%$$

Whereby  $E_i$  is the illuminance due to daylight at a point on the indoors working plane from an unobstructed hemisphere of the sky illuminance, which is  $E_o$  (Hopkinson, Petherbridge, & Longmore, 1966). By using relative values which compare indoor to outdoor illuminance, this factor is constant under widely varying outdoor sky and day lighting conditions (Ahmad, Ossen, & Khaidzir, 2008). Design guidelines worldwide currently recommend daylight provision in terms of the long established DF (Mardaljevic, 2008) (Mavromatidis, Marsault, & Lequay, 2014) (Du & Sharples, 2011).

In order to calculate DF, one must establish the amount of light received from the outside to the inside of a building. There are three paths along which light can reach a point inside a room through a glazed window, rooflight, or aperture, as follows:

- Direct light from a patch of sky visible at the point considered, known as the sky component (SC),
- Light reflected from an exterior surface and then reaching the point considered, known as the externally reflected component (ERC),
- Light entering through the window but reaching the point only after reflection from an internal surface, known as the internally reflected component (IRC).

As depicted in Figure 1, the sum of the three components gives the illuminance level (lux) at the point considered as follows (Hopkinson et al., 1966):

$$\%DF = SC + ERC + IRC$$

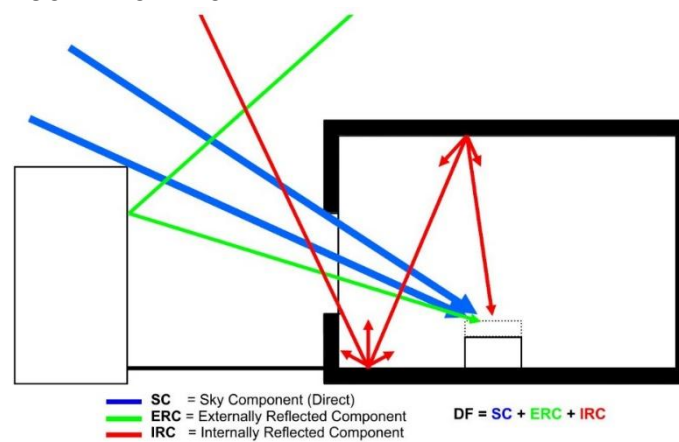


Figure 1: The three components of DF in graphical form.

Windows are the most commonly used method to deliver daylight. (Boyce, Hunter, & Howlett, 2003), and according to (Danny & Ernest, 2008), window area is also commonly represented by the window-to-wall ratio (WWR) that is defined as the ratio of the total area of windows to the overall gross façade areas including window. The Window to Floor Ratio (WFR) also coincides with the WWR. For thermal analysis, WWR is used instead of WFR. (Zain-Ahmed, Sopian, Othman, Sayigh, & Surendran, 2002) (Pino, Bustamante, Escobar, & Pino, 2012). For daylight distribution and visual comfort in residential buildings, the critical factor determining the daylight entering a building is the window or glass area. According to the Malaysian Uniform Building By Law (UBBL, 2010), the required window area in residential buildings should be more than one-tenth of the floor area of the room. All rooms must have at least a 10% window-to- floor ratio (WFR).

WFR was the basis for many previous studies in Malaysia, especially those related to day lighting requirements (Zain-Ahmed et al., 2002) (Beltrán & Martins-Mogo, 2007) (Abdullah, Fadzil, & Al-Tamimi, 2009) (Al-Tamimi, 2011) (Mirrahimi, Lukman, Ibrahim, & Surat, 2013) (Lim, 2013) (Fadzil et al., 2014) (Dass, Ibrahim, & Lukman, 2014).

## 2. OBJECTIVES AND METHODOLOGY

This study focuses on day lighting study using %DF in varied residential room designs with varied WFR. More specifically the objectives of the study are as follows:

- To determine the effects of varied WFR ratios to the natural illumination levels and to the %DF of a single midpoint of rooms.
- To determine the effects of ERC or the Externally reflected component the DF
- To determine a new maximum WFR for effective day lighting design under the real skies

In the study, two similarly designed units of the View condominiums were selected. The first was Unit 1A on the 9th floor at Tower A, and the second, Unit 1B on the 3rd floor of Tower B. Four varied sizes room forms were used (R1 – R4). Due to height and location, Unit 1A has no external obstructions which would affect day lighting; while Unit 1B located at third floor had some external obstructions from surrounding low rise buildings and trees. In both units; the internal reflected component (IRC) was similar as both units were vacant with similar material reflectance values and without any furniture. The WFR as a ratio to study was selected due to its conformity to the Malaysian UBBL 2010. The effects of various shapes of rooms were investigated along with the effects of the externally reflected component (ERC).

In selecting the sample buildings for case study, several considerations were taken into account. First was to select a residential design with variety and some complexities in the rooms' shapes and forms. Second was to find owners and housing managements who and which agree and give permission for research and data collection to take place. Third was to find a building with close proximity to university as easy access and transportation and moving and setting up of instruments needed to be practical to researchers. From the many buildings selected, only the View condominiums satisfied all three requirements.

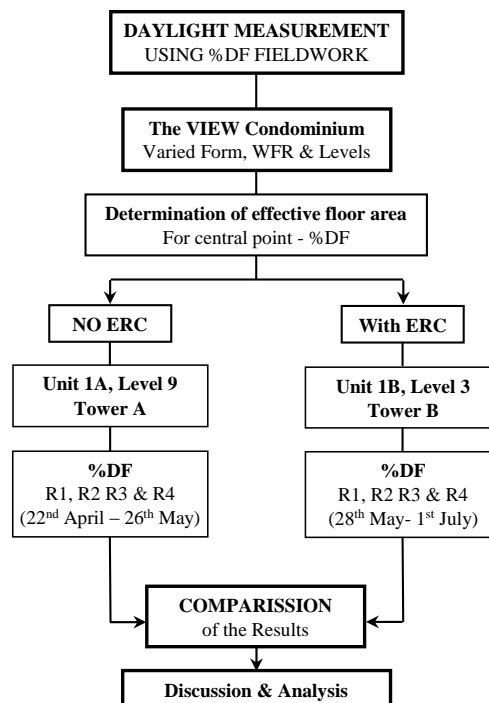


Figure 2. Brief methodology flow chart of the study.

A brief methodology flow chart is given in Figure 2. Data collection were taken using the Babuc/A data logger connected to indoor luxmeter probe with a maximum reading 20,000 lux and an



outdoor luxmeter probe with maximum reading 100,000 lux. The indoor lux meter probe was located at the middle of each test rooms (R1 – R4) at 1m above of the floor level for Unit 1A and for unit 1B. Readings were set to be collected digitally every 10 minutes continuously in each individual room during the period of April to July 2009.

Due to limitations in instruments, the  $E_i / E_o$  ratios depicting the average %DF at mid points per room were collected as 6 day averages per room and on the dates indicated on the chart in Figure 2. The effects of direct sunlight were disregarded in all data collected in all rooms. Readings taken were from 10.30am to 3.30pm when the sun's altitude was higher, and when there was no direct sunlight entry detected in any of the rooms.

### 3. THE VIEW CONDOMINIUMS

The View condominium was selected and used as the primary case study. The condominium (also popularly known as Penang Twin Towers) is located in Penang Malaysia at Batu Uban area with latitude 5.20 degree north and a longitude of 100.18 degree east (Figure 3). The residential scheme consists of two towers (Tower A and B) of 29-storey condominiums, both of them are connected to each other by a sky-bridge at the 14th floor, and has a total of 164 units (Figure 4). The View was built by Ivory Properties Group Sdn Bhd, and was completed in 2007. The building is oriented to the South East direction (Tower A) and North East (Tower B). Each floor consists of 3 residential units per tower with approximate floor area of 530 square meters per unit (Figure 6).

Two units from the View were chosen for the case study with permission granted from the owners and the management body. The first unit is called Unit 1A at Tower A located on the 9th floor while the second unit called Unit 1B at Tower B was located on the 3rd floor as could be seen in Figure 6. Details and configurations of R1, R2, R3 and R4 are given in Table 1.



Figure 3: The View Building (Case Study) location in Penang, Malaysia.



Figure 4: The View Building (Case Study) general views.

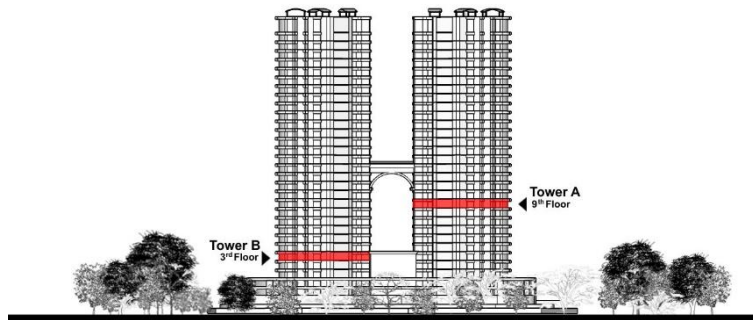


Figure 5: Schematic elevation of The View Towers with study units at both towers indicated.

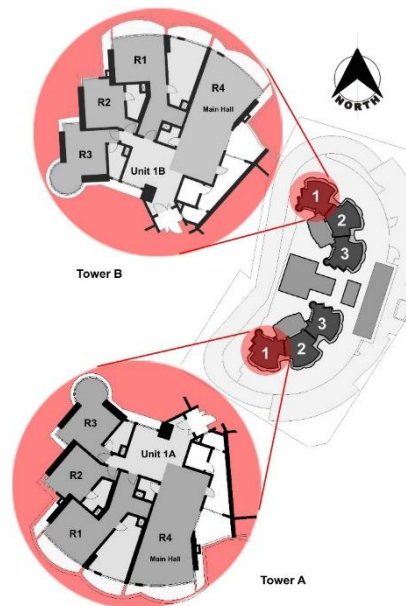


Figure 6: The View building typical floor plan, Unit 1A & 1B at tower A & B.

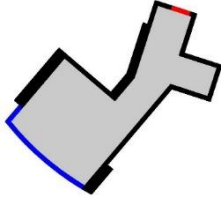
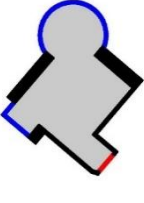
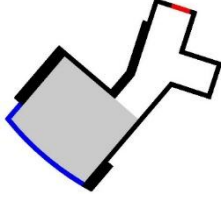
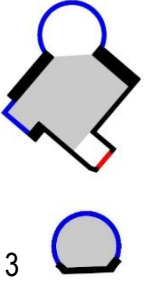
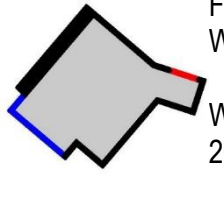
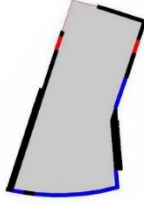
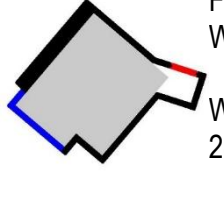
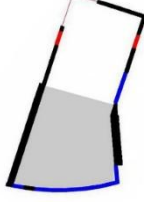
Measured  $E_i$  and  $E_o$  illuminance data from Unit 1A used the formula:  $\%DF = SC + IRC$ , as there was no externally reflected component (ERC). Unit 1A (Tower A) had the sky component (SC) and the internally reflected component (IRC) as the two components making up the DF. Unit 1B on the other hand was at the lower level of tower B and located approximately 14 m from ground. Unit 1B experienced some ERC from trees, and nearby buildings that would affect the DF calculation as follows:  $\%DF = SC + IRC + ERC$ .

#### 4. DETERMINING WFR FOR THE ROOMS

Due to irregularities of room shapes and forms, determining the WFR ratios of rooms was found to be not as easy as in a simple rectangular room. This was unforeseen in the research. Only 1 point data was taken in all rooms and the points were placed at typical centers but irregularities in the room shapes make the exact placement of the point difficult. As can be seen in Table 1, the calculation of WFR for R3 for example, can be as high as 81% dividing the total glass area of 14.7m<sup>2</sup> to the total floor area of 18m<sup>2</sup>. The WFR for just the circular area was calculated to be 105% (5.4m<sup>2</sup> divided by 5.1m<sup>2</sup>). Not all the light from the circular window get to be reflected to the single point. The appropriate calculation for the single point %DF of the rooms was found to take and use just the effective floor area

of each room which has the single point at the middle. Thus this effective area method was used in the calculation of WFR for all rooms R1 to R4 in both units 1A and 1B as depicted by Case 2 in Table 1.

Table 1: Floor area total and effective for WFR calculation.

Layout	WFR	Layout	WFR
	R1	R3	
Case 1	 <p>F = 26.6 m<sup>2</sup> W = 10.4 m<sup>2</sup> WFR = 39%</p>	Case 1	 <p>F (all) = 18 m<sup>2</sup> W = 14.7 m<sup>2</sup> WFR = 81%</p>
Case 2	 <p>F = 16.6 m<sup>2</sup> W = 10.4 m<sup>2</sup> WFR = 62.65%</p>	Case 2 & 3	 <p>2- F (effective) = 13 m<sup>2</sup> W = 7.36 m<sup>2</sup> WFR = 56.6%</p> <p>3- W = 5.4 m<sup>2</sup> F = 5.2 m<sup>2</sup> WFR = 105%</p>
	R2	R4	
Case 1	 <p>F = 14.5 m<sup>2</sup> W = 3.8 m<sup>2</sup> WFR = 26.2%</p>	Case 1	 <p>F = 42.6 m<sup>2</sup> W = 15.4 m<sup>2</sup> WFR = 36%</p>
Case 2	 <p>F = 13.4 m<sup>2</sup> W = 3.8 m<sup>2</sup> WFR = 28.4%</p>	Case 2	 <p>F = 23.6 m<sup>2</sup> W = 11.8 m<sup>2</sup> WFR = 50%</p>

## 5. RESULTS OF CASE STUDY

The results of the data collected from the case study are shown graphically in Table 2 and Table 2 and also in Figure 7 and Figure 8.

In terms of the natural illumination levels at mid points of all rooms in lux, it could be seen that all rooms in both towers were brightly illuminated. The illumination levels in rooms at Unit 1B were overall higher than Unit 1A. However in terms of the %DF derived from the field work data as could be seen in Figure 7, it was found that the average %DF for all rooms in Unit 1B (with ERC) were found to be lower than Unit 1A (without ERC). The reason for higher illumination levels indicated overall much brighter skies during data collection at Unit 1B. This proved the importance of %DF value as ratio of indoor illuminance to the simultaneous outdoor sky conditions to more accurately assess the daylighting performance. Figure 8 shows the average %DF from R1 to R4 comparing Tower A and B where the reduction in %DF values in rooms at Unit 1B can clearly be seen. R1 had a reduction of 2.8 %DF comparing to Unit 1A; R2 a 1.7 %DF reduction; R3 a 2.8 %DF reduction and R4 a 1.8 %DF reduction.

Table 2: Tower A WFR, Daylight Factor and Illumination.

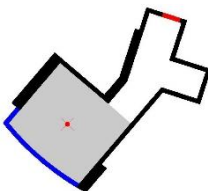
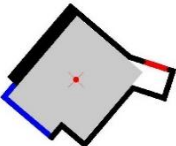
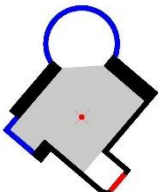
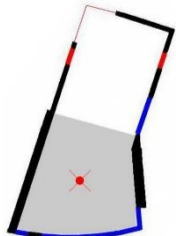
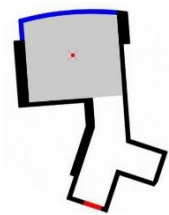
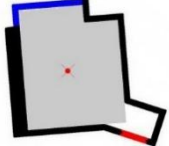
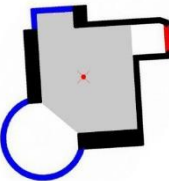
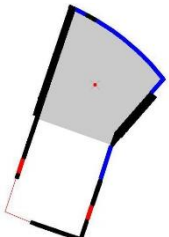
R	Tower A Rooms WFR Effective Floor Area	WFR	DF (%)	Illumination (lux)
R1		63%	Ave. 7.3% Min. 5.7% Max. 8.9%	1248 765 1794
R2		28%	Ave. 4.5% Min. 3.5% Max. 7.2%	815 441 1258
R3		57%	Ave. 7.1% Min. 5.4% Max. 12.2%	1337 944 1810
R4		50%	Ave. 5.9% Min. 5.1% Max. 6.8%	1051 753 1186

Table 3: Tower B WFR, Daylight Factor and Illumination.

R	Tower B Rooms WFR Effective Floor Area	WFR	DF (%)	Illumination (lux)
R1		63%	Ave. 4.5%	1740
			Min. 2.2%	1290
			Max. 8.5%	2615
R2		28%	Ave. 2.8%	1193
			Min. 1.3%	568
			Max. 6.0%	2146
R3		57%	Ave. 4.3%	1340
			Min. 1.3%	844
			Max. 8.5%	2075
R4		50%	Ave. 4.1%	1799
			Min. 3.6%	1091
			Max. 6.4%	2408

In Figure 7, a comparison was given in %DF in R1 to R4 comparing Unit 1A (Tower A) to Unit 1B (Tower B). It could be seen that %DF values were lower at tower B with the effect of ERC (Externally reflected components). Another finding could be made comparing the rooms according to their WFR values.

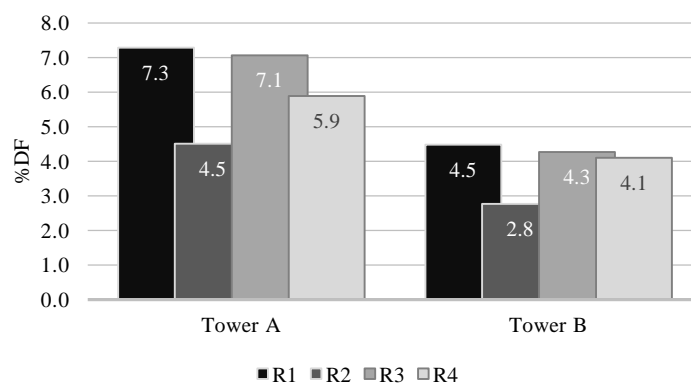


Figure 7: Daylight Factor R1 to R4, Tower A & B.



Table 4 ranked the 4 rooms R1-R4 according to their effective WFR ratios from smallest to largest for units 1A and 1B. Figure 8 showed the average %DF of all rooms ranking them in their WFR from smallest to largest. The results clearly showed that the higher the WFR the higher too the average %DF. The effects of ERC at unit 1B make the %DF there lower than at unit 1A which were without the effects of ERC. The reduction in %DF values in rooms at Unit 1B could clearly be seen.

It could be deduced that the lower the WFR the lower too the average single point %DF. For example, at Unit 1A, R2 had the lowest WFR of 28% and also the lowest average %DF of 4.5%. R1 on the other hand, had the highest WFR at 63% also had the highest average %DF of 7.3%. R4 and R3 fit nicely between the two.

From Table 1, all rooms had WFR more than 10% minimum which was required by UBBL #39. The calculated WFR for R1 was 39%; R2 26%; R3 81% and R4 36%. For day lighting studies, depending on design, location of glazed areas and indoor probe, it was also found that the effective WFR needed to be determined. All these WFR ratios (effective or not) were found to produce natural illuminance levels indoors over and above the standards for typical residential and bedroom activities of between 100 to 200 lux typical. Thus, under bright Malaysian tropical typical sky conditions, UBBL should impose a maximum WFR so that spaces are not over lit than necessary. Therefore it is recommended effective WFR of 20% as maximum for cases without ERC; and a maximum WFR of 30% be recommended for cases with ERC.

With these results designers and home buyers can anticipate that if units bought have windows with a lot of ERC a lot lower levels of natural illumination will be received compared to units without ERC. In a highrise residential, for example, if similar standards of illuminations are to be maintained in all units, then different kinds of window areas need to be considered. Units at lower levels with ERC may have bigger windows compared to higher levels without ERC, or lesser ERC, as schematically shown in Figure 9.

From this case study, an estimation of between 1 to 3% DF reduction in day lighting levels can be anticipated in residential rooms comparing rooms without ERC to rooms with ERC. This under the bright tropical skies is significant.

Table 4: Tower A Rooms Ranking according to WFR.

R	WFR	Unit 1A %DF = SC+IRC		Unit 1B %DF = SC+IRC+ERC	
		DF (%)	Illumination (lux)	DF (%)	Illumination (lux)
R2	28%	4.5%	815	2.8%	1193
R4	50%	5.9%	1051	4.1%	1799
R3	57%	7.1%	1337	4.3%	1340
R1	63%	7.3%	1248	4.5%	1740

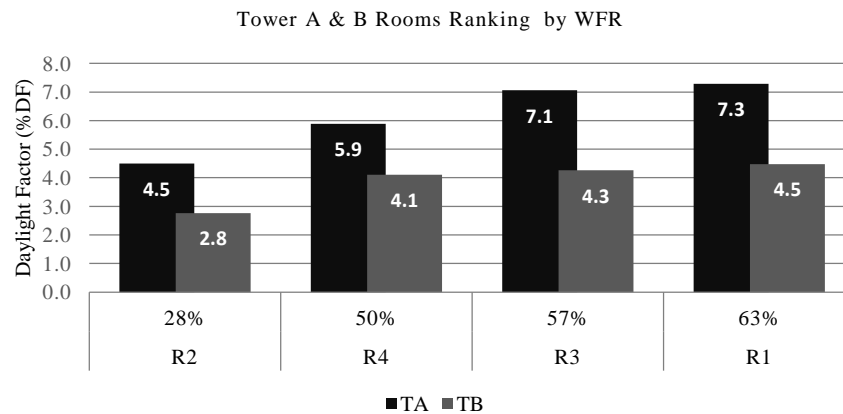


Figure 8: Tower A & B Rooms Ranking by WFR.

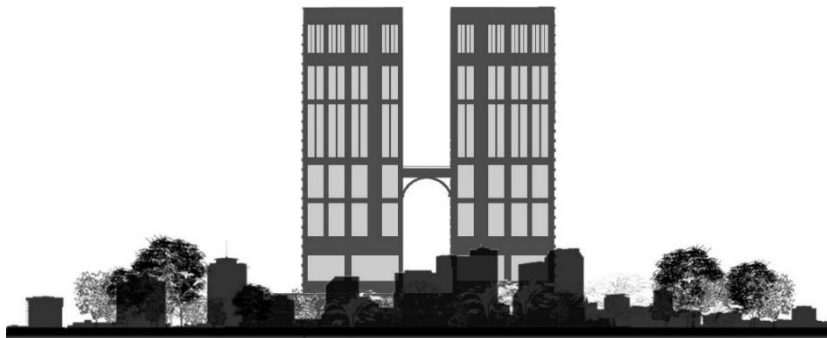


Figure 9: Schematic drawing for window design with ERC effects.

## ACKNOWLEDGEMENT

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## INTERACTIVE e-PLANNING APPROACH (lePA) FIRST STEPS TOWARDS LIVEABILITY IN SUDANESE CITIES

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### ABSTRACT

A starting point of this paper is the notion of a liveable city, a dominant concept of global development which assumes the harmonization of environmental, social and economical development. In urban planning process, a liveability assumes, among other things, an interactive participation of the public in making planning decisions on liveable development, including their responsibility for the implementation and outcome. The traditional methods of urban planning process used in Sudanese cities were not suitable, for meaningful involvement. It has faces so many problems such as; Lack of integrity, incomplete databases, and difficulty in handling ad hoc queries and updating system information. Recent developments of Internet Technology (IT) in Sudanese cities, provided considerable challenges and opportunities to improve the management of urban planning processes, and make better use of resources. The main objective of this paper is to develop Interactive electronic Planning Approach (lePA), that helps to improve knowledge and level of the Public Participation (PP) in Urban Planning Process (UPP) to achieve a liveability in Sudanese cities, taking Khartoum Metropolitan (KM) as a case study.

**Keywords:** Urban Planning Process (UPP), Public Participation (PP), Internet Technology (IT), Khartoum Metropolitan (KM), Interactive e-Planning Approach (lePA)

### 1.0 INTRODUCTION

Technology affects what we plan, how we plan, who plans, and is set against the wider context of why we plan (1). It affects the three major professional activities of planning: analysis or the deployment of knowledge, design or the activity of invention, and the management of public participation through the engagement of planning with clients and the public's (2). E-Planning emerged during last decade, and offers considerable opportunity for early and rapid change to the future delivery of planning services, with an emphasis on electronic delivery (3). The main aims of e-Planning are to enable more people to get involved in planning; to increase transparency, efficiency and effectiveness; to arrange the delivery of planning service to meet citizens' needs. To design a good e-Planning system, two aspects need to be carefully considered, namely, access and comprehension (4).

Sudan placed the development of information and communication technologies among top national priorities. Beyond statistical data, the future of the IT sector in Sudan measures in terms of society and cultural choices in accordance with the national economic options (5). Public access to the Internet is still relatively low at the moment. All the indications suggest that levels of access are improving

as many Internet Service Providers are offering free access with only local telephone calls to be paid for (6).

The current available database system in **KM** is not reliable, for use in **UPP**, because it uses a relational database, for data manipulation. The limitations of the relational database are due to failure in application of data, with a complex structure, that need to be integrated, from different resources, into a single homogeneous system, and which need powerful and flexible data models, to serve multiple tasks. Although the old urban planning theories (strategic approach) are still relevant today in **KM** but failed to cope with these drastic changes (7). The question often posed is: what approach can tolerate such changing environment of **KM**? A dynamic, interactive and electronic planning approach is needed to a achieved liveability.

## 2.0 URBAN PLANNING PROCESS (UPP) IN **KM**.

Number of traditional approaches has been applied to planning and decision-making processes in **KM** in the past. The most conventional method is the linear approach, where a planning issue is raised, a solution is proposed and implemented, and then the solution is assessed. Introducing feedback approach makes this framework slightly more sophisticated. Another approach is the alternative evaluation approach, which enables comparisons between different options. However, each of these approaches requires a long planning period. Later Strategic approaches were applied which aims to exploit new and different opportunities of tomorrow. This is in contrast to long-range planning, which tries to optimize today trends for tomorrow (6).

Other new approaches include Object-oriented Approach (**Figure 1**) represents the development of the Strategic Approach model it takes in account the external environment and bounded with administration boundary. It is able to thoroughly represent complex relationships and to represent data and data processing with a consistent notation, which allows an easier blending of analysis and design in an evolutionary process. The goal of object-oriented approach is to make system elements more reusable, thus improving system quality and the productivity of systems analysis and design (8).

Recently the urban planning authority in **KM** introduced strategic planning system, using a cycle process for the planning (**Figure 2**). This Planning cycle brings together all aspects of planning into a coherent, unified and controllable process. It thinks **UPP** as a cycle and not as a straight-through process (9).



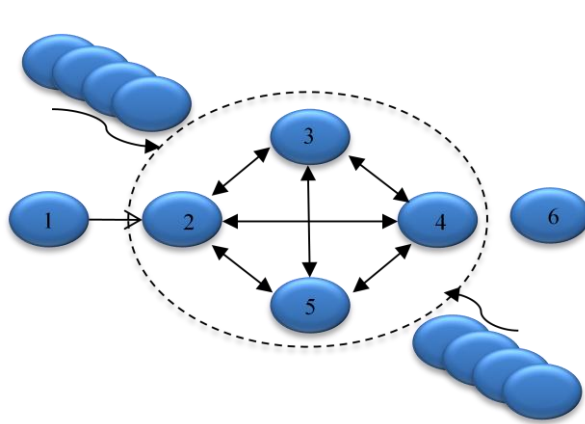


Figure 1 Object-Oriented Approach  
Source: Narushiae. (2000)

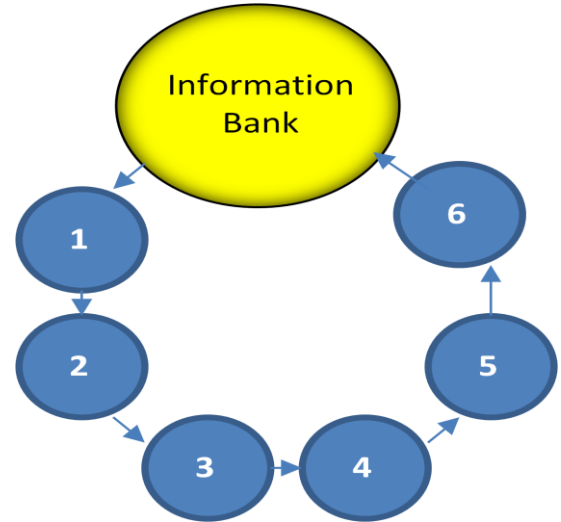
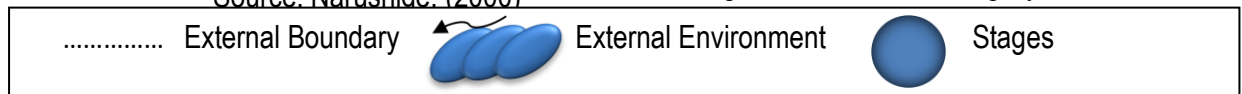


Figure 2 Current Planning System In KM



Access to information in the current planning system is restricted, that is, there is no continuous inclusion of the public, starting from the initial stages of the planning process. Also there is a huge number of people who do not actually know how to participate and in what areas. The unqualified people do not understand the 2D documentation. Planners need to access data sources individually and then combine the results manually every time. In addition most data are scattered, in different government departments, and need to be collected and organized. The available scarce data itself is not possessed by a single administrative body, and may not in a form that can be readily used. This is a very tedious and time-consuming task. The cost of gathering and processing this data is arguably the most significant cost for planning analysis (6).

### 3.0 INTERACTIVE e-PLANNING APPROACH (lePA)

#### 3.1 CONCEPT OF leP

The concept of **leP** is based on the interactive relationship amongst internet, urban planning process and public participation (**Figure 3**). It can be described as a creative process, for collaborative learning, within a network of stakeholders. This is opposed to standard planning methods, which aimed at a systematic planned rational approach, for problems solving. It also helps government officials and other professionals, to create better planning alternatives. It gives the public the sense of responsibility, and leads to the creation of sustainable development. The main objective of the **leP** is to encourage citizens, to participate in planning of their own society. The participative process is believed to increase people's satisfaction, in their living environment and to decrease complaints, in the last phases of the planning process.

The purpose of **lePA** is to identify new means, by which technology can improve the delivery of urban planning processes. It sets out online information and services that need to be provided, to the users for the official operation of the planning system. Users can be at any level or position in society, from the international to the national, regional, household or local level. Users could include policy makers, planners and administrative people in ministries, researchers, NGOs, traders, consumers, farmers and even children. They can live in the area, or far away.

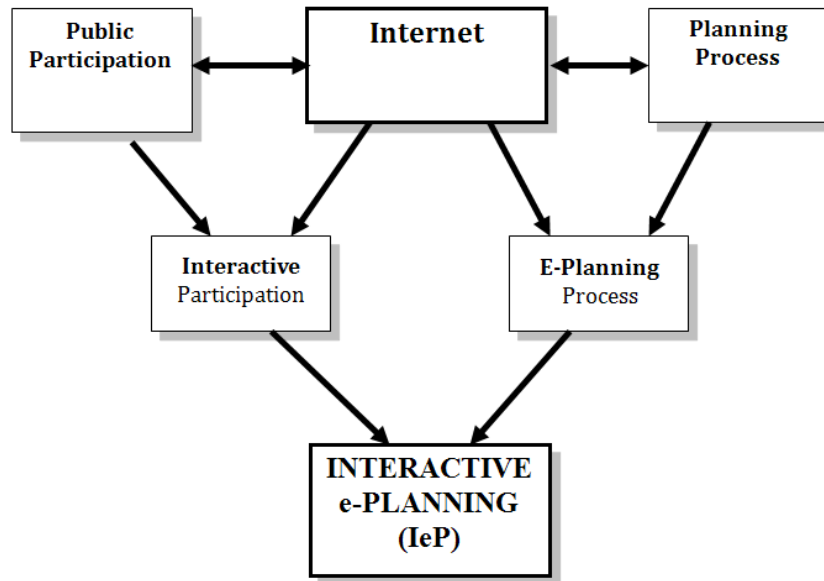


Figure 3 Concept of IeP  
Source the Author

### 3.2 CONCEPT OF IePA

The general objective of urban planning is to provide for a spatial structure of activities, which in some way is better than the pattern existing without planning (10). Achieving of this objective is not only the matter of planners and governments, but also concerned with the cooperation among investors, architects, engineers, and the public. **lePA** is a new tool, intended to improve the knowledge, and level of public participation, in the planning process using 3D for better understanding, of planning information contents and for interactive participation. The concept of **lePA** is based on the development of the object-oriented approach and the current urban planning system in **KM** (Figure 4).

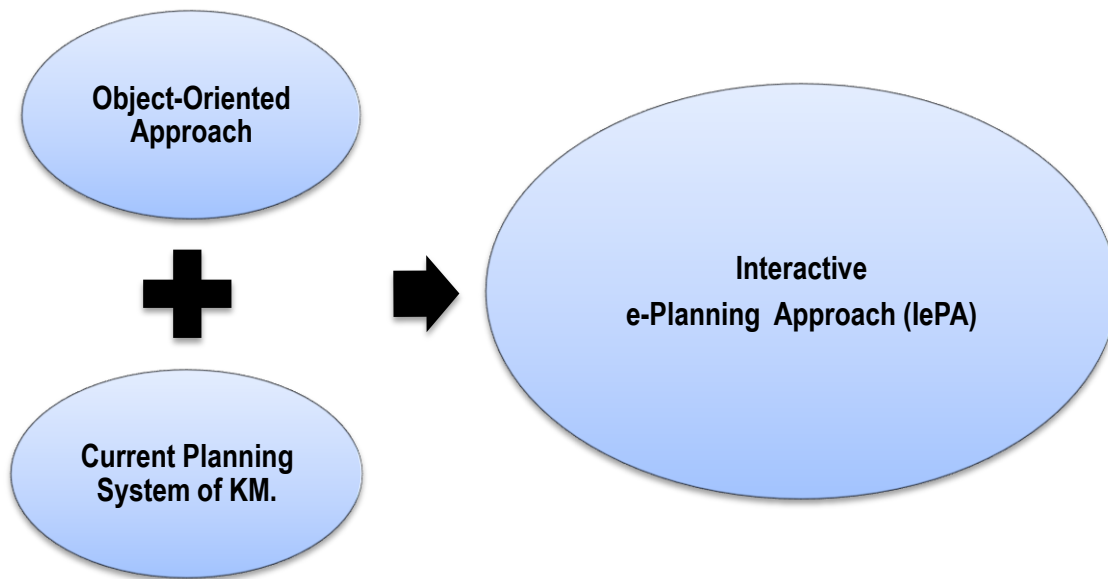


Figure 4 concept of lePA  
Source the Author

### 3.3 CONCEPTUAL FRAME OF lePA

**lePA** is about to represents the development of the kinetic state of the current urban planning process of **KM**, and the object oriented approach. Based on this concept, the conceptual frame of the **lePA** has been set up (**Figure 5**). This approach provides a good solution, for the urban planning process and public participation at **KM**, that fulfills the followings;

1. Utilizes a planning cycle process, with controllable stages and power full problems-solving tool.
2. Uses dynamic data at all stages, where the core of the approach is an online participations.
3. Offers a considerable opportunity, for incorporate early and rapid contextual changes, in the future delivery of planning services.
4. Flexible and applicable to a wide range of planning projects.
5. The Approach offers a high degree of flexibility; it can be altered or updated with more relevant information, throughout the public participation process.
6. A completely open ended approach - anything can be said or suggested at any stage any time;
7. It provides information, which can be of use to both the local community and the wider local authority, in terms of future planning and knowledge of local opinion.

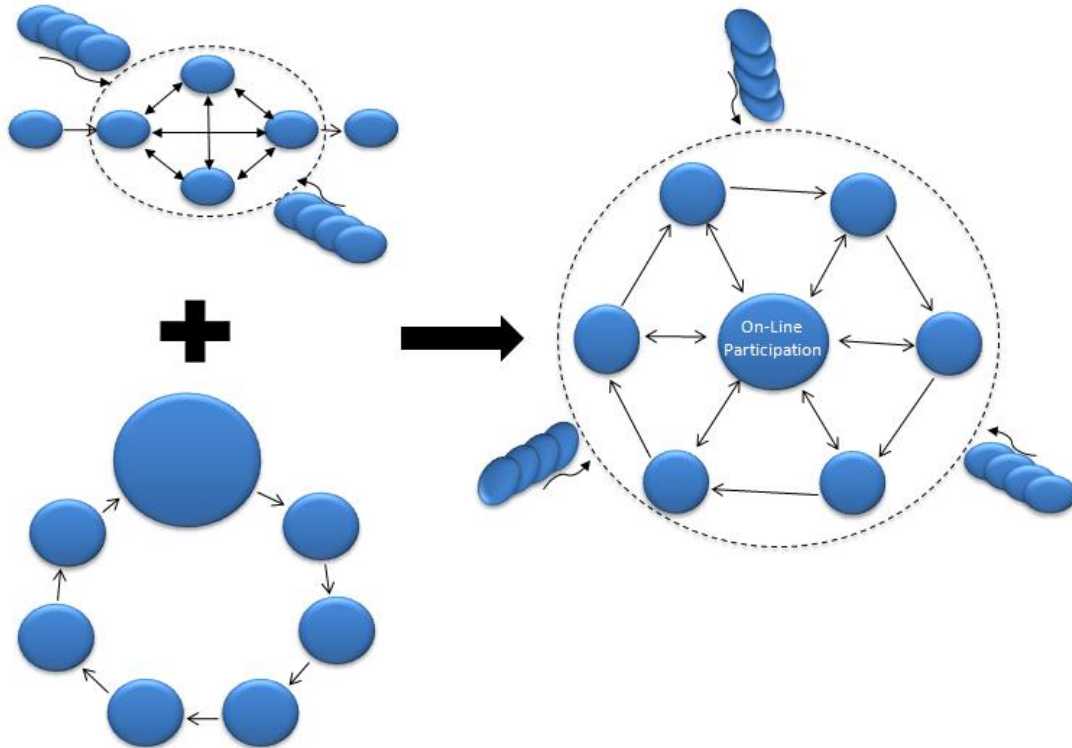
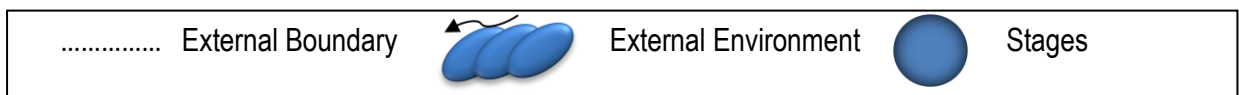


Figure 5 Conceptual Frameworks of lePA  
Source: the Author



### 3.4 CONTENTS OF lePA

lePA consists of six stages, in a cycle process and controlled by the online participation forum (Figure 6). The details of the six stages are elaborated below.

#### ● Stage 1-Data Collection

This stage contains systems of collecting, analyzing and evaluating data about the users and the case study. It identifies the followings;

1. The contents and aims of a system;
2. the user groups and their requests;
3. the structure of used case process; and
4. means of collecting data and analysis of process

#### ● Stage 2-Data Analysis

This stage contains the system checklist, user profiles and thematic and spatial data. It defines the followings;

1. The system and the case study.
2. Users requests checklist
3. Influencing factors concerning lePA in general and the case study in specific

### ● Stage 3-Strategy Development

1. This stage contains the summary of the system checklists and user's needs, based on the analysis of thematic and spatial data. It defines the followings;
2. Matching of result- expectation of user groups requested from the system and technology available;
3. Summary of the general requirements, and those concerning the specific case study; and
4. Asses' type of software and technology to be used, to develop e-planning system, as well as the data type involved. This is in relation to data modeling tools, visualization tools, simulation tools and interaction tools.

### ● Stage 4-Quick win proposal development

This stage transfers the summary of stage 3 to design language in order to;

1. Produce technical models that mediate designer's language to facilitate coding and cooperation.
2. Develop interactive model for system interface.
3. Implements quick win proposal with its most essential functions.

### ● Stage 5- proposal evaluation

This stage acts as a base for discussion, about technical development of the system. Users use their local government web site to;

1. Assess the quick win proposal.
2. Validate the models produced by quick win proposal.

### ● Stage 6-System implementation

This is a revision and evaluation stage. It revises the system in general and identifies the followings;

1. Revision of the models produced, for quick win proposal, in term of the stated evaluation.
2. Develop system optimization, based on the revised model.
3. Implementation of result and optimized system development.



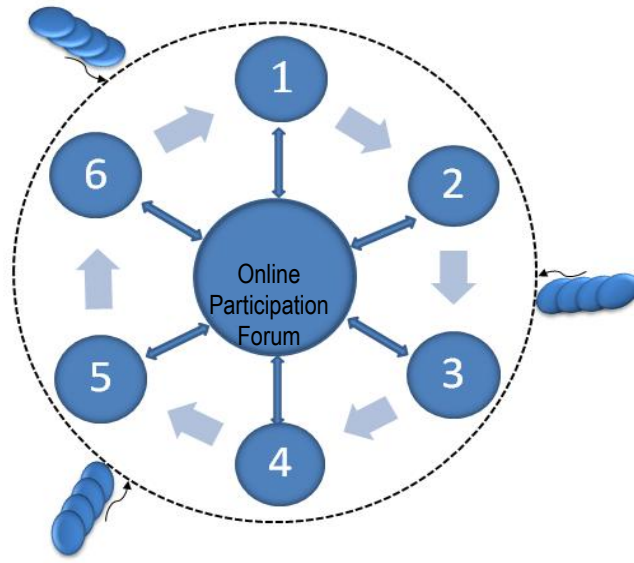


Figure 6 Contents of lePA  
Source: the Author



### 3.5 DATA COLLECTION AND INTEROPERABILITY OF lePA

**lePA** data can be collected for case studies from urban public sectors or urban planning authorities levels. The system protected by administrative boundary (represented by dashed line), license restricted for non-users. Users can participate at anytime, anywhere and at all stages. **lePA** Software should inform users and gives opportunity to ask questions on important planning problems, via internet or computer network. At the end of each stage a chat room may be held to summarize the important issues raised by the discussion during the forum.

The proposed **lePA** approach is a flexible model can be applied for all planning levels (from action area planning to regional planning). The interoperability of these models can be either through Bottom up Approach (planning by design approach) or Top down Approach. For each case study **lePA** model must be constructed depends on the public profile and the case study checklist (**Figure 7**). The public profile list describes the characteristics of the public in term of Knowledge, experience, motivations, expectations of the public. The case study checklist defines the title of the case study, purpose, transformation, actors, owners and the data available.

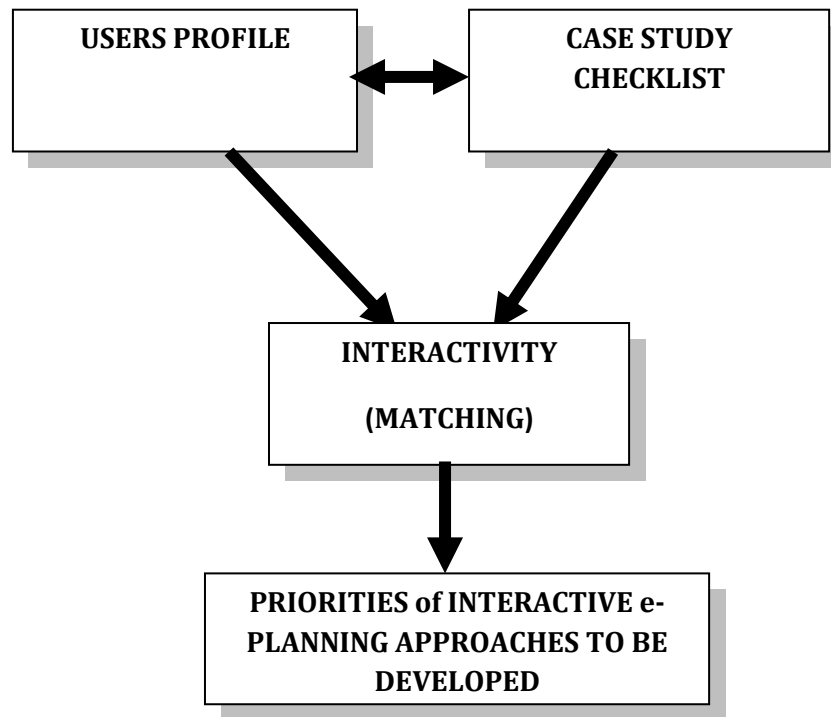


Figure 7 Priorities of IePA  
Source: the Author

#### 4.0 METHODOLOGIES OF APPLYING IePA TO THE CASE STUDY

There are three different scenarios, concerning technology and urban societies. The first one is the contemporary theoretical studies of Peter Hall and Manuel Castells, they see that technology has divided the urban societies into two different isolated groups (Traditional societies and Virtual societies). Also they suggested that the advance of technology will widen the gap between the Traditional societies and Virtual societies. The second scenario represented by the studies and researches of Nicholas Negroponte. He explained that technology in the future time will be cheaper and every one will access technology. Accordingly, as he said traditional societies will be disappeared. The third scenario presented by M.J. Mitchell, who considered virtual places as well as physical ones, which are not separated (6).

Mitchell presented logical analysis concerning the impact of IT on the traditional societies, and avoided mysteries and utopia in his theory concept. Although the researcher agrees with the theories of Peter Hall, Manuel Castells and Nicholas Negroponte, toward the risks that will Happened in the traditional societies in the future, due to the advancement of IT, but the optimistic visions of Mitchell represents the suitable theoretical base for the analytical methods which presented in this study. Mitchell (11) describes the features of the future town. He emphasizes both the roles of electronic connectivity and the power of place, with unique qualities, both will function interdependently and in complementary manner with each other (Figure 8). According to Mitchell's model the advancement of IT will give power to the physical places to move towards virtual places either by complementary or by substitutions. And accordingly the traditional transportation links will move towards the telecommunication links.

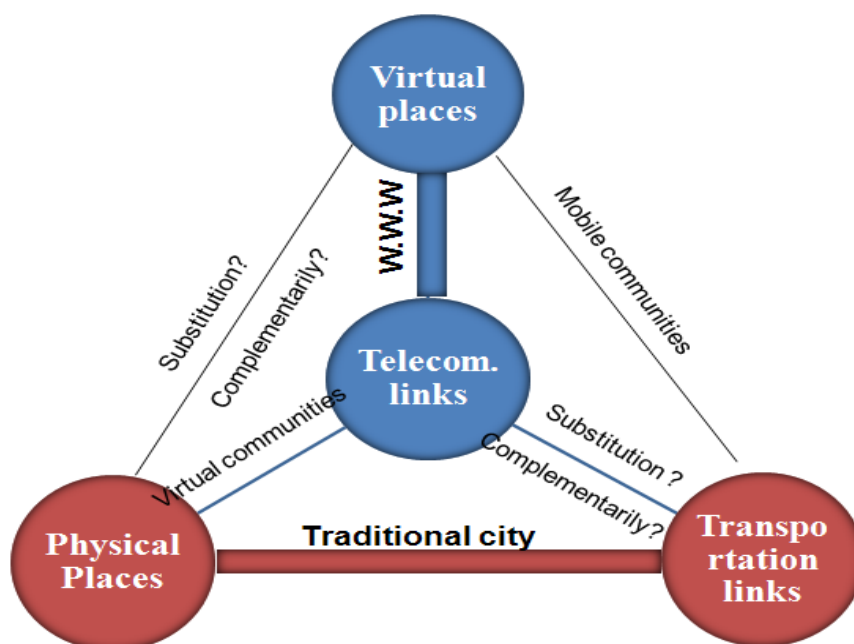


Figure 8 Interaction of physical and virtual places  
Source: Mittchel, 1999

#### 4.1 TRADITIONAL AND VIRTUAL SOCIETIES IN KM

Regarding the case study **KM**, statistics shows that the population of **KM** increases with annual rate 8%. The number of the internet users increases by 23% annually. This means that the transformation of traditional societies towards virtual societies in **KM** is going very fast (**Table 1**). Whatever the figure, the majority of the populations of **KM** now are traditional and have poor levels of literacy and many will neither have access to electricity, computers, or **IT**. Accordingly a question must risen, concerning the **leP** Approach, when and how to be applied in **KM**?

Table 1 Internet user and population projection in KM

	A.R	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
population (Million)	8%	5.76	6.06	6.55	7.08	7.65	8.27	8.94	9.60	10.44	15.34
Internet users (Million)	23 %	0.9	1.10	1.35	1.65	2.03	2.5	3.08	3.79	4.67	13.15
		17%	19%	21%	24%	27%	31%	35%	40%	45%	86%

## 4.2 PROPOSED MODELS OF lePA For KM

The proposed models of **lePA** constructed according to the virtual society (internet users) projection in **KM** (Table 1). Table 1 shows that **KM** contains traditional and virtual societies. The majorities are traditional societies but the projection shows that in the future time the traditional societies will moved towards the virtual societies. Accordingly the proposed model of **lePA** in **KM** must have traditional systems beside the online participation. The researcher adopted Mitchell's model (Figure 8), and decided Urban Planning Process and Public Participation (**UPPPP**) as urban activities, with their virtual and physical environment. Based on this concept the proposed model of **lePA** for the year 2010-2014 to **KM** built as shown in figures 9. With the advancement of the internet technology in **KM** the physical **UPPPP** will moved towards the virtual **UPPPP** either by substitution or by complementary. Accordingly the proposed models of **lePA** for the years 2015-2019 and 2020-2024 to **KM** built as shown in figures 10 and 11

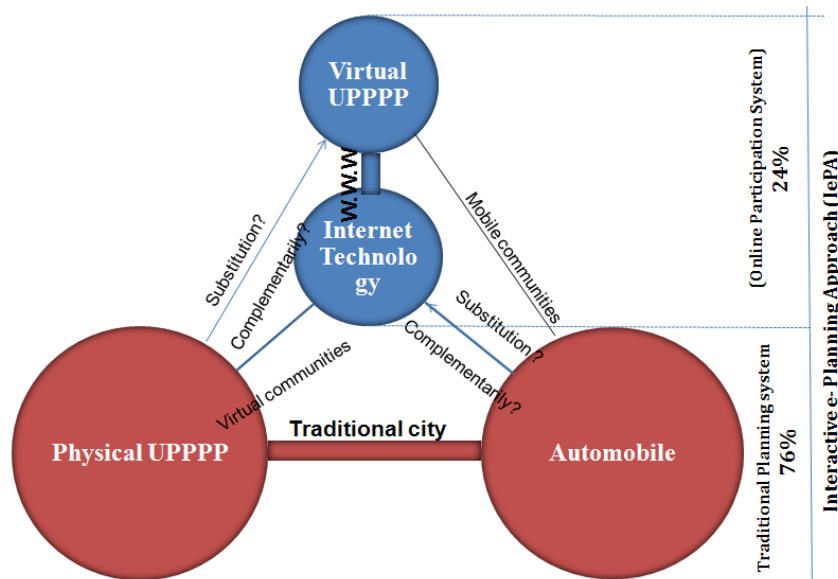


Figure (9) Proposed model for KM (2010-2014)  
Source: the Author

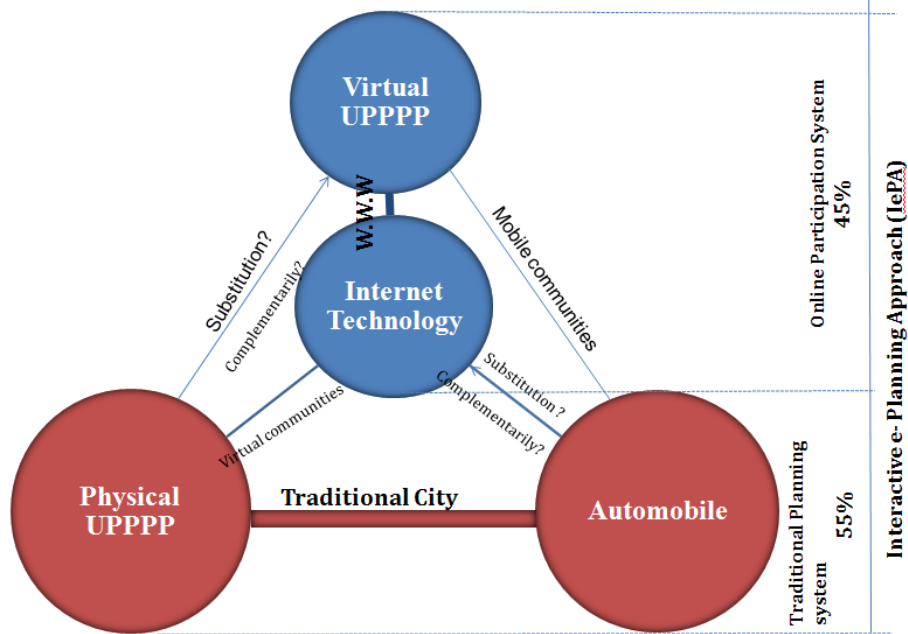


Figure (10) Proposed model for KM (2015-2019)  
Source: the Author

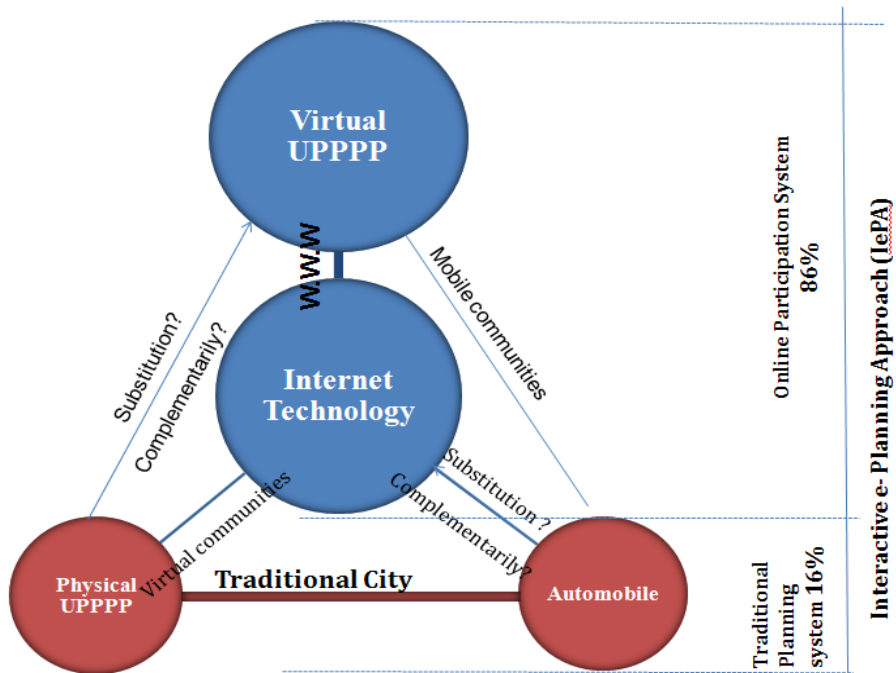


Figure (11) Proposed model for KM (2020-2024)  
Source: the Author



### 4.3 PROPOSED TECHNIQUES OF IePA For KM

To apply IePA to KM, three types of techniques are adopted to be operated efficiently in the current situation (Table 2). Table 2 shows advantages and disadvantages of each technique to be used.

Table (2) Proposed Techniques of IePA  
Source: the Author

Techniques	Advantages	Disadvantages
Workshop, round table meeting	solutions to problems can also be tested.	Only offers limited participation opportunities.
Electronic conferencing	Making anonymous comments; Simultaneous input and discussion of information; All data is automatically stored and structured.	The coordinator has influence, via addition, removal and restructuring; Dependent upon equipment; Some computer experience is required.
Internet, electronic participation and on-line planning	People with various skills and characteristics can still participate; Participation is made easier.	Limited computer infrastructure / some computer experience is required; Many politicians feel threatened by electronic participation and on-line planning.

### 5.0 METHODOLOGY OF APPLYING IePAS TO THE PILOT STUDY

To give the scenarios a common structure and to develop guidelines to define user and system requirements, Almogran project has been chosen as pilot study, for the following reasons;

1. It is a more essential project in **KM**;
2. It has different users in different locations need an interactive system to communicate;
3. It uses **3D** visualization and simulation functions for the planning; and
4. It has available data

In the early 2007 Alsunut Comply started stage five of Almogran Project (proposal evaluation). At this time the researcher finished the construction of the theoretical frame of the IeP approach. The company presented the proposal to the public for evaluation through seminars. Seminars always limited and dominated by small pressure groups. Accordingly, and to attract more beneficial public anywhere to participate in this essential project for evaluating the proposal, the researcher constructed web site for the project. The software (online participation forum) for stage five was designed with the assistant of two computer specialists, using Oracle program language.

#### 5.1 ONLINE PARTICIPATION FORUM

Several approaches have uses the technological dimension of Web-Based Planning tools, provided for participation in the context of aspects that need to be achieved - interactivity, communication between users, analysis, visualization, understanding and access. The main conclusion of these approaches is that don't have comprehensive tools, to achieve all the aspects, either locally or across a

network. In other words, current technology offers no universal solution, for full integration Internet-GIS-VR. Accordingly, **lePA** Online Participation forum stressed on 3D visualization and simulation functions that make spatial and conceivable information more comprehensive to stakeholders, especially to non-professionals citizens. It also adapted the idea of Google Earth software as it helps normal users understand the spatial information. Google Earth could quickly zoom from space down to street level and combine imagery, 3D geography, maps, and business data to get the total picture in seconds. The home page of the forum is designed and presented in three screens. The top screen contains home page tools. The right screen shows planning stages, links and definitions of Almogran Project. The left screen displays, spatial data, non-spatial data and discussion (**Figure 12**).

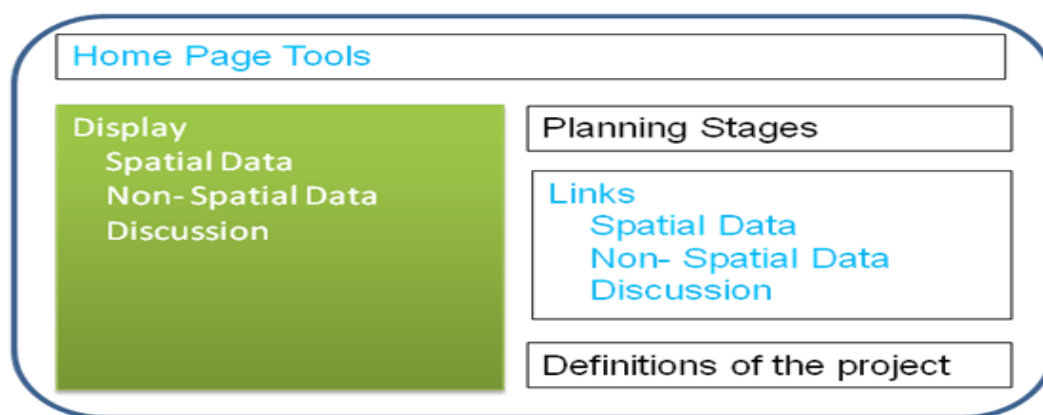


Figure (12) Design of the home page

The forum also provides an environment of discussions and message exchange among the users. Each stage of the planning process should have its own software (**Table 3**), with a navigation bar linking to the preceding and following planning steps. Any time that you want to return to the home page of a stage, select the "home" link on the bottom of the navigation bar. The forum is a very essential category and represents the core of the approach, where the user of the proposed web site of Almogran Project can navigate, discuss and exchange information. The window on the left hand of the screen displays what has been selected such as; texts and 2D maps (**Figure 13**). It also shows discussions and comments regarding these selected features (**Figure 14**). 3D dynamic spatial data such as galleries and animations of the proposed web site of Almogran Project could be saved as or open in new window, because it takes time to downloaded (**Figure 15**). Texts, 2D maps and 3D models could combined together to make the tool more easily to be used.

Table (3) Proposed Software of lePA stages

Source: the Author

Stages	Stage Contents	Participation of public in various stages of the planning process	Internet Software should be designed for each stage
Stage 1	<ul style="list-style-type: none"> <li>○ The contents and aims of a system;</li> <li>○ The actor groups and their requests;</li> <li>○ The structure of used case process;</li> <li>○ means of collecting data and analysis of process</li> </ul>	information regarding Problems in the field	On-line Polls
Stage 2	<ul style="list-style-type: none"> <li>○ The system and the case study.</li> <li>○ Actors requests checklist</li> <li>○ Influencing factors concerning IePA and the case study in specific</li> </ul>	Discussion about actual problems or wishes and visions for the future	On-line Discussion Forums
Stage 3	<ul style="list-style-type: none"> <li>○ Matching of result</li> <li>○ Summary of the general requirements</li> <li>○ Asses' type of software and technology to be used</li> </ul>	Requests to give opinions, conditions and approvals on development projects	On-line Services – forms and documents in electronic form
Stage 4	<ul style="list-style-type: none"> <li>○ Produce technical models that mediate designer's language to facilitate coding and cooperation.</li> <li>○ Develop interactive model for system interface.</li> <li>○ Implements quick win proposal with its most essential functions.</li> </ul>	Public insight in planning documents, alternative options and scenarios with the possibility to react	On-line GIS, 3D , VR
Stage 5	<ul style="list-style-type: none"> <li>○ Assess the quick win proposal.</li> <li>○ Validate the models produced by quick win proposal</li> </ul>	Interactive participation of public in the creation of a planning solution	On-line Planning Support Systems (PSS)
Stage 6	<ul style="list-style-type: none"> <li>○ Revision of the models produced for quick win proposal in term of the stated evaluation.</li> <li>○ Develop system optimization based on the revised model.</li> <li>○ Implementation of result and optimized system development.</li> </ul>	Participation of all participants in plan adoption	On-line Decision Making Support Systems (DMSS)

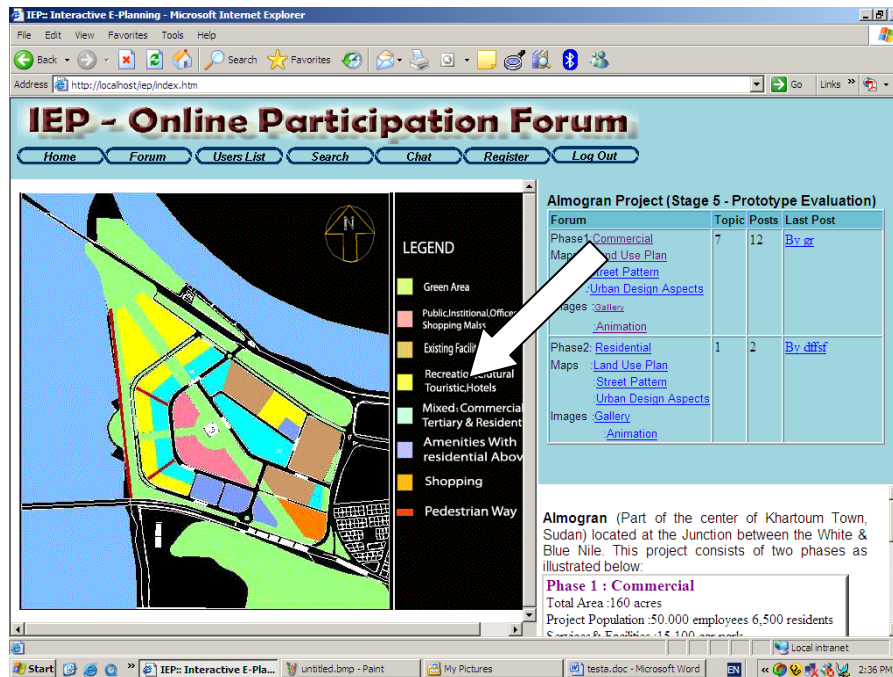


Figure (13) texts and 2D maps Screen Shot

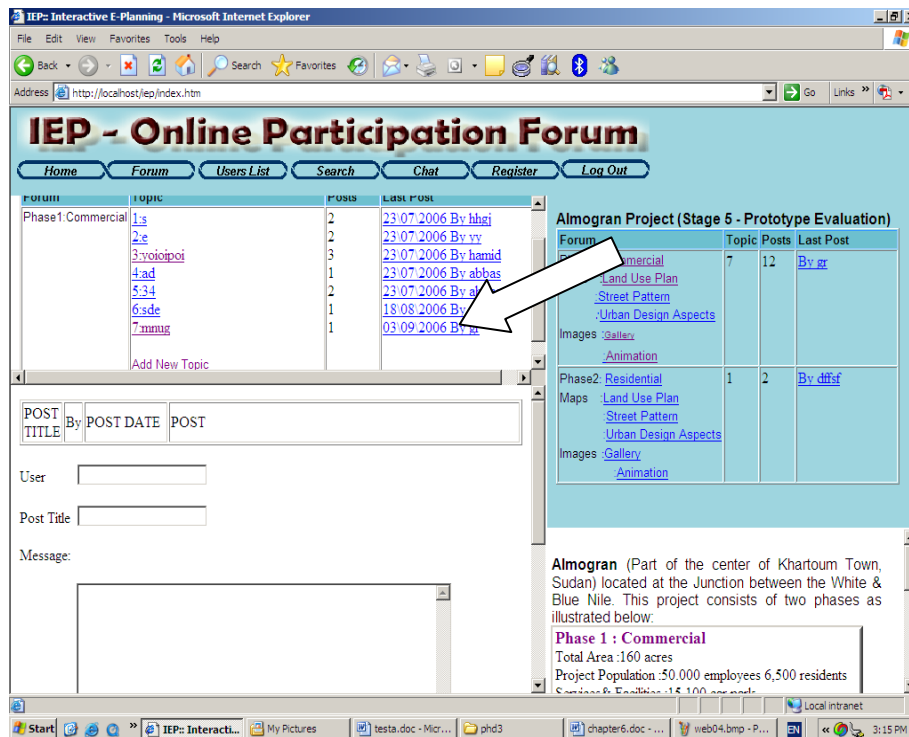


Figure (14) Discussion Screen Shot

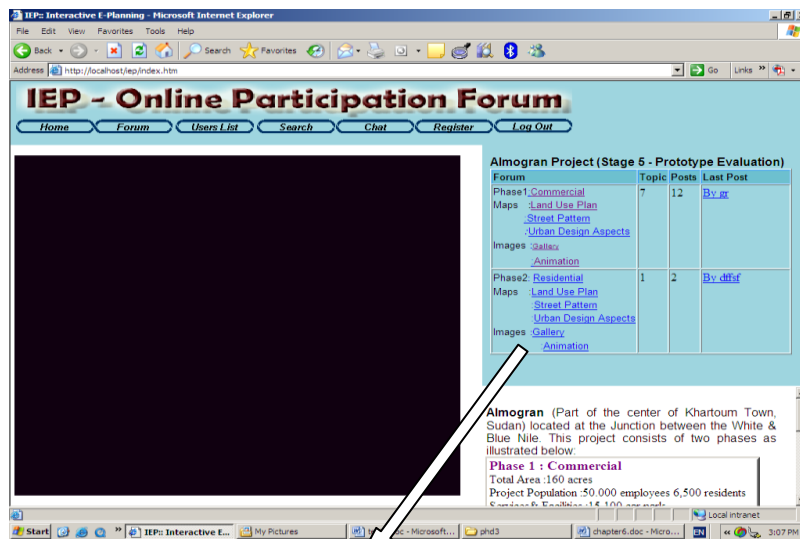


Figure (15) Galleries and animations Screen Shot

## 5.2 IePAS CHALLENGES

IePAS challenges the existing practice. It was allowed a **two-way interactive process**. The stage at which citizens may view and respond to planned changes can either be at the Master Plan stage or at a development proposal stage. However, citizens will be able to upload their own alternative planning scenarios and view the results in terms of visual and environmental impact as well as download and view the details of the planned development. This would improve mutual understanding by 'what-if' exploration.

### 5.2.1 ADVANTAGES OF IePAS

More importantly, IePAS has the potential to create a breakthrough in four ways:

1. Promoted more constructive public/agency relationship, by
  - a. Decreasing the public's distrust of an agency by shared access to the same planning tools,
  - b. Allowed the public, engineers, and planners to see same information, alternatives, and results – greatly reducing confusion,
  - c. Invited collaborative problem solving.



- d. Contributed to improved social cohesion.
  - e. Contributed to mutual trust between people, organizations and authorities.
  - f. Improved communication and cooperation between people and organizations.
2. Improved quality of public's participation
    - a. Enabled hands-on, real-time opportunities to influence outcomes.
    - b. Advanced planning technology encourages innovative "What if?" scenarios.
    - c. Immediate analysis of public input made users more responsible, accountable players.
    - d. Improved communication and cooperation between people and organizations.
  3. Reduced time and cost to complete the planning process
    - a. Eliminated lengthy, costly cycles of public consultation and feedback.
    - b. Increased probability of achieving agreement, and avoided a veto.
  4. The system has offered a high degree of flexibility
    - a. Simpler, faster, and more accessible planning processes;
    - b. Speedier decisions; by getting the results in no time;
    - c. Reduced regulation; by avoiding bureaucratic and complex regulations
    - d. Greater community involvements;
    - e. More streamlined Development Plan processes; and
    - f. Planning policies to underpin decisions on planning applications.

### 5.2.2 DISADVANTAGES OF lePAS

The defects of **lePAS** as follows:

1. Accessibility;
  - a. Numbers of computers, it is not suitable where there is a limited computers infrastructure.
  - b. Internet bandwidth, it is time consuming where the internet width band is very low.
2. Involvement of the public
  - a. The risk is proportionate to the level of interest and ability of a community involvement;
  - b. Getting public familiar with the issues. They need time to be familiar with the system.
3. Decision making
  - a. Can lead to decisions with a compromise character.
  - b. Can lead to disappointments, because usually expectations of the users are too high.
  - c. Can lead to solutions, that are technically seen not the best solutions for the project problem.

### 5.2.3 FUTURE DEVELOPMENT OF lePAS

The key to e-planning is not the computer as such, but is the Internet (World Wide Web (**WWW**)). Without the Internet computers in planning are restricted to stand-alone machines and the traditional planning software. Once the Internet is introduced, new and innovative software becomes available as well as the obvious benefits of distributed communication. **WWW** provides planners with the ability to present planning information on the Internet graphically in both two and three dimensions way. Three dimensional planning offers what may be the most important innovation in planning

communication since the beginning of the development plan. The Internet also allows planners to model the built environment in three dimensions by utilizing an Internet based Virtual Reality systems. Widespread use of the WWW in KM has been still some time far away, although the speed at which business, government and to a certain extent the public have been adapted to use the technology is arguably faster than any other technology used before. As computers become more widespread especially in schools and the workplaces the tendency of the general public to use computers and sense feeling comfort with computers and various telecommunicating technologies would increase. Recently computer software for drawing and manipulating map-based software in KM has become easier to understand and operate. The use of a map as the central theme of the lePAS would provide instant familiarity of the location, in which the public participation process is taking place. One explanation for this is the ability of the user to click on a feature on the map and be interactively informed about, what that feature is it, such as a road, restaurant or community building etc.... This capability in the system will definitely help the user to be familiar with the map's items.

Using a dynamic map and interactive views in lePAS provided endless information about features on it and allowed the user to elicit greater detail about issues and problems in hand. This type of information is impossible to be provided on a traditional paper map and cannot allow a much richer environment for the user to interact with. So, lePAS must be configured for multi threading operation, facilitating simultaneous usage of the system by a number of users (i.e. threading the requests). In order to increase the level of public participation (PP) in the lePAS there is a necessity to develop a platform for a virtual society. One tool that could be implemented in this sense is a Map Forum (MF) – which permits users to share annotated images. After generating an image, the user would be able to annotate the image with personal comments, there after save, the image is to be referenced by other members of the community. The current lePAS proposes 'read only' functionality with the datasets, not permitting any manipulation with displayed features. In order to enhance PP to higher levels, a Scenario Modeling could be introduced, by facilitating the lePAS to manipulate the features by the public.

## 6.0 CONCLUSION

Urban planning activities and urban societies in the electronic era are changing very fast. And urban planning is a dynamic activity that is intended to achieve various goals, to control current situation, in cities and provide a better plan than presently exists, to fill the gaps in services. Time and accurate information remains vital for decision-making, in urban planning in KM. The tradition approaches adopted in the UPP in KM often based on narrow data sets that focus only on one topic. New methods of participation need to be proposed to supplement traditional ones like public meeting and consultation documents. It calls for interactive e-planning systems, based on local online information systems, which acts as a vehicle for planning and policy making. New interactive web-based tools can bring knowledge and important information to the fingertips of individuals and professionals. The development of a coherent legal and statutory planning method in KM would allow providing Internet services and widespread access to the network.

lePA is a web-based PP system, which would make UPP and PP in KM more effective and subjective to the changing new era. This approach has the following components:

1. PP to set clearer objectives for planning interventions; by using a web-based PP system to encourage a feeling of ownership; to promote public awareness; to strengthen urban management instruments; and to encourage public involvement;
2. Involvement of all users in the city: everyone whose interests are affected by UPP, from the initial stages of the planning process to the implementation and maintenance stage;

3. Coordination and matching between national plans, policy guidance, available technology and local information, and user needs; and
4. Subsidiary: taking decisions on planning at the lowest level compatible with achieving the desired objectives can help to maximize the effectiveness and participation in the planning processes.

**lePA** is presents a good supplement to some classic, traditional ways of **PP** as it encourages public involvement and to identified how people become involved in planning matters. It should never be observed as a replacement and exclusion of existing techniques and models. Public involvements is an important, people quite properly, expect to have the opportunity to have their say on plans for the future of their area, on planning applications in their neighborhoods, and on developments going on nearby that may affect their quality of life. But people do not always find it easy to get involved in planning issues and the actual levels of their involvement in KM were fairly low.

Therefore, **lePA** is concerned as first steps towards liveability in Sudanese cities, where the public has a voice and full power. It used Interactive three-dimensional (3D) virtual reality visualizations, which allow the viewer to experience highly complex information, without the need for training, because they can see and experience what the impacts of a planned development will be and can see the visual and environmental consequences in an easily understandable format. Currently citizens are often excluded from the planning process in **KM** due to difficulties in understanding 2D maps. Online Participation forum could be more useful, if it is facilitated with 3D visualization and simulation functions, which make spatial and conceivable information more comprehensive to users, especially to non-professional citizens.

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## THERMAL SURFACE ANALYSIS ON VERNACULAR STYLE'S APARTMENT FACADES IN PUTRAJAYA, MALAYSIA

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### ABSTRACT

This study analyses thermal surface of apartment facade design with vernacular style in Malaysia. The scope of this study is to conduct the analysis on solar radiation. The results will provide a data which shows the level of solar radiation and shading performance that represent the level of the apartment facade designs in response to tropical context's passive design on shading devices. Passive design is the building design which does not adopt mechanical cooling or heating, but in case of shading devices, it integrates roof overhangs, attached roofs, recessed walls, balconies or verandas, and louver screens. Vernacular style is derived from the traditional architecture. It is a design complied with the designer's understanding and respect to surrounding environment. Knowledge of nature's ways was prevalent in traditional architecture. This design-with-nature approach is best reflected in the climatic design of the building. Two vernacular style's apartments built in Putrajaya are selected as the case studies. A thermal device named Fluke Ti20 Infrared Camera was used to capture a series of thermal images on a surface of the apartment facades. This camera captured the apartment facade in hourly time during the field works. The study finds that both apartments have good performance of the facade design with shading design elements. In conclusion, by applying vernacular style in apartment design, it guides the architects with traditional passive design elements which are embedded as part and parcel of the design in a context of tropical climate.

**Keywords:** apartment facade; thermal surface analysis, shading design; vernacular style

### INTRODUCTION

This study discusses on awareness of apartment design with vernacular style in Malaysia by measuring its facade exposure to solar radiation. Apartment provides house units for medium income family compared to condominium and flat house units for high and low income family (Datcua, Ibosa, Candaua, & Matteib, 2005). Excellent facade design will help to hinder solar radiation which causes indoor heat gain causing thermal comfort problem to the occupants. With excellent design, it reduces the use of electricity consumption on indoor cooling cost. The excellent design creates shades which block to direct sunlight to the surface of apartment facade (Prado & Ferreira, 2005; Arab, 2015). The problem of most apartment facades in Malaysia is that its design is concerned with the architectural

styles rather than sustainable awareness on minimizing solar radiation. It causes inefficient use of electricity for air conditioning and fans to create thermal comfort to the building occupants. The apartment today is a mass-produced construction design industry, built homogeneously by the developers to provide immediate home to live to the city population due to housing shortage with little awareness to design for energy efficiency concept (Al-Obaidi, Ismail, & Rahman, 2014). With this study, it could promote awareness to the architects to have apartment design according to Green Building Index (GBI). As a result, the apartment design will also promote awareness on energy efficiency in reducing electricity consumption on air conditioning (Omer, 2008). This research focuses on developing a guideline for awareness model of apartment facades to hinder solar radiation to a medium cost of present apartment facade designs in Malaysia which reduces the indoor temperature (Omer, 2014).

This study focuses on the high-rise apartment buildings as the case study. A high-rise building is a multi-stories and tall building furnished with elevator (Cheung, Fuller and Luther 2005). The first high-rise building in the world was constructed in Chicago in the United State in 1930s followed in the United Kingdom in the 1950s. While on the other hand in the 1960s, the Sulaiman Courts building was constructed as the first high-rise building in Malaysia. (Hoffman, 1996). Table 1 and Figure 1 show the percentages of residential building by categories in Putrajaya. Apartment/flat covers 74.1 percent of the total housing units (Department of Statistics Malaysia, 2010). It shows that apartments are the most popular house type in Putrajaya.

Table 1. The percentages of residential units in Putrajaya by categories

Types	Total Units	Percentage
Detached	249	1.0
Semi-Detached	1423	5.8
Terraced	4605	18.7
Townhouse	93	0.4
Apartment/Flat	18215	74.1
<b>Total</b>	<b>24585</b>	<b>100.0</b>



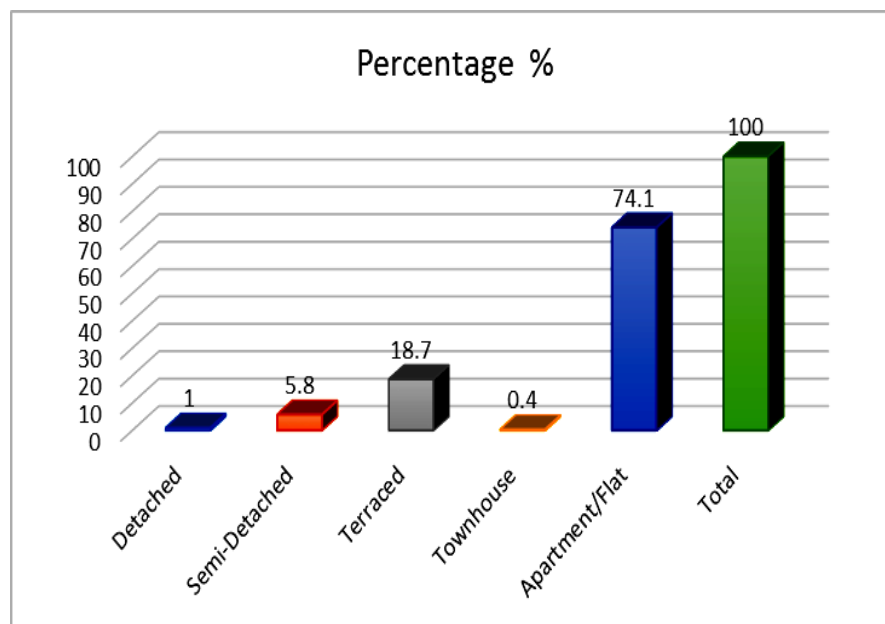


Figure 1. Apartment represents 74.1% of the total units of living quarters in Putrajaya.  
Source: Department of Statistic Malaysia (2010)

## VERNACULAR ARCHITECTURAL STYLE

Vernacular architectural style was defined by Mohd (1983) as the concern about the conditions of the place, environment, local materials and traditions. The most important elements in the Malaysian vernacular style are using the local and available rainforest construction materials, elevated ground floor and flexibility of the space design to fit with the tropical climate. Cut jungle poles, bamboo, rattan ropes and palm trunks and leaves are the main construction material in the simple traditional Malay house, these materials can easily be found the nature. The most popular structure of the traditional Malay house is timber post and beam and using bamboo or wooden wall having large openings and large indoor open space (Lim 1987), the large windows help to provide good natural ventilation (Lim 1984). In 1998 Hassan argued in his study that using the local materials in the traditional Malay houses such as timber and the palm leaves help to reduce the heat gain, and these materials are good insulation materials, that is why the vernacular style provides the thermal comfort in the tropical climate.

## PASSIVE DESIGN

A building with passive design means that the building does not need mechanical cooling or heating systems, and reach the thermal comfort by having natural daylight, air ventilation systems and orientation (Commonwealth of Australia, 2008). When the residents feel that the temperature is not too high nor to low, it means that the building achieves the thermal comfort, or as Cena and Clark (1978) defined is 'the expression of satisfaction by the users' to the thermal environment. During the last three decades scholars around the world give more attention to the passive thermal design, especially after setting the primary global agenda on sustainable development in Rio Summit in 1992. The research in this study aims to provide a better understanding about shading devices in passive design in the tropical region. Passive design is the building design which does not adopt mechanical cooling or heating, but in case of shading devices, it integrates roof overhangs, attached roofs, recessed walls, balconies or verandas, and louver screens. The selected case studies in this research are located in Putrajaya, Malaysia.

The climate in Malaysia was classified by Lim (1987) as warm-humid temperature and he described the characteristics as the followings:

1. The air temperature average is usually between 22°C and 32°C
2. The humidity in high during the year is about 75% or more in average.
3. The wind is low speed in general, and usually strong wind brings rain.

The building can help the building to obtain the thermal comfort in the tropical region:

1. The main three factors to be controlled in order to achieve the thermal comfort are temperature, humidity and solar radiation.
2. The main technique to reach the thermal comfort with the human being body temperature 37°C is to balance between the outdoor and indoor environment by reducing the solar radiation to the minimal and decrease the heat gain from direct sunlight.
3. Direct solar radiation is the main source of the heat gain, so the designer must pay more attention to the façade shading design and building materials in order to create thermal comfort.
4. Design with good natural ventilation based on either stack effect or air flow help to provide better living conditions for the residents in a region with hot and humid climate such as Malaysia.

## METHODOLOGY

This field survey will record surface thermal temperature on the selected apartment facades in the case studies using thermal imager device Fluke Ti20. This device is available at the School of Housing, Building and Planning, Universiti Sains Malaysia. Fluke is a camera used to conduct the on-field survey for the apartment surface temperature. It provides superior image quality and advanced features with a premium viewing experience, an extensive feature set, and highly detailed images. Fluke has the Infrared Camera needed to solve the problems of solar radiation in on-field survey. The researcher can store the images in one location for comparison over time and get work order approvals or questions answered without leaving the field.

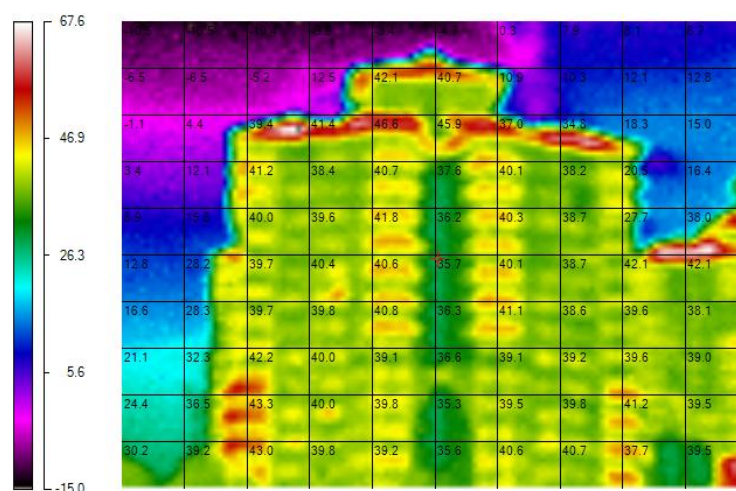


Figure 2. An example of infrared image with the temperature value

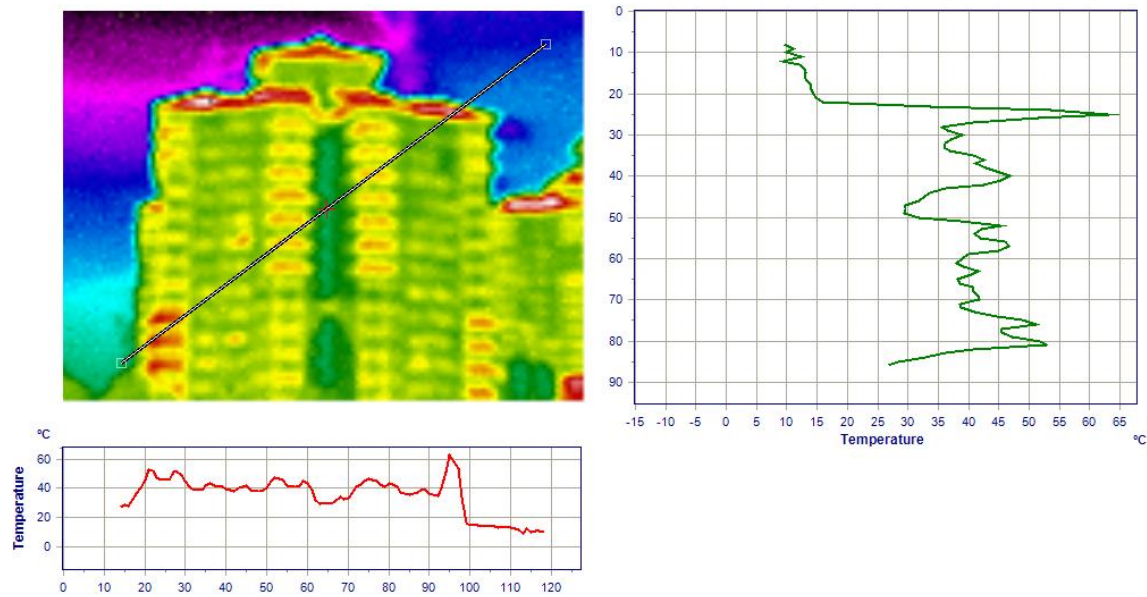


Figure 3. An example of infrared image with the thermal graph.

Fluke Ti20 camera is provided with software is a modular suite of tools that allows the researcher to view, optimize and analyze infrared or IR images (Figure 2 & 3). The researcher can generate fully customizable reports. SmartView® software is intuitive and easy to use which makes it ideal for customers with basic needs, yet it delivers the performance specialized thermographers require for advanced reporting and analysis. The software combines digital and infrared images into a single image, delivers strikingly crisp detailed images, making the analysis possible. SmartView software allows the researcher to use this patented technology, so the researcher can capture and annotate images and quickly import them into the reports.

### CASE STUDIES

Two apartment facades in Putrajaya, the new administrative capital city of Malaysia are selected for this research. Putrajaya was built by a decision of the federal government to have a new capital city in the 1990s (Moser, 2009). The decision was made to design the newest and most developed city in Malaysia, and the most common building style was post-modern architectural style, which comes out with a mixture of traditional, modern and colonial styles (Hassan, 2005) and later with simple and minimal styles known as neo-minimalist style. The city was planned to be an intelligent and ideal garden city with capability of housing 250000 people (Scott, 1998). Putrajaya city is located about 25 km south of Kuala Lumpur on the highway between Kuala Lumpur and the Kuala Lumpur International Airport which gives more importance to this city. (Ariffini, 2003; Hassan, Arab & Ismail, 2015).

Two selected case studies are about 7 km apart to each other, the first case study is *Kuarters Kerajaan* (Government Quarters). It is an apartment complex with sixteen stories buildings designed with vernacular architectural style, located at Block A1, Jalan P 16, Presint 16, Putrajaya (Figure 4). On the other hand the second case study as shown in Figure (5) is a Public Housing Complex with seventeen stories buildings called Block 9A with vernacular architectural style located at Jalan P9 C/1,



Presint 9, Putrajaya. Both case studies are constructed with a mix of pyramid, pitch and overhang roofs and other traditional style's shading elements.



Figure 4. The first case study, vernacular style apartment.



Figure 5. The second case study, also with vernacular style apartment.

## RESULTS OF THE ANALYSIS

The study analyzes photos generated for surface thermal temperature of the apartment façades in the case studies. The shots were taken with a position of the thermal imager camera at an eye level, with a distance about 45 m from the building positioned perpendicular to the façade. The thermal shots were limited to be taken at hourly intervals from 2:00 pm to 5:00 pm in both of the case studies due to the risk of unfavorable weather condition with full cloud sky and raining normally occurred after 5:00 pm which would affect the survey's results. The other limitation of this study is the small angle's building position difference at 2 degrees between case study 1 and 2. Figures (7 to 10) and tables (2 to 5) illustrate results of the survey. The analysis will assessed the results of 4 selected pointed areas namely A1-3, B1-3, C1-3 and D1-3 series in the case studies as shown in Figure 6. The comparison will also be made for these selected pointed areas of the two case studies at A series, B series, C series, and D series from top 5 stories level respectively.

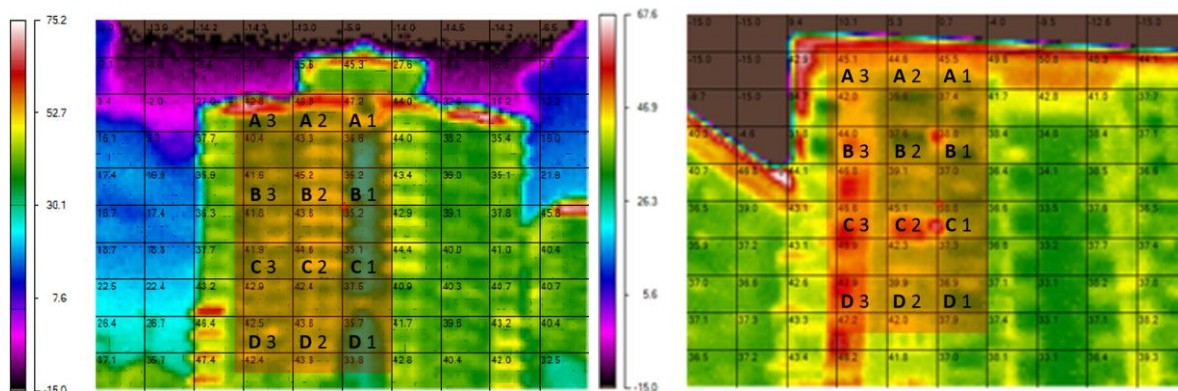


Figure 6. Selected pointed areas of case study 1 (left) and case study 2 (right)

### Results at 2:00 pm

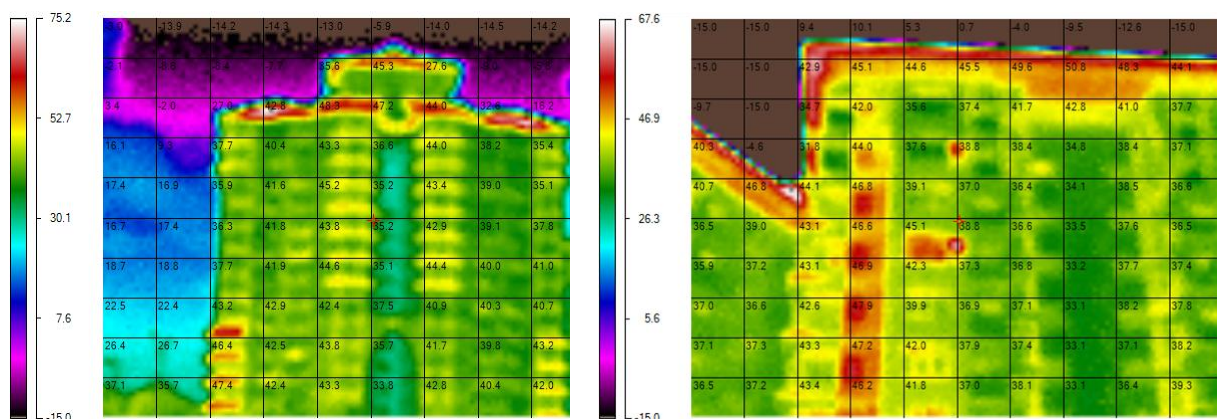


Figure 7. Thermal images for case study 1 (left) and case study 2 (right) at 2:00 pm



Results at 3:00 pm

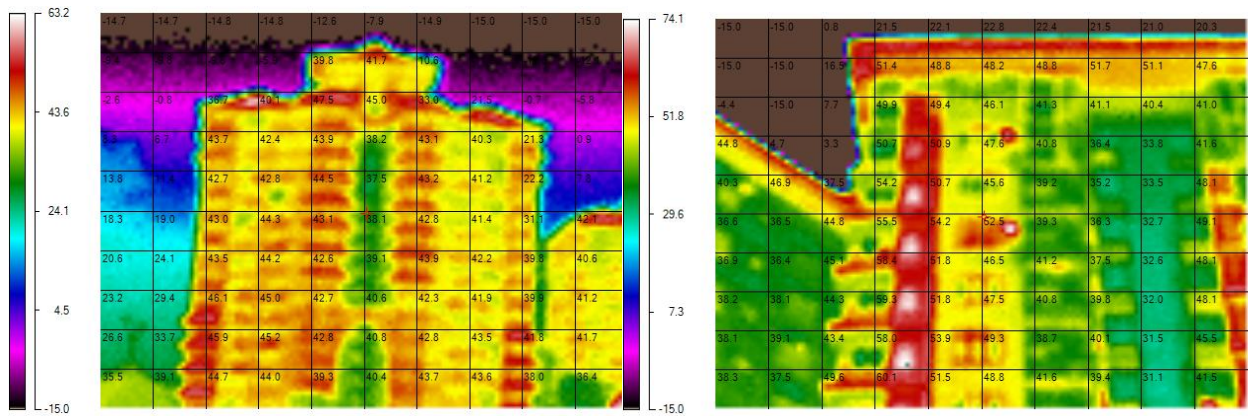


Figure 8. The thermal images for case study 1 (left) and case study 2 (right) at 3:00 pm

Results at 4:00 pm

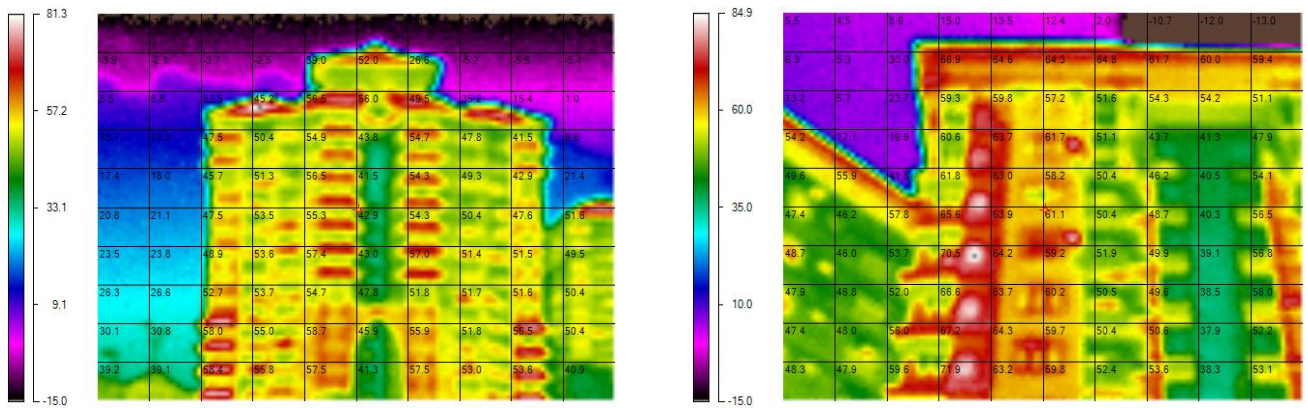


Figure 9. The thermal images for case study 1 (left) and case study 2 (right) at 4:00 pm

Results at 5:00 pm

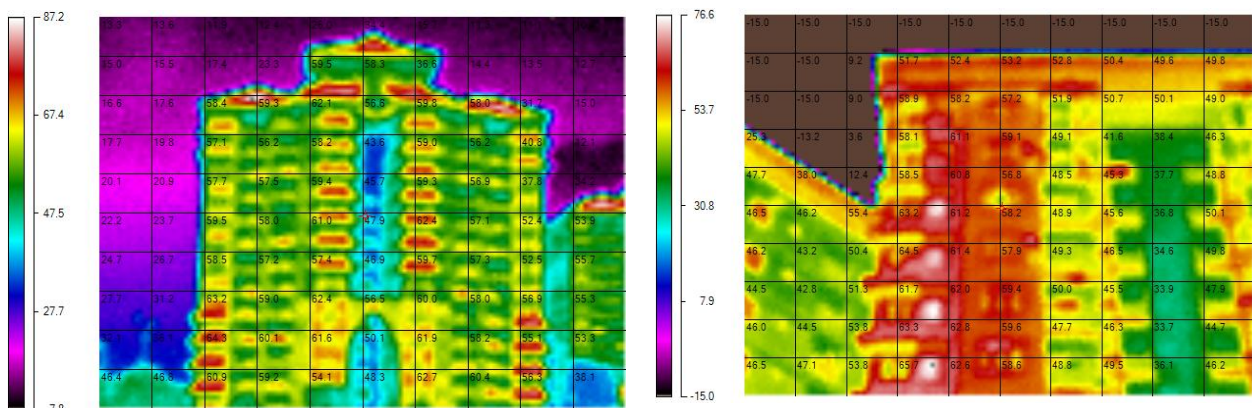


Figure 10. Thermal images for case study 1 (left) and case study 2 (right) at 5:00 pm

Table 2. The results (temperature point A) for case study 1 (left) and case study 2 (right)

Temperature	Case 1 Vernacular style (%)				Case 2 Vernacular Style (%)			
Time	A1	A2	A3	Average	A1	A2	A3	Average
2:00 PM	36.6	43.3	40.4	40.10	37.4	35.6	42	38.33
3:00 PM	38.2	43.9	42.4	41.50	41.3	46.1	49.4	45.60
4:00 PM	43.8	54.9	50.4	49.70	51.6	57.2	59.8	56.20
5:00 PM	43.6	58.2	56.2	52.67	51.9	57.2	58.2	55.77
Average of A1, A2, A3 and A4				45.99	Average of A1, A2, A3 and A4			48.98

Table 3. The results (temperature point B) for case study 1 (left) and case study 2 (right)

Temperature	Case 1 Vernacular style (%)				Case 2 Vernacular Style (%)			
Time	B1	B2	B3	Average	B1	B2	B3	Average
2:00 PM	35.2	43.8	41.8	40.27	37	39.1	46.8	40.97
3:00 PM	38.1	43.1	44.3	41.83	39.2	45.6	50.7	45.17
4:00 PM	42.9	55.3	53.5	50.57	50.4	58.2	63	57.20
5:00 PM	47.9	61	58	55.63	48.5	56.8	60.8	55.37
Average of A1, A2, A3 and A4				47.08	Average of A1, A2, A3 and A4			49.68

Table 4. The results (temperature point C) for case study 1 (left) and case study 2 (right)

Temperature	Case 1 Vernacular style (%)				Case 2 Vernacular Style (%)			
Time	C1	C2	C3	Average	C1	C2	C3	Average
2:00 PM	37.5	42.4	42.9	40.93	37.3	42.3	46.9	42.17
3:00 PM	40.6	42.7	45	42.77	41.2	46.5	51.8	46.50
4:00 PM	47.8	45.7	53.7	49.07	51.9	59.2	64.2	58.43
5:00 PM	56.5	62.4	59	59.30	49.3	57.4	61.4	56.03
Average of A1, A2, A3 and A4				48.02	Average of A1, A2, A3 and A4			50.78

Table 5. The results (temperature point D) for case study 1 (left) and case study 2 (right)

Temperature	Case 1 Vernacular style (%)				Case 2 Vernacular Style (%)			
Time	D1	D2	D3	Average	D1	D2	D3	Average
2:00 PM	33.8	43.3	42.4	39.83	37.9	42	47.2	42.37
3:00 PM	40.4	39.3	44	41.23	38.7	49.3	53.9	47.30
4:00 PM	41.3	57.5	55.8	51.53	50.4	59.7	64.3	58.13
5:00 PM	48.3	54.1	59.2	53.87	47.7	59.6	62.8	56.70
Average of A1, A2, A3 and A4				46.62	Average of A1, A2, A3 and A4			51.13

## DISCUSSION

Table 6. The average results of the selected points (points: A, B, C and D) for both case studies.

Temperature	Case 1 Vernacular style (%)					Case 2 Vernacular Style (%)				
Time	A	B	C	D	Average	A	B	C	D	Average
2:00 PM	40.10	40.27	40.93	39.83	40.28	38.33	40.97	42.17	42.37	40.96
3:00 PM	41.50	41.83	42.77	41.23	41.83	45.60	45.17	46.50	47.30	46.14

4:00 PM	49.70	50.57	49.07	51.53	50.22	56.20	57.20	58.43	58.13	57.49
5:00 PM	52.67	55.63	59.30	53.87	55.37	55.77	55.37	56.03	56.70	55.97

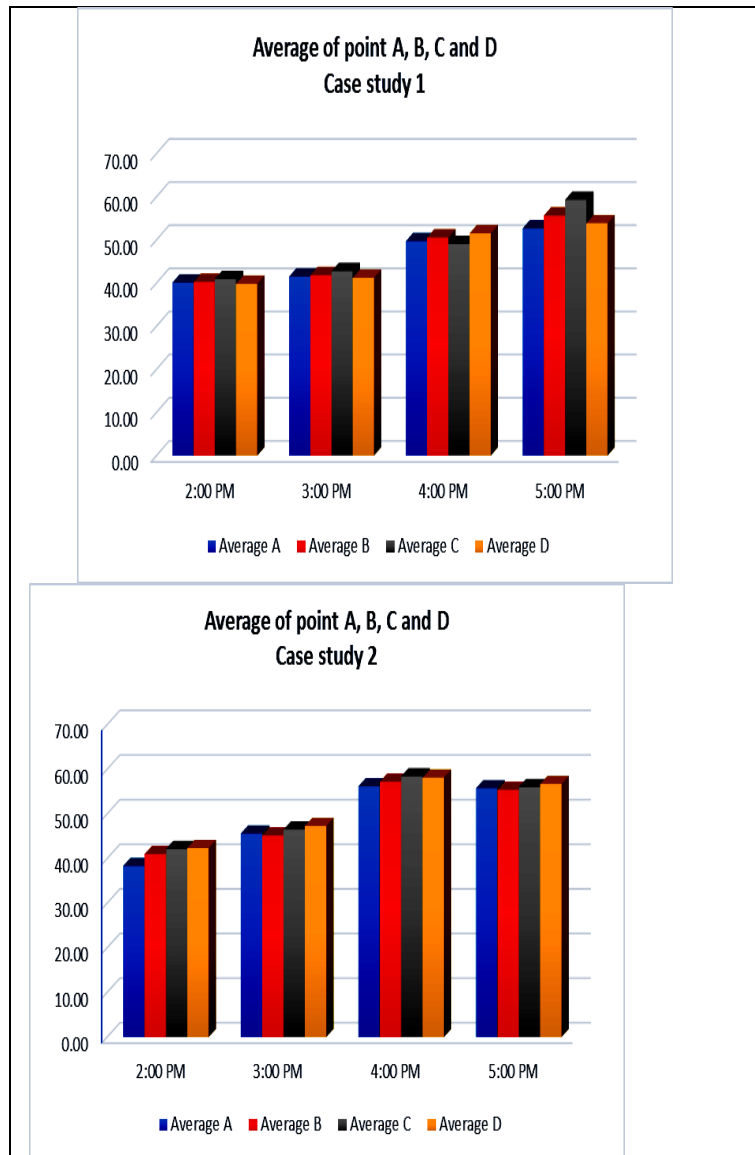


Figure 11 the average of surface temperatures of both case studies

From results of the analysis in Table 6 and Figure 11, the findings of the surface temperatures at the apartment facades in the case studies are as the followings:

- The highest temperature in the case study 1 recorded at point C2 with 62.4°C at 5:00 pm, while it was 64.3°C at point D3 in the case study 2 at 4:00 pm.
- The lowest temperature recorded in the case study 1 was at point D1 with 33.8 °C at 2:00 pm, whereas it was 37 °C at point B1 in the case study 2 at the same hour.

- In general, the results show that all selected points in the case study 2 have higher average surface temperature than the points in case study 1 except for point A at 2:00 pm, point B and C at 5:00 pm.
- The largest difference in average surface temperature between the two buildings was at point C with 9.4 °C at 4:00 pm.
- The highest average thermal surface in the case study 1 was 55.37°C at 5:00 pm followed by 50.22°C at 4:00 pm and 41.83°C at 3:00 pm while the lowest is 40.28°C at 2:00 pm.
- On the other hand the highest average surface temperature in the case study 2 in was 57.49°C at 4:00 pm followed by 55.97°C at 5:00 pm, 46.14°C at 3:00 pm and 40.96°C at 2:00 pm.
- The average of all hourly intervals shows lower temperature in the first case study 1 than case study 2.
- The findings show that at 2:00 and 5:00 pm the temperature differences were smaller than 1°C, while at 4:00 pm the temperature had the largest difference at 6.63°C.

## CONCLUSION

The research finds that both of the case studies have similar pattern in term of the façade surface temperatures at the hourly intervals. The architects are able to provide good façade design by applying the traditional shading elements to minimize the sunlight exposure to the façade surface temperature, and that helps to decrease the amount of solar radiations to the indoor atmosphere. Therefore applying the vernacular architectural style, it is able to guide the architects with awareness of shading elements like roof overhangs, attached roofs, recessed walls and balconies or verandas, embedded as part and parcel of the design in a context of tropical climate to reach the thermal comfort. The study can be referred as an example of using the vernacular style components for the architects and designer for their future project with traditional passive shading design approach.

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## SHADING PERFORMANCES ON NEO-MINIMALIST AND COLONIAL STYLE APARTMENT IN PENANG, MALAYSIA

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### ABSTRACT

This study aims to measure the sunlight shading performance on the two front apartment façades with different design of the architectural styles in Malaysia. Two case studies of high-rise apartments in Penang were selected for a comparative study of the results of sunlight shading performance. The first case study is Halaman Kristal apartment, a thirty one stories high rise with a mix of European and traditional architectural styles so called the colonial architectural style located in Jelutong, Penang. On the other hand, the second case study is twenty six stories Bayswater condominium designed with early neo-minimalist style located at the east coast of Penang Island, Malaysia. Penang with a latitude 5° 25' 0" N and longitude 100° 19' 0" E is in tropical climate. Nowadays, it is second most important state in Malaysia, which has witnessed great developing progress during the last decade. SunTool software is used in the survey to calculate shading area on the high rise façade. The survey will be conducted in hourly intervals from 8:00 am to 7:00 pm at a position when the sun path is perpendicular to the house façade, and then the comparison between these two designs will be made from the results of the computer simulations. The research finds that the colonial style has slightly better results of its shading performance compared to the neo-minimalist style in the morning and evening hours. The recessed wall and balcony design at Halaman Kristal is more effective shading elements compared to those at Bayswater Apartment. The elements block sunlight penetration to the indoor area and solar radiation to the façade wall. The important focus is the facade design for the late evening hours after 5:00 pm where the use of vertical louver and attached roof overhang as the additional shading devices are important to tackle solar radiation.

**Keyword:** Apartment Façade; Colonial; Early Neo-Minimalist; Sunlight; Shading

## INTRODUCTION

The aim of this research is to analyse and examine the sunlight shading performance of two different case studies of the colonial and neo-minimalist architectural style, and to do a comparative study on shading performance of the high rise façade designs of these two different architectural styles (Bakhlah & Hassan, 2012; Arab & Hassan, 2015; Al-Obaidi, Ismail, & Rahman, 2014). The selected case studies are located in Penang, Malaysia located at a tropical region (Yeang, 1987). This study is a part of the research aims to analyse the façade design performance of high-rise apartment buildings in order to measure the problem caused by the inefficient façade shading design (Omer, 2014; Ismail & Idris, 2002), and to contribute research findings to overcome the problem of heat gains due to solar radiations (Omer, 2008; Rahman, 1995; Royle & Terry, 1990)

## The Case Studies

Two of high-rise apartments in Penang Island, Malaysia (latitude 5° 25' 0" N and longitude 100° 19' 0" E) were selected to be the case studies in this research. Penang is considered as the second most important state in Malaysia which has witnessed rapid economic developments during the last decades (Lim, 1987). The first selected case study is Halaman Kristal apartment, a thirty one stories apartment building with late colonial architectural style, the building is located in Lengkok Free School, Jelotong, Penang (Figure 1). Late colonial architectural style has modern design of neo-classical style with colonial roof design decorated with colonial motifs. Bayswater Condominium is selected as the second case study in this research which is a twenty six stories apartment with early neo-minimalist architectural style. Early neo-minimalist architectural style has simple geometric façade design with simple roof with an influence from modern architecture. The building is located at Gelugor, Penang island as indicated Figure 2 (Arab, 2015; Hassan, Arab, & Ismail, 2015).



Figure 1. Halaman Kristal apartment with colonial architectural style  
(Left & Middle: Photos, Right: Section A-A)

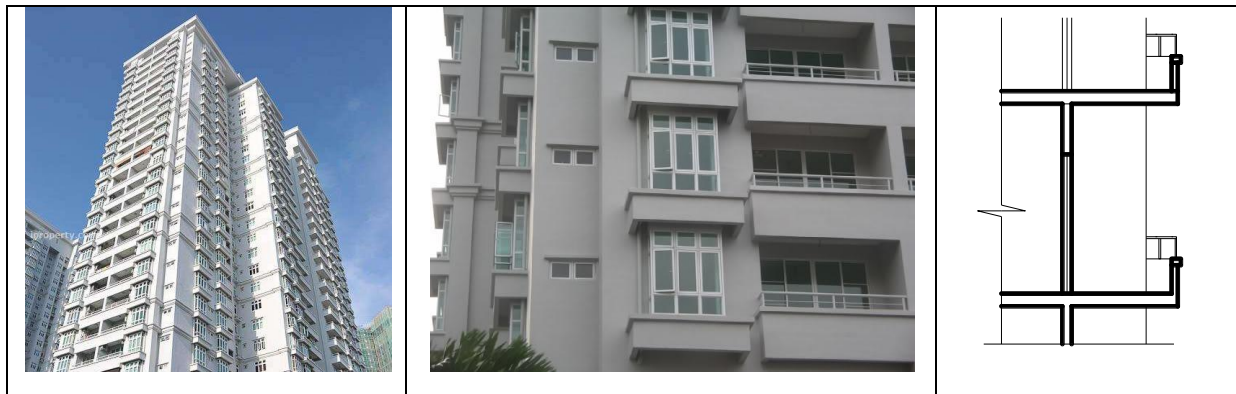


Figure 2. Bayswater condominium of minimalist architectural style  
(Left & Middle: Photos, Right: Section B B)

## METHODOLOGY

The research aims to measure shading area of the case studies, the shading area will be calculated using SunTool computer simulation software (Arab & Hassan, The Sunlight Shading Performance in Traditional Style Apartment: Case Study of Putrajaya, Malaysia, 2015). This study is to measure the shading performance of the front façade of the two selected high rise apartments with different architectural styles. The simulations were made when the buildings expose to the maximum level of direct sunlight during the day hours. The simulations will be conducted when the angle of the sunlight rays are perpendicular to the selected building façade (the east façade during the morning hours and the west façade in the evening hours) in hourly intervals from 8:00 am to 7:00 pm (Mazloomi, Hassan, Bagherpour, & Ismail, 2010; Arab & Hassan, 2015). In order to get reliable simulation results, this study will be limited to the sun path changings to get the perpendicular sunlight rays to the east façade (90°) and west (270°) (Hassan & Arab, 2012) as indicated in Table 1 and Figure 3. The limitation of this study is that the maximum exposure to the direct sunlight is limited to certain dates and times in the year where there are several positions with the sun path's azimuths not exactly 90° or 270°. As a result, the study will use the closest azimuth to 90° and 270° in the morning and afternoon hours respectively (Arab & Hassan, 2013).

Table 1. Time, date and azimuth of the sun when the sunlight extent penetration of façade was calculated for cases in Malaysia. (Hassan & Arab, 2014)

Orientation	Time	Date	Azimuth	Orientation	Time	Date	Azimuth
East 90°	7 am	23 March	90°	West 270°	1 pm	16 September	90.5°
	8 am	25 March	90°		2 pm	29 March	89.8°
	9 am	27 March	89.8°		3 pm	18 September	89.8°
	10 am	28 March	90.1°		4 pm	26 March	89.9°
	11 am	29 March	90°		5 pm	24 March	89.9°
	12 pm	29 March	92.2°		6 pm	22 March	89.9°

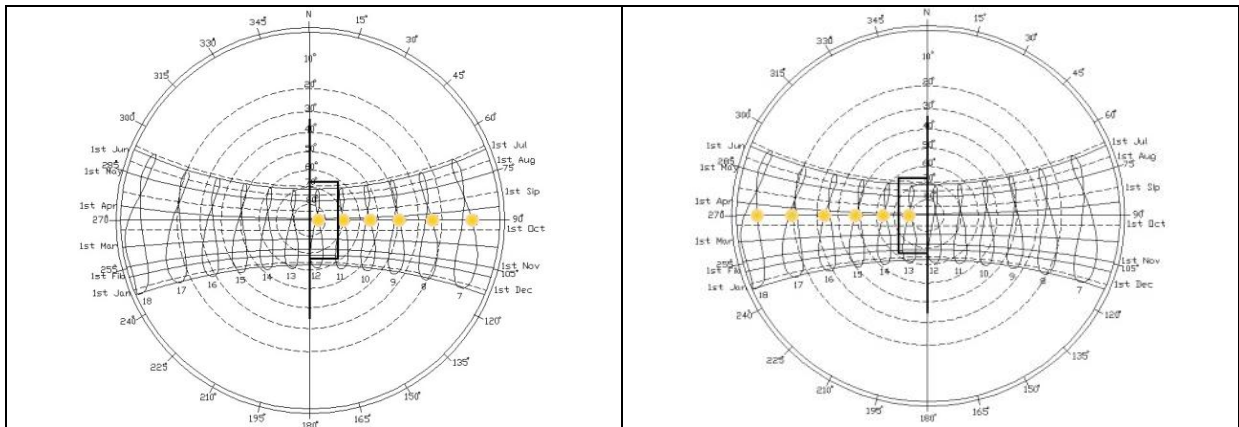


Figure 3. Sun path diagram shows the position of the sun perpendicular to the house facade from 7 am to 12 pm at orientation of 90° (left) and from 1pm to 6pm at orientation of 270° (right). Source: SunTool Software. (Hassan & Arab, 2014)

All information of the times, dates, locations and orientations data will be keyed into the SunTool software in order to get the correct positions and orientations of the two case studies and to do the simulations (Saleh, 1990). SunTool software will provide the calculations to figure out the percentages of the façade shading area based on the provided dimensions, height, width and depth of the wall façade and window sill to the façade sections for both of the case studies. The SunTool output (sunray and window section drawing) will be imported into Autocad in order to redraw the actual sun ray after adding the parallel sun ray to the sun ray with the edge of the external shading device. This simulation step cannot be added in SunTool software which shows the exposed and shaded area on the external wall of the apartment façade as illustrated in Figure 4. A comparative analysis will be assessed to the simulation’s results of the two case studies to get the findings of shading performance of the façade designs.

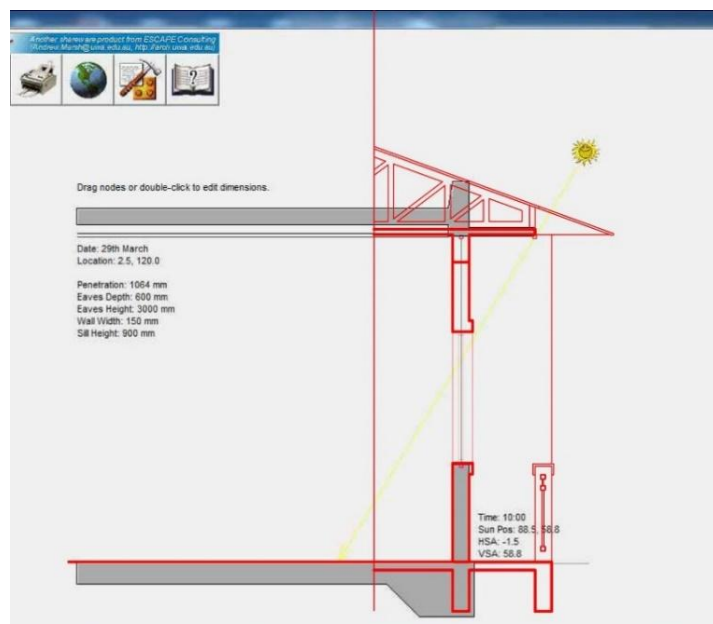


Figure 4. SunTool software (window section) (Arab & Hassan, 2015)

## SUNLIGHT SHADING

The façade is divided into opaque and glazing areas, the shaded area is an accumulation of shaded opaque and glazing areas. In order to get the total shaded area, the research used the following formula and illustrated in Figure 5:

$$SA = SH \times L$$

Where: SA = Shading Area, SH = Shading Height, L = Length of facade

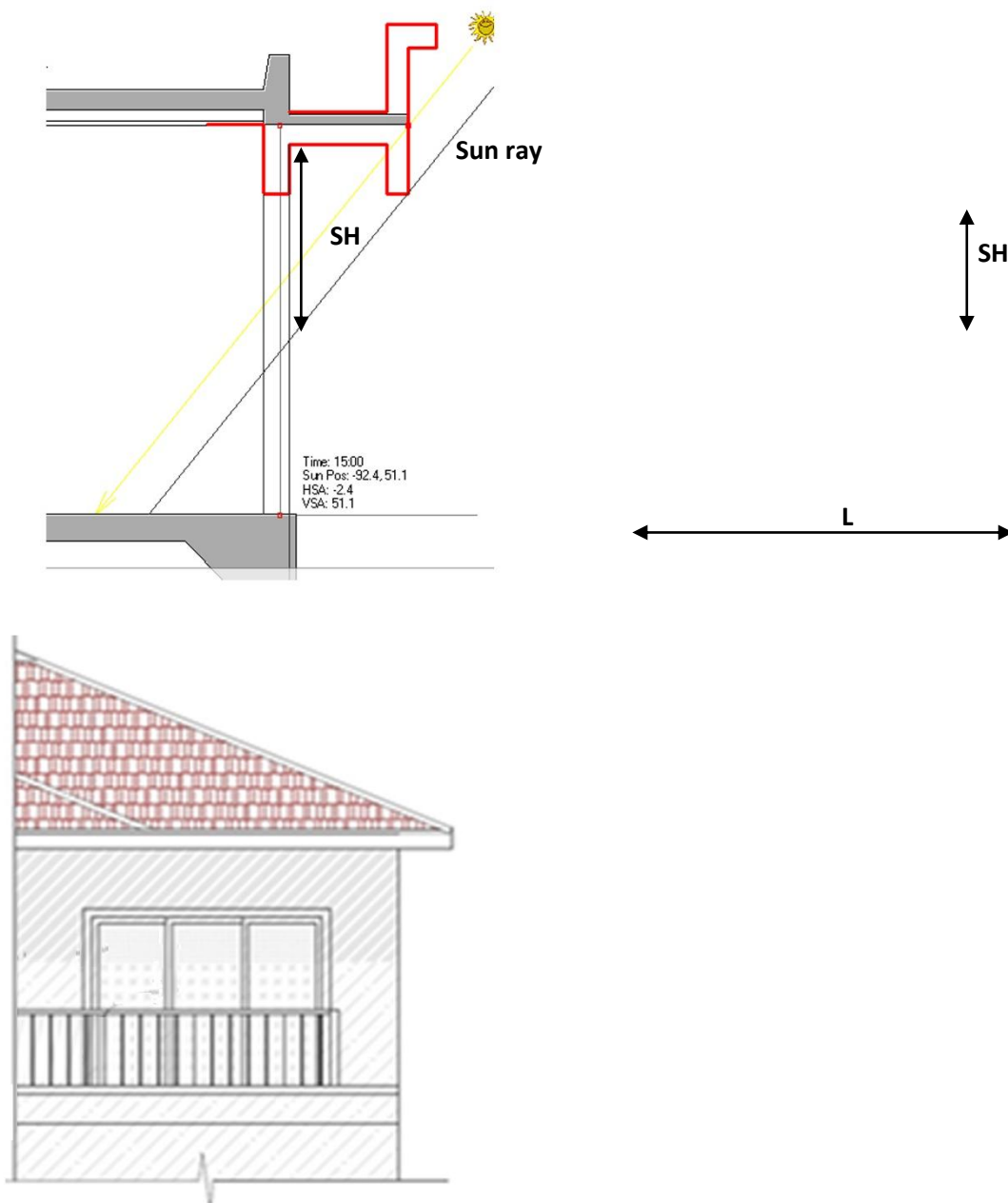


Figure 5: A section and front elevation of the apartment unit which illustrate the calculations of the formula.



## RESULT ANALYSIS

This study analyses and compares the shading performance of the two high-rise residential building façade, the first case study is Halaman Kristal apartment with colonial architectural style, whereas the second case study is Bayswater condominium with early neo-minimalist architectural style. Both of the case studies are located in eastern part of Penang, Malaysia. The study will compare the shading performance at the living room façade of both case studies with the results of shading areas shown at hourly interval from 8:00 am until 7:00 pm. Table 2 and Figure 6 show the results in both of the case studies.

Table 2. Shading area percentages in the case studies

Time	Halaman Kristal	Bayswater	Differences
	Colonial Style	Early Neo-Minimalist Style	Halaman - Bayswater
8:00 AM	23%	6%	+17%
9:00 AM	32%	22%	+10%
10:00 AM	44%	42%	+2%
11:00 AM	64%	72%	-8%
12:00 PM	100%	100%	0%
1:00 PM	100%	100%	0%
2:00 PM	100%	100%	0%
3:00 PM	90%	100%	-10%
4:00 PM	59%	67%	-8%
5:00 PM	42%	38%	+4%
6:00 PM	31%	23%	+8%
7:00 PM	22%	7%	+15%

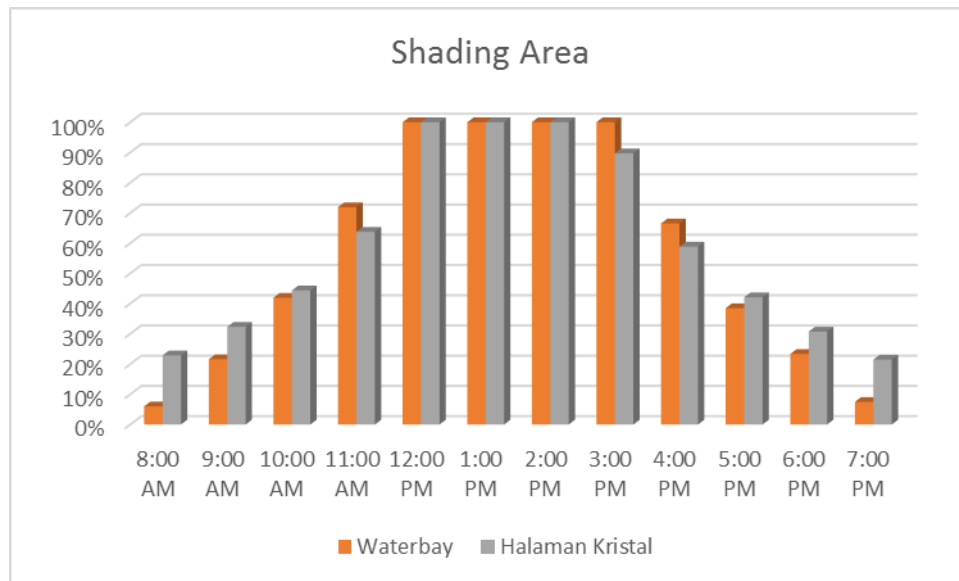


Figure 6: A bar chart of sunlight shading performances of colonial and neo-minimalist architectural style

Table 2 and Figure 6 show the simulation results if the shading area percentage of both Halaman Kristal and Bayswater façade. The study finds that the colonial style has better shading performance during the early morning and late evening hours. The results of Halaman Kristal started with 23% and 32% while Bayswater had 6% and 22% of the façade shaded at 8:00 and 9:00 am respectively, and then at 10:00 am both case studies have slightly more than 40% of the façade being shaded by the shading devices. Between 12:00 and 2:00 pm both case studies had excellent shading performance with 100% of the façades being shaded. Bayswater façade had better results at 11:00 am, 3:00 and 4:00 pm with 72%, 100% and 67% compared to Halaman Kristal with 64%, 90% and 59% of shading area respectively. Finally, the last three hours of simulations show better shading performance at the facade of Halaman Kristal with 42%, 31% and 22% than Bayswater with 38%, 23% and 7% at 5:00, 6:00 and 7:00 pm respectively.

## DISCUSSION

From the analysis, this study compiles with the finding as follows:

1. The simulation results show that colonial façade design has better shading performance than early neo-minimalist façade design during the morning and evening hours.
2. The results show that both of the colonial and early neo-minimalist façade designs have an excellent shading performance with 100% of the façade area shaded during the afternoon hours from 12:00 to 2:00 pm.
3. Poor shading performance was recorded during the early morning before 10:00 am and the late evening after 5:00 pm which had casted the shade on the facade wall less than 50%.
4. The finding shows that the colonial style (Halaman Kristal) has overall better performance than the early neo-minimalist style apartment (Bayswater). It has slightly better design recessed wall and projected balcony.
5. The finding proposes the use of vertical shading devices like louvers to block the late evening sunlight to avoid solar radiations to the facade wall.

- The finding finds that no roof overhang integrated to the apartment designs. It proposes the application of the attached roof overhangs to the apartment design to increase the shading performance.

## CONCLUSION

This study concludes that in general, the Halaman Kristal apartment with colonial style has slightly better shading design performance than the early neo-minimalist façade design of Bayswater Condominium. The contributions of this research is that having better recessed wall and balcony design will able to create better shading performance to the facade wall. As both of the apartments have excellent shades from 11:00 am to 3:00 pm, the most important focus must be the facade design for the early morning and late evening hours. The design must apply vertical louver and attached roof overhang as the additional shading devices to tackle this problem to reduce solar radiation (Landry & Breton, 2009; Arab & Hassan, 2015). During the afternoon and early morning and evening hours, the recessed wall and balcony are very effective shading devices (Arab, 2015). This study will provide a good example and guideline to the architects and facade designer to optimise the use of shading devices in order to reduce solar radiation.

## ACKNOWLEDGEMENT

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## IMPROVING WALKABILITY WITHIN EXISTING URBAN CONTEXT "OLD SOUK IN JAZAN CITY- SAUDI ARABIA"... A CASE STUDY

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### ABSTRACT

Walkable communities can quickly become an avenue to increased economic vibrancy in several ways. As people get out of their cars to interact with their surroundings, businesses experience an immediate benefit. The degree to which a city is sustainable is affected both by the form of the urban street block and also by the composition of the activities it accommodates. The traditional city with residential and office accommodation arranged over ground floor shopping streets is often cited as a model arrangement for a lifestyle which is not dependent upon high levels of mobility. Old shopping streets are complex places that serve multiple, and at times, competing needs. This paper aims to revitalize and redevelop the old market "the Old Souk in Jazan City- Saudi Arabia" through the views of shoppers; the study adopted the descriptive documentary survey research methods. The study is presented in two sections, section 1 is devoted to literature review related to revitalizing and redeveloping city centers, while section 2 analyzing the old souk current urban form, and the views of shoppers to revitalize the area. The study finding that the old souk current state lacks proper maintenance, public services and streets suffers from low levels of hygiene, and lack of comfortable seating areas.

Redeveloping old centers in its simplest sense is to pressure and respect its urban context and improve the quality of life of its resident communities. Well-connected walkable communities are not only beneficial to citizens, but can also deliver real economic rewards to businesses and local governments.

**Keywords:** shopping streets, old souk in Jazan city, redeveloping, urban context, quality of life, walkability.

### INTRODUCTION

With the benefits of building walkable communities clear, the question then becomes "how", for communities looking to make immediate improvements to walkability, there are ways to achieve this goal using existing infrastructure and design envelopes. By identifying existing routes that simply require reconnection, cities can quickly improve their walkability and boost community vitality. Through the study of the design decision of the urban emphasis on the importance of studying the development of the internal market area came in the context of interest in the development of the old central business district in the city of Jazan future and that the internal market is represented with the preservation of historical and heritage, popular and traditional aspects that symbolizes the ancient history of the city and knows people in the region and visitors on that date. Despite that experienced and witnessed many facilities in the city of Jazan in the development plan of development taking place in the entire region, however, is still the internal market as one of the most prominent landmarks in the



city of Jazan private and represents the first trade center, business retains its importance despite the deployment of these new commercial complexes.(see figure 1).

Our overall objective was to intend design a project that was gleaned from local elements, responsive to merchant's concerns, feasible to implement, and adequate as a platform for future development. Mapping and sampling met and discussed their finding, and adjusted their research accordingly .The acquired data determined the Souk's key structural elements to be space organization ,circulation patterns, services delivery ,garbage collection, rental procedures and working shifts. As part of Jazan urban development project, a joint understanding by Jazan municipality and Jazan university , this paper discusses the spatial strategy of the project that aimed at articulating a long-term vision for sustainable development at a city scale, this study carried out by the student of Architecture Department at Faculty of Architecture and Design for girls, acknowledged the existing dynamics shaping the city as the base for defining future spatial qualities, and for steering urban development. The work resulted in a report that was delivered in April 2015; this paper is intended as a critical summary of the initial project organized in four months. The first section develops the overall approach to the field study, the second section explains the main findings of the urban analysis, and the final section concludes. It is worth noting that the work will developed due to the lack of clear information at this stage.

## Data Collections

Students started their research work by examining the available literature that shed light on the area, and by collecting data from engineering firms that had prepared infrastructural drawings, soon after conducting the initial field visits, research revealed major discrepancies within the material at hand. Accordingly, reliable data had to be gathered directly from the site, a matter that entailed intensive field work. Investigating the daily practices and the management of activities was essential to setting a design proposal that aligned with the markets unique dynamics. Field research depended on three primary collection methods ; (a) surveying-open, and closed ended forms conducted with local stakeholders and shoppers, (b)mapping preparing detailed drawings of the existing physical conditions in the market, and (c) sampling-collecting indicators to waste management.

## 1. REDEVELOPING CITY CENTERS

Traditional cities which have grown slowly over time have qualities that cannot be reproduced with new development. People identify with the smaller details of the physical areas in which they live and move around In particular, cultural elements and linkages must develop. New development rarely permits this as the financing of commercial development is expensive, developers attempt to obtain returns on their investment as soon as practicable, and the inclusions of building elements which do not contribute to profit are unpopular. Walkable developments are residential or mixed use developments which normally provide a traffic free immediate environment, and offer no parking or limited parking separated from the residence, and designed to enable residents to live without owning a car. Walkability in particular has been singled out as a key factor in best practice urban design .Walkable development as a key feature driving community growth (Shokry, 2008). Movements that encourage this vein of thinking are popping up throughout the urban planning profession. The term walkability development implies a physical change - either new building or changes to an existing built area. This research shows that walkability plays an important role in attracting young and creative talent, as well as the baby boomer generation to cities - all of who value safe, comfortable, and convenient access to amenities, public transit, and their places of employment. If human behavior in relation to its context is

better understood, then governments can manage city centers in such a way that it will be more attractive for visitors and inhabitants. Pedestrians will feel more at ease, will be happier and will enjoy being in a city center.

The old center in Jazan attempt to reproduce the experience but have only a limited range of activities, nearly all of them retail. Commercial and recreational activities need to be added to the mix in order to produce the fully-rounded urban experience, and this is what many new developments attempt to replicate (Riyadh, 2010). But those which seem to work best are those having a long history of development, changing with time and in response to a variety of events and issues. It is very difficult to reproduce this in a new development, particularly with the need to recoup development expenses. Up to fifty years ago, the old center provided for most of the needs of those living in Jazan. This would, of course, have been supplemented both by smaller centers around town. Factors such as extended-family structures, privacy, gender separation and strong community interaction were clearly translated in the densely built form of the buildings. Paths are the channels along which the observer customarily, occasionally or potentially moves, they may be streets, walkways, transit lines, canals. For many people, these are the predominant elements in their image. People observe the city while moving through it, and along these paths the other visual environmental elements are arranged and related (Lynch, 1960). Each path has its own character. It fits into the cultural and natural landscape in its own way and reveals its own sequence of views (Lynch, 1984).

## 1.1 Historical background

Jizan, or more properly Jazan, was known in ancient times as Almikhlaif Alsulimani. The Province of Jazan lies in the south west section of the Kingdom of Saudi Arabia. It has a population of approximately 1.2 million and covers an area of 40,000 km<sup>2</sup> including some 5,000 villages and cities. Jazan area consists of fertile plains, forests and mountains, the fertile plains, which extend behind the coastal swampland, have been created by the alluvial deposits brought down from the mountains by river and flood (Riyadh, 2010). Jazan is one of the Kingdom's richest agricultural regions, remarkable for both the quality and variety of its agricultural produce. Attached to it are 100 islands, including the important island of Farasan. Jazan is the third most important seaport on the Red Sea. Jazan has a hot-humid, desert climate (Golany, 1995) with an average annual temperature of 30 °C (86 °F). The weather varies from extremely hot in its long summers to hot rainy in its short winters.

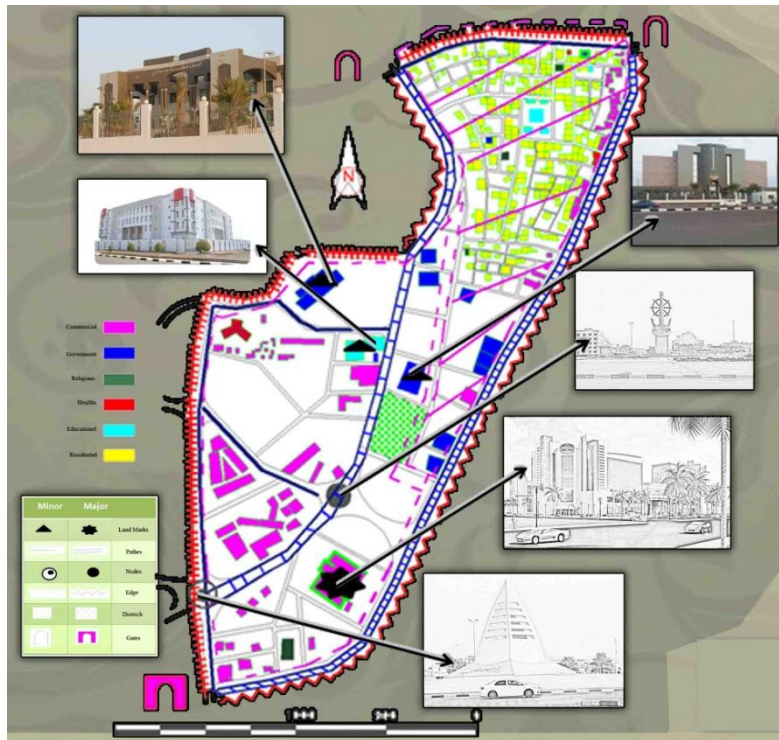


Figure (1) the main buildings characterizes the new center of Jazan, with wide streets and modern building style, as seen in student analysis.

Jazan today is a developing port, so why we improve the traditional souk in Jazan , in the early 20th-century, Jazan was a major site for pearl fishing, (Ishteeaq, 2008) , when World War I began, trade declined at Jazan, moving to Al Hudaydah in Yemen. Today, huge ambitious projects in transport, renewable energy, tourism and agricultural development are taking place in Jazan region to enhance the relationship rather than be developed in isolation. Jazan region is renowned for its popular Souks where many visitors go to enjoy and purchase local goods and traditional products including rare animals and birds. The most important markets are the Saturday Souk, Sunday Souk, Tuesday Souk, and the traditional internal souk (Ishteeaq, 2008) In order to present the argument in a structured, yet summarized way; the internal market in Jazan will be examined as case studies. This area must be understood not only in a physical sense but also in a cultural and social context; in a specifically given time and for a specifically group of given people. Internal market in Jazan ready to be the most beautiful and best popular market and heritage, social and cultural in the south of the Kingdom through improved and developed for the better, and make it a tourist destination for annual turn into a masterpiece heritage beautiful racing to visitors and tourists every year (Riyadh, 2010). Jazan city needs more than just good architecture; it needs good urban environmental design as well, based on a historic understanding. We need a new tradition in urban design, supported by designers who live and work in the city itself. The local authority must develop skills for the specific work on the inner city, and consider urban design a craft that needs an eye for decisive details.

## 1.2 "Hot-humid" climatic design in Jazan

The main climatic objectives in a hot-humid climate, concerning the street layout within the urban area, are to provide good ventilation conditions for pedestrians in streets and good potential for ventilation of the buildings along the streets. Another objective is to provide shade over sidewalks in streets with large concentrations of pedestrians. Such shade can be provided by trees along sidewalks, as well as by special details of the buildings. When conflicts exist between a street layout aimed at provision of ventilation and that aimed at shading of the sidewalks, the ventilation aspects may be more important in a hot-humid climate. From the point of view of urban design morphology, the climate can be classified by major climate features. Golany summarized basic urban design guidelines to the hot-humid climate type as seen in Table 1.

Table 1- Basic urban design responses to hot-humid climate. (Golany, 1995).

Main Climatic Types	Major Problems	Basic Urban Design Response
Hot-humid	Excessive heat High humidity	Ventilation: open ends & dispersed form widely open streets to support wind movement extensive shadow. Dispersion of high rise buildings to support ventilation. Combined variation of building heights Wide, yet shadowed open spaces Shadowing, planned tree zones

**1-2-1 A good street layout from;** the urban ventilation aspect in a hot-humid region is when wide main avenues are oriented at an oblique angle to the prevailing winds (e.g., at about 30 degrees,). Golany, 1995). This orientation still enables penetration of the wind into the heart of the town. The buildings along such avenues are exposed to different wind pressures on their front.

**1-2-2 Width of Streets;** the width of the streets determines the distance between the building on both sides of the street, with impacts both on the ventilation and solar utilization potential. Narrow streets provide better shading by buildings for pedestrians on sidewalks than the wide street. Narrow, winding or zigzagging alley minimum sunshine, reduce the effect of stormy winds and establish shadowed space throughout the day. In a hot-humid climate, wide streets help ventilate the city, but they will need much shadowing (Golany, 1995). Since they will receive and absorb large quantities of solar radiation and discourage pedestrian use. Shade for sidewalks can be provided even in wide streets by special details of the buildings or by trees.

**1-2-3 Outdoor Space Wind Conditions;** urban density affects the ventilation conditions in the streets and thus also the potential for natural ventilation of buildings this effect, however, depends greatly on the details of the urban physical structure. It is possible to obtain a wide range of wind conditions, even in a densely built-up area, by applying different urban design approaches. (<http://nacto.org>).

## 1-3 The Economic Value of the Internal Souk

The Souk is of great importance in the lives of the people of Jazan city and the region in general offering goods from household items more than any other market in the region and the acquisition of a commercial reputation among the region's population. The old souk in the center of Jazan used to be a really interesting place to walk around or sit in. The main part of it was covered,



though little of it was properly paved and the souk was commonly a network of narrowed alleys covered by light steel sheets and temporary awnings of wood and, more rarely, cloth or canvas. The narrow alleys permitted light to penetrate and air to circulate affording some degree of coolness to those using them. The souk provided not only the goods required for the house but it also was a place to stop and talk with friends while tea was drunk. Many of these places were within the shops themselves where the owner would entertain friends and customers, but there were no formal cafés. See figures 2 ,3 and 4..

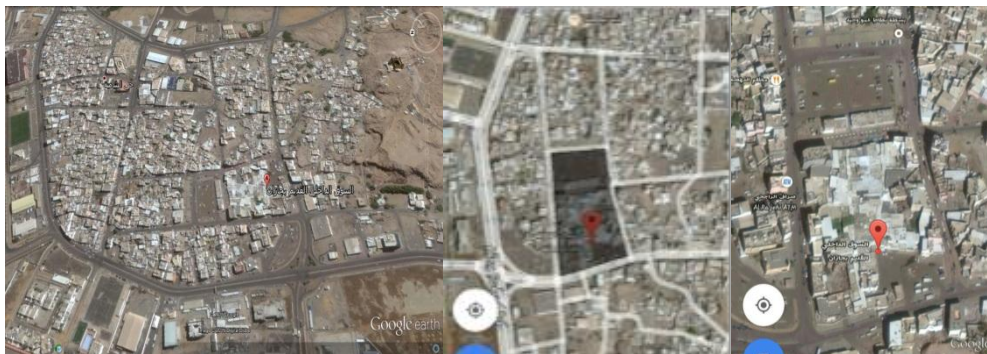


Figure (2) the location of the internal old souk (source Google earth).

## 2. THE FIELD STUDY – SURVEY

The King Faisal Street is the main access to the market, where it is entering the visitor to the parking lots and into the popular arena that pointed its shores to the central gold markets as sellers of silverware occupies another aspect of the arena. Survey was conducted for a number of 290 respondents, of whom 150 men and 140 women. Questions focused to know their views on the region's problems and possibilities of development and the type of community participation and development are the parties concerned. Half of the respondents from men ranging in age from 20:35 years old, and the other half more than 35 years and less than the age of 60, a basic labor forces while females 65% of them are less than 35 years old. Varied educational status to include half of the sample of male illiterate and of employees in the market, and on the contrary, the proportion of women in university education 55%. They are students of the University of Jazan and the proportion of one-third of a sample of women working in the market and they illiterate. 81% of men had engaged in volunteer work before, while 60% of women had engaged in volunteer work before.

### 2-1 Pedestrians in the Centre of Jazan

For this research project, we specifically looked at pedestrian use of the city center and the quality of the public space in order to provide spatial design Interventions that would improve public space for pedestrians. We used GPS tracking technology (temporal-geographical information), questionnaire surveys, and trip diaries (social-geographical information). With two research project pilots, one for visitors (like tourists) and the other for city center and neighborhood inhabitants, we followed 290 people throughout the city center of Jazan: a city with about 100 000 residents, a picturesque city center and a prominent university. We tracked participant's every movement and mode of transportation outside the house and then we conducted a visual analysis of the streets that they chose—or rather, didn't choose—to travel. For the most part, participants chose to walk to the city center, and their main purpose was for shopping activities. Movement concentrated on some streets over others. Land use analysis demonstrated that these streets had few functions, or were solely



residential. Since shopping is the main reason for visiting the center, this analysis is logical—those streets will not attract people because they have little or no shopping function.

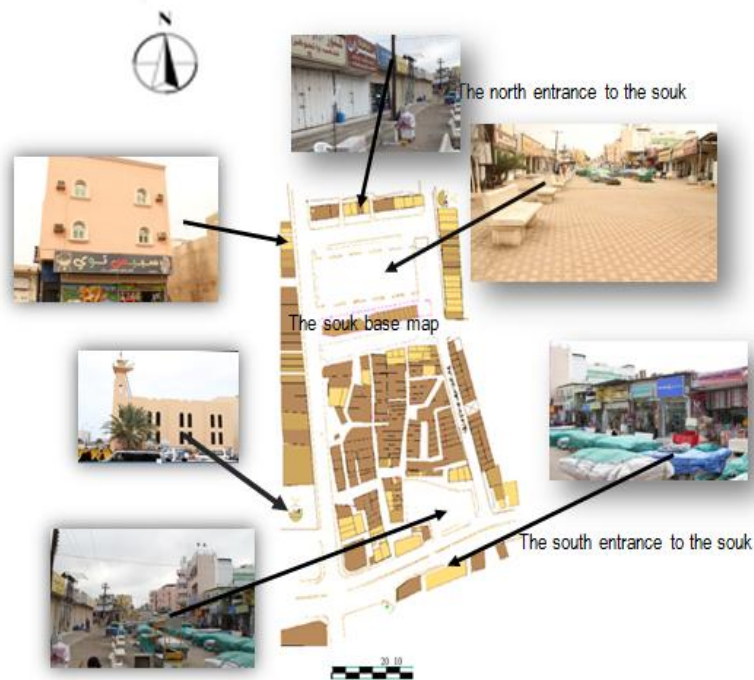


Figure (3) the main buildings characterizes the old souk as seen in student analysis.



Figure (4) street elevations as seen in student analysis of the old souk

**2-2 Site Problems from the standpoint of respondents** see figure 5.

- Narrow lanes and inner lanes 40%

- Small spaces shops. 25%
- Severe interference in the use of stores 32%
- The presence of street vendors and stalls frequently 22%
- The presence of beggars in abundance. 20%
- Garbage and waste accumulation around the market 34%
- Limited availability of places to sit and rest for shoppers 65%
- Parking overlap with vendors Movement 60%
- Infrastructure problems 55%
- Lanes levels, and finishes 45%



Figure (5) the current situation of the streets surrounded the old souk..  
(Photos taken by the author in March 2015)

### 2-2-1 Development proposals

- Expansion shopping corridors and provide arenas for shoppers. 60%
- Increase the number of stores. 75%
- Increase spaces shops. 80%
- Market demolition and construction of a new market. 85%
- Group similar products in specific areas within the market. 55%

### 2-2-2 Basic principles and concepts

In focus groups people tell us that they are tired of shopping in malls filled with the same stores that they can find everywhere else in the country. (Benfield, 2012), Many say they want to shop in downtowns, in quaint, one-of-a-kind stores. But, seeing the street as a commercial space, a dirty street and sidewalk are turnoff for shoppers, and if people won't come downtown to shop, there simply won't be a civic realm. We found a particular pattern with the streets pedestrians chose to 'enter' the city center: participants chose an entrance street with shopping functions before they continued their trip into the center. More interestingly, pedestrians made little use of what we found to be well-connected streets according to the Three-Step analysis.

**Commercial alleys:** often thought of as dirty or unsafe, can be designed to play an integral role in a downtown street network and improve the pedestrian realm in and around commercial areas. The design of commercial alleys should strive to balance their necessary utilitarian features with their place making potential. Commercial alleys may be constructed using low-impact pavement materials, such as modular paving. Prevailing design guidelines recommend a minimum sidewalk cross-section of 5 feet, exclusive of other amenities and large enough for two people walking side by side.

**Sidewalk zones:** Sidewalk standards should accommodate higher anticipated pedestrian volumes and provide ample space for an expanded frontage zone as well as other street furniture, such as trash receptacles, bus stops, signage, and bike share stations (Benfield, 2012). The sidewalk is the area

where people interface with one another and with businesses most directly in an urban environment. Landscape strips are an effective treatment between sidewalks and streets to create a buffer from moving vehicles and street noise, and help pedestrians feel more comfortable walking along the street.

**The frontage zone** describes the section of the sidewalk that functions as an extension of the building, whether through entryways and doors or sidewalk cafes and sandwich boards. The frontage zone consists of both the structure and the facade of the building fronting the street, as well as the space immediately adjacent to the building.

**Street furniture/curb zone:** The street furniture zone is defined as the section of the sidewalk between the curb and the through zone in which street furniture and amenities, such as lighting, benches, newspaper kiosks, utility poles, tree pits, and bicycle parking are provided. The street furniture zone may also consist of green infrastructure elements, such as rain gardens or flow-through planters. Using handsome groupings of benches and tables seem inviting and attract teenagers and other loiterers, who scare off shoppers. The elegant streetlamps, the expensive trash cans, and the distinctive granite paving stones, that people will stare at them as they walk by the storefronts. See figure 6.



Figure (6) Shading the narrow alleys of the old souk with light steel elements,  
(Photos taken by the author in March 2015)

## RECOMMENDATIONS

- Unshaded pavements should be avoided as far as possible and air should not be allowed to pass over such hot surfaces before reaching buildings.
- High trees with wide, shading crowns provide significant protection from solar radiation and should be incorporated as much as possible into any landscape planning.
- The roof should be made of lightweight materials with a low thermal capacity and high reflectivity. Metallic and light colored surfaces have the best reflective capacity
- The proper arrangement of vegetation, mainly of shade-providing trees, within the surrounding space is an important aspect for the improvement of the indoor climate.

## CONCLUSION

The old city centers offer many attractive public spaces for pedestrians to enjoy. We drew two main conclusions from our analyses. First,, alleys and some buildings exhibit poor maintenance and contribute to perceptions of danger. Second, we observed the ground floor plinths in the shopping area

are degraded and are in need of revitalization. With these conclusions we offered a few different design interventions to strengthen the fragmented urban spaces. Based on our results, we advised the City to better match public space functions to their surrounding land uses, to focus on enhancing pedestrian movement within current city center redevelopment projects, Design should not only focus on the section or profile of a building, but also the space between buildings. That's where city life exists and continues.

In short, a walkable community is a sustainable community. But the benefits reach beyond a city's future population growth. Improved economic vibrancy, a sense of vitality and connectivity, and the enhanced health and well-being of citizens are all direct and immediate results of improving a community's walkability. While walkability helps to attract new social capital to a city, it also helps to grow the social capital that already exists within its limits.

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## VEGETATED ROOFS AS PASSIVE COOLING METHOD FOR INDOOR TEMPERATURE REDUCTIONS IN MALAYSIAN HOUSES.

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Global warming as a result of deforestation and rapid urbanization have posed many climate related events including temperature rise of cities as well as rural regions across the globe. It is due to increasing atmospheric CO<sub>2</sub> emissions generated by building operations which contributes about 40-50% (Drexler, 2012; IPCC, 2001). A possible global warming of more than 2°C and sea level rise of more than 2m by 2050 is predicted by scientists. As CO<sub>2</sub> concentrations increase on earth atmosphere, heat is trapped on earth surface and fail to reradiate it back to space, keeping earth warm (Houghton, 2004). In Malaysia, buildings heat gains are the major issue which creates discomfort, illnesses and high cooling loads to the inhabitants. Indoor temperature increases when trapped heat is transferred downwards from roof. Most buildings in Malaysia depend on air conditioning to cool down spaces; however it has negative implications to surrounding environment as waste heat and CO<sub>2</sub> are emitted in uncontrollable fashion.

Many studies suggested that greening building envelope could mitigate heat-related problems. Vegetated roofs can be used to regulate air temperatures by absorbing heated gas in the air to maintain comfortable indoor and outdoor environment. A common type of it is the horizontal vegetated trellis shading device to cool roofs and ground surfaces. Vegetated surfaces have lower albedo than the artificial hard surfaces; it can replace warm air rises on hard surfaces and reducing heat island effect (Sheweka and Mohamed, 2012). Vegetated roofs contribute to ecosystem services through evapotranspirational and shade cooling. Additionally, rooftops vegetation can improve air quality through the uptake of gaseous pollutants and absorption of dust particles. CO<sub>2</sub> is used by plants to create oxygen and fix carbon as biomass in photosynthesis process. Vegetated roofs has the potential to produce natural food supply to inhabitants and less dependent on genetically modified organism GMO that concerning human health; it provides alternatives to overcome food insecurity. Vegetated roofs can be integrated with new building design and retrofitted to existing buildings.

However, there is limited research on design aspects especially the investigations on which planter designs and which type of plants are best at cooling in Malaysian context. In this research, experimental studies are carried out to examine vegetated roofs designs in terms of roof profile, substrate design, containers design and key plants traits to optimise its cooling effects. Two (2) species of perennial plants were identified and grown in raised planter boxes to quantify their cooling effects and gaseous pollutants uptake capacity over roof surfaces of a mock-up building.



Measurements taken include leaf temperature, substrate temperature at different depths, ambient temperature 15cm from plants and indoor temperatures. Vegetation transpiration rates are determined by water loss through leaf. Based on the experiments' findings, the study aimed to develop planter box designs to support optimal roof cooling. The research will determine the optimal spacing of ventilated air gaps between the bare roof and the retrofitted planter boxes including its shapes, heights and colours. The designs should be modular system that allow easy installation such as movable trays with interlocking grids that is flexible to change according to users' needs; it should allow drainage and ventilation capacity. The practical uses of vegetated roofs can become key components of building for natural cooling and energy saving benefits. It allows us to rethink how this method can be adapted to Malaysian buildings for improving quality of life

**Keywords:** Vegetated roofs design, Passive roof cooling methods, Indoor temperature reductions, Gaseous pollutants uptake of plants, Sustainability.

## DEVELOPMENT OF LANDSCAPE STRUCTURE INDEX AS BASIS INDICATOR FOR LANDSCAPE QUALITY AND CHARACTER: A REVIEW

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### ABSTRACT

Landscape as a sphere within which a range of processes actively occur. Phenomena of natural entities including landforms, soils, vegetation and attributes influenced by humans are constantly evolved in the landscape. Landscape also is a mirror of man's actions upon the physical surface of land, a constantly changing reflection of actions and non-actions (Abrahamson, 1999). There is a new determination to protect and enhance landscapes by developing fundamental information at the regional scale. In order to make decision involving the development, management or planning of a certain area, a physical inventory proved to be essential as a basis indicator for reference tool to facilitate the process especially to prevent bad decision making that can alter environment of the landscape. The Landscape Character Assessment (LCA) is a tools used and practically applied to evaluate for landscape character in countries such as England and Scotland. This approach influences the process of managing and planning the landscape in these countries which also been used as guidance in various study areas in identifying, mapping, classifying and describing the landscape character. This research will extensively use GIS application in the mapping process including map overlays as a basis for preliminary identification of landscape types. The study will adopts the four steps desk study, field survey and classification and description. The study aims to provide literature review for a fundamental structure for landscape classification of the Taiping District area that will contribute to the decision making in development and management of the landscape resources in Malaysia.

**Keywords:** Regional scale, Landscape character assessment, fundamental landscape structure

### 1. BACKGROUND

Landscape is a term used by many different disciplines with varies connotations. Physically, landscape is a tract of land with its distinguishing characteristic and features. Landscape is defined as a view of scenery prospect that can be taken in, at the glance from a point. It is about what we see and sense when we see it and the system which support both of this. In the sixteenth and seventeenth

century, the word landscape is perceived as a picture representing natural inland scenery, as distinguished from a sea picture, portrait, and also defined as „a piece of country scenery“ specifically „a view of prospect of natural inland scenery, such as can be taken in at the glance from one point of view“ in eighteenth century (Makhzoumi, 1999, p. 3). Landscape is not about visual insight, it also about our interaction with our surrounding that lead to the phenomenon of relationship between people and place and eventually provides changes to our daily life setting. It can be described in a variety of components system of our environment including natural and cultural that interact together dynamically. European Landscape Convention (ELC) defines landscape as “an area perceived by people, whose character is the result of the action and interaction of natural and human factors.”(Council of Europe Treaty Series no. 176, 2000).

In explaining the importance of the landscape, it is necessary to develop a landscape concept. There are two lines of thought by the experts on how the landscape can be conceptualized, one is the component of a human development perspective and the other is seen as part of a natural form from an environmentalist perspective. If the two areas have the same physical component, then there is a high possibility that they have the similarities in the element of shape, color, line and textures. Therefore, there is not much differences in the approaches used to identify the landscape. However, there may be differences resulting from the implementation of landscape planning and development.

In order to make decision involving the planning development, management of a certain area, a physical inventory proved to be essential as a baseline information to facilitate the process of wise use of the character of the landscape area. The inventory should consist of information presented in details manner which consider the systematic landscape classification based on the distinctive landscape character that inherit in the local context.

Currently in Malaysia, there is no systematic planning tool available to describe, classify, evaluate and predict the location or the resulting pattern on existing landscape (Samat, 2009). Right now, physical planning in Malaysia has no direct integration with the landscape character distinctiveness. However, landscape character assessment is an effective approach that has been carried out in developed countries and can serve the purpose of systematically the integration of landscape quality and character into the planned development setting.

## 2. LITERATURE REVIEW

In sixteenth & seventeenth century, landscape as a picture representing natural inland scenery, as distinguished from a sea picture, portrait, and also defined as ‘a piece of country scenery ‘ specifically ‘ a view of prospect of natural inland scenery, such as can be taken in at the glance from one point of view’ in eighteenth century.(Makhzoumi 1999, p. 3). In the other hand, landscape is ‘a tract of land with its distinguishing characteristic and features, especially considered as a product of modifying or shaping processes and agents’. Landscape as a view of prospect of scenery such as can be taken in at the glance from the point. It is about what we see, senses when we see it and the system which support both of this. Landscape is not just about visual insight, it also about feeling on our surrounding. A soul definition of landscape is about relationship between people and place and also provides changes for our day lives setting. It can be describe as a variety of system components of our environment including natural and cultural that interact together and perceived by human kind.

Besides, landscape is a vital part of our environment in our quality of life. In the broadest sense, it commonly refers to the appearance of the land cover, but also includes such components as its shapes, textures and colours, reflects the way in which these various components combine to create specific patterns and distinctive pictures to particular localities. It encompasses the whole natural and man-made environment, urban and rural. The patterns and textures of buildings, streets, open spaces and trees, and their interrelationships within the built environment are each important parts of our wider landscape heritage. Landscape has become a major issue in spatial policy both as a sector in its own right, important to outdoor amenity and the leisure economy, and, increasingly, as a basis for framing and managing wider socio-environmental systems. This trend reflects two major elements in sustainable landscape development. First, focused on the design and protection of scenic assets and second, emphasizing dynamic multifunctional links between ecosystem services and human well-being. Given sustainability's centrality to public policy and corporate social responsibility is not surprising that analysts are asking critical questions about the nature of "sustainable landscape".

## 2.1 Landscape Character

The definition of Landscape Character is the pattern that arises from particular combinations of the different components that can provide a sense of place to our surroundings (The Countryside Agency, 2002). Landscape assessment can be define as practical value as a decision making tools and provide more informed analysis of the way in which the landscape has evolved. It is a basic understanding on the dynamic current and future change. The assessment of landscape functions also supposition to formulate ecological target of landscape development, on the conditions of landscape changes which continuously increase (Olaf Bastian\*, Matthias RoEder.1998). Landscape Assessment only required as part of planning applications and visual impact assessment in Environmental Impact Assessment (EIA) procedures for public and private sector development project. These assessments are limited in scope and provide only a partial picture of the whole area of a local authority (Kim, 2007). Landscape Assessment also can be defined as all the ways of looking at describing, analyzing and evaluating the landscape. (Makhzoumi and Pungetti, 1999, p60). A suitable approach for landscape assessment was sought to characterize the landscapes, to describe the main forces of change and assess their biodiversity values on basis of existing or easily derived information (Kim 2007) and has to prepare the designation of preferential areas for specific forms of land use. The assessment results are the basis for the enforcement of sustainable land use.

## 2.2 Landscape Character Assessment

Landscape Character Assessment is a tool which can make significant contribution to the objectives that relate with environmental protection and prudent resource use as corner stores of sustainable development. It's also a merge as an appropriate way to look at landscape because it provides a structured approach to identifying character and distinctiveness as well as value (The Countryside Agency, 2002). It can be a powerful tool to aid the planning, design, development and management. Addressing the characterization process involving identifying, mapping, classifying, and describing landscape character and the process of making judgment based on landscape character to inform the range of decision. This approach influence process of managing and planning the landscape in these countries used as guidance in various study areas. It is not just

rank or judge character of places and it simply record in systematic way (landform, underlying geology and soil).

However, with the advent of new enabling technologies such as remote sensing (RS) and Geographical Information System (GIS) together with suitable methodologies and improved data collection procedures, new insights emerged to close the gap for finding ways to get a systematic landscape quality value. This value is important as a meaningful way of determining the level of quality environment especially in our rapidly developed country.

Due to this development most of our Malaysian landscapes have been seriously degraded. To maintain a sustainable development while preserving the natural landscape, a landscape quality index is envisioned as a viable standard to make alternative decision to support physical development. There are three core areas that will be examined mainly scenic quality or visual quality value, distinctive character area and site ecological services.

Scenic quality assessment that determined data visual quality value of a site will be conducted using the Bureau of Land Management, US Department of Interior as a methodology to determine the visual quality of the study area. Distinctive character area will be evaluated from the Landscape Character Assessment (LCA) that has been extensively used as planning tools and practically applied as guideline for landscape planning and management in countries such as England and Scotland.

Landscape character refers to the perception by people of the distinctive, unique and recognizable characters that occur consistently which differentiate one landscape from another (Swanwick, 2002). The characters can be in form of natural elements or human developments that represent the features for the area. The existing character of landscapes is very crucial and need to be taken into consideration for the decisions in planning and development of certain area. This will ensure the suitability of future development by being sensitive to site context in physical developments well as meeting the social and economic objectives. LCA also served as a baseline inventory and provide guidance for its development and management by taking into account current best practice involving identifying, mapping, classifying and describing the landscape character.

### 2.3 Landscape Structure

A landscape can be distinguished from the relationship between the components that create landscapes (resources). The landscape is characterized by a wide range of landscapes and characters to create a configuration (sometimes referred to as the perception of the landscape or landscape pattern), and this is an aspect of the landscape in a combination that creates a large landscape.

The composition of the landscape refers to features associated with the presence and quantity of each type of patch is in the landscape, but without a clear spatial. In other words, the composition of the landscape includes various patches in the landscape, but not in the name of the place or location where the patch in the mosaic is located. The composition of the landscape is important for many ecological processes and organisms. For example, many vertebrate species



require specific habitat type, and amount of suitable habitat (landscape composition function) may affect the events, and many species of vertebrates.

Configuration refers to the landscape character of the spatial distribution of physical or patches in the landscape. Some configuration aspects, such as isolation patch, patch comparison with other types of patch, patch boundaries, or landscape features that are attractive and other characters landscape patch.

There are many aspects of landscape configuration and index methods developed to analyze the structure of the landscape. The configuration of the landscape can be measured using the statistics in terms of landscape unit itself (ie, patch). Spatial pattern is the character represented landscaping individual patches. Location patch connect with each other in the landscape (ie, patch configuration in the landscape), cannot be seen clearly.

## 2.4 Landscape Metrics

Landscape metrics are measured in terms of individual patches (for example, mean that the patch core, meaning a patch) is in accordance with a clearly visible at the level of individual patch landscape. This metric is to recognize that the ecological characteristics are influenced by the surrounding neighbourhood and the magnitude of this effect is influenced by patch size and shape.

Landscape metrics to measure only the landscape as a whole, the characteristics of the average patch size, or number of variables in the feature patch. While this metric is not totally clear in all spatial landscape level, they have clear ecological relevance when considered from the point of view of dynamic patch. Measuring minimum core patch of landscape across the landscape can provide a good index for suitability for a particular use landscape.

Landscape metric tools were used in landscape ecology research as supporting analysis for landscape planning and landscape management decisions making. Landscape metrics were used to measure the landscape structure and the complexity of this structure in large scale of landscape. The complexity of the structure of landscape structure, landscape metrics used for measuring and Mosaic structure and related information can be obtained. Thus, the characteristics of the landscape easily perceived (Farina 2000; Letiao and Ahern 2002; Wu 2004). It is to put forward the development of the landscape and to assess fragility, emerging over time (Jaeger 2000). This tools was required for determining the relations among structural features, landscape function and landscape change for variety of landscape.

Landscape metrics help to calculate the composition and configuration, which have variety characteristics of landscape structure.

Landscape composition and configuration with landscape metrics perceives with different approaches. Landscape metrics are used to with regard to the importance of each patch type to perceive composition. It was determined characteristics such as rate, richness (patch richness), regularity, dominance and diversity (patch number) with metrics related composition. It was defined physical distribution of patches in mosaic structure with landscape configuration. Metrics are size and shape, neighborhood (the distance to the nearest neighborhood) and distribution related configuration, (Farina 2000; Letiao and Ahern 2002).

Landscape metrics helps to understand changes in landscape from different perspectives (e.g: Visual, ecological, cultural, and social). It is understood relationship between landscape structures, landscape context and landscape function with landscape metrics. Otherwise, using method of landscape metrics, it will estimate the effects of landscape planning activities on development process. At the same time, landscape metrics are made, to determine the changes in the landscape over time.

Landscape metrics are used in conjunction with geographic information systems (GIS). GIS has made a major contribution to the study of the landscape metrics (Johnston 1998) and landscape character. It offers a lot of possibilities to the users. To use landscape metrics and digital data adapted with GIS technologies have been made contributes to the landscape planning studies and also sustainable planning and development.

Determination of landscape structure, Quantifying changes in this structure and determination of the structure of the landscape, with regard to the evaluation of these enhanced measures (Landscaping measures).

(Mc Garical et al. 2002; Farina 2000) was identify landscape metrics could be calculated to three categories:

1. Patch level: To calculation ever patch type in a mosaic.
2. Class level: To calculation ever patch type class.
3. Landscape level: All of the mosaic is calculated.

The structure of the landscape reflect a pattern of landscape elements and relationships between the various ecosystems or landscape elements are different. Landscape Structures has two qualities. This is the composition and configuration (Farina 2000). Composition Landscape: The nature of the composition of non-space, and cannot be measured. It defines the quality of the landscape patches, scattered in the landscape. This composition is not accurate identification of the mosaic structure of the landscape. But, it is a good indication of the suitability of the environment for several species (type patch according to species) (Farina 2000). Landscape configuration: Configuration refers to spatial characteristics. It refers to the characteristics of the same space with the spatial distribution of land cover (Farina 2000).

Patch is defined as a nonlinear area (polygon) which is less abundant. It is different from the matrix. Corridor is a special type of patch which links other patches in the matrix. Typically, a corridor is linear or elongated in shape, such as a stream corridor. Matrix is the land cover that is dominant and interconnected over the majority of the land surface. Often the matrix is forest or agriculture, but theoretically it can be any land cover type. Mosaic means a collection of patches, none of which are dominant enough to be interconnected throughout the landscape.

## 2.5 Landscape change

The landscapes of today have been shaped by powerful. Ever-present forces are seen in space and time by anthropogenic activities (Sanderson and Harris, 2000). Landscapes are not static. Landscapes are impressed by Climate changes, land-use changes and human activities. It can be changed mosaic structure, shape and size of patches in a landscape. All these changes could be seen different spatial sizes and frequencies (Farina 2000).

A change can be defined as any modification occurring in a system state (from individual to biosphere) produced by a broad variety of abiotic and/or biotic factors that introduce or subtract energy and information to the system (Farina 2010).

Changes can be considered modifications in the availability of an expected resource or pattern and the temporary or permanent impossibility for species, populations, communities, ecosystems, and land mosaics to incorporate the new conditions (Farina 2010).

To assess the current conditions of the landscape, historical process must be known. Depending on the natural and cultural influences the changes are seen over time in the landscape structure. In this case, landscape structure and relationship between ecosystems are changed. As a result of change studies, functions and conditions in the mosaic of different sized and shaped patches can be revealed (Wu, 2000).

Changes can be integrated with the abiotic-biotic processes, and basic components of each ecosystem. Health of the system can be revealed to analyse rate, frequency, and intensity of change. Change may be occurred at different levels. Small scale systems have a higher change level from large-scale systems. It is more useful to assessment of the change at large scales (Farina 2000).

There are two main factors of landscape change. These are natural processes and human activities (especially nowadays). Both natural conditions and human needs are changed over time. Complex changes can be emerged in the landscape structure related to natural conditions and human needs (Antrop 1998; Farina 2000).

Defining change depends upon the temporal resolution of consecutive observations and data sets. Also, these differences must be observable or measurable in magnitude and this depends on the degree of detail and accuracy of the data used. Frequent and multiple observations enhance the knowledge of the dynamics of landscape processes, but became only available with the technology of remote sensing and the setting up of monitoring programs (Antrop 2005).

Landscape change can be revealed to analyse of aerial photography, land maps and satellite images through different techniques. There are some challenges related to landscape change studies. Data for previous years are different type and quality. It is difficult to get qualified data (Farina 2000).

Landscapes change 'naturally' as they are the expression of the interaction between the natural environment and man's activities. Both the natural conditions and the human needs change in time and are controlled by different but interactive factors (Antrop 1998).

Change can be expressed to made comparison of at least two different time statuses. Landscapes are mixture of the different qualifications in consists of peculiar dynamics. Depending on these dynamics, change can be emerged in different speed and scale (Antrop 1998).

There are five main compelling powers are effective in the landscape change such as socio-economic forces: Urbanization, industry, industrial activities, political forces: Incorrect

applications, technological forces: Car roads, infrastructure facilities, natural forces: Avalanche, landslide, flood and cultural forces: Accessibility, human intervention, fire (Farina 2000; Bürgi et al. 2004; Antrop 2005).

The nature of change also demands new thinking. Actual changes are so complex and fast it becomes hard to keep track of them. Comprehensive and integrated methods for fast inventorying and

### 3. METHODOLOGY

The study will adopt the Landscape Character Assessment (LCA) tools developed for landscape assessment guidance of England and Scotland. The LCA guideline comprises of four steps which are the process of defining the scope, desk study, field survey and the final steps of classification and description.

The phases of research will be as follows:

Literature Review: Review on fundamental theories on landscape character, landscape classification, assessment tools used as well as additional aspects affecting the study.

Phase 1: Defining the scope. This stage involves the planning of the landscape character assessment considering the purpose and the aims of the assessment, the scale and level of the detail required, the skills, the people and resources required, the time taken to undertake the task, the nature of the outputs needed as well as to determine the judgment to inform the relevant decision.

Phase 2: Desk study. The desk study involves the usage of the GIS tool by creating the map overlay covering the study area to identify draft of the landscape character types. Later the 3D image of the area based on the remote sensing data from Landsat will be built.

Phase 3: Field Survey (Ground Truthing) The field survey is carried out to provide the ground level view as seen by people. The information gathered from the study area will be recorded. This information will be used to amend, confirm and provide details which cannot be identified from desk study.

Phase 4: Classification and description. This phase is an important part of landscape characterization concerning dividing or grouping the area based on the distinct, common or recognizable character of the study area. The approach for classification will be from using GIS classification techniques.

Phase 5: Application of selected alternative to be applied in development and protection a landscape will be determined using Multi Criteria Decision Making (MCDM).

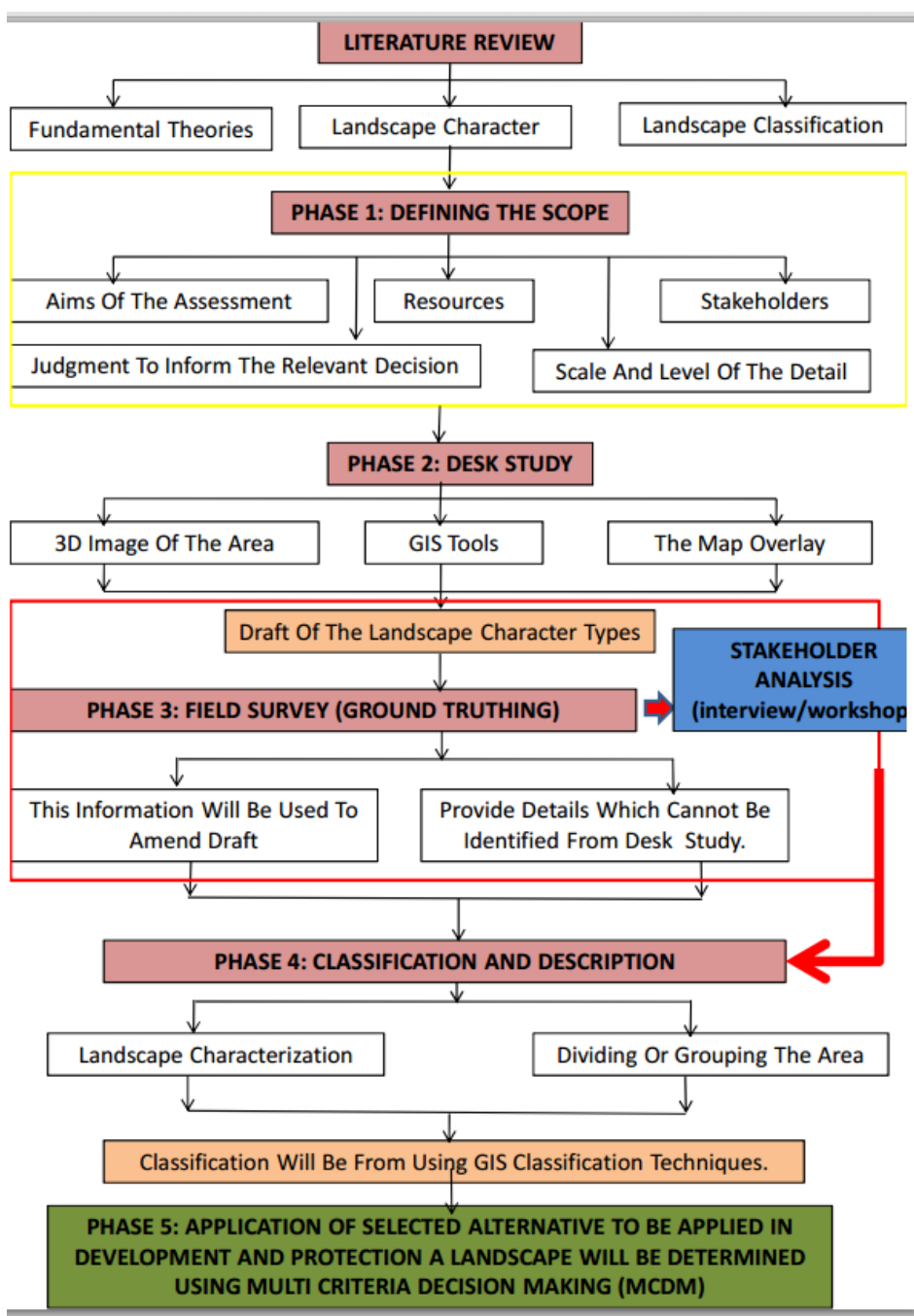


Figure 3.1 Methodology diagram for Development of Landscape Structure Index as Basis Indicator for Landscape Quality and Character

### 3.1 Importance of Scale Hierarchy Based on Landscape Character Assessment Region

The use of scale is very important to be dealt with in this landscape character assessment study. Two major scale landscape character assessments are:



**i. Regional Scale:**

Study on regional level using a large scale (1:100,000 until 1:250,000) and can cover the whole country or large region to identify broad patterns of variation in landscape character. This gives pattern of landform for land cover layer with a wide range of ecological influences.

**ii. Local Scale:**

It is necessary to perform the valuation of a smaller area on a scale of 1:10,000 - scale 1:25,000 or a more specific and localized, such as farms, parks or on proposed development area. At local scale, it is important to set the reference base in the context of landscape character assessment in great details, to indicate types of landscape character.

For this study, scale of the research conducted at state / regional level. This is because the study is the basis for a detailed study on district and special area. In addition, the data for this regional study are easily available for academic research purposes.

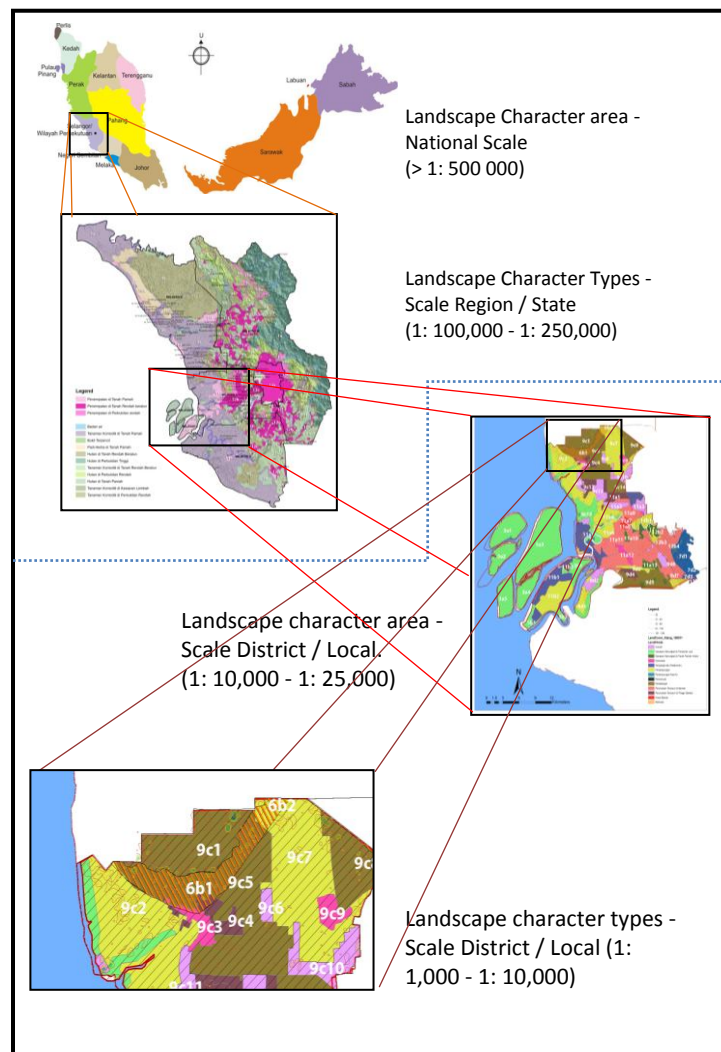


Figure 3.2: Spatial hierarchy of landscape character assessment-for example the relationship between different scales- Example Landscape classification for Selangor

#### 4. LANDSCAPE DEVELOPMENT IN MALAYSIA

Efforts in planning, development, management, preservation and conservation of the landscape had existed in this country indirectly through the implementation of law enforcement under certain acts, policies and guidelines are available. However, the protection and management specifically related to the landscape did not exist in legislation, policies and guidelines. But, indirect acts, policies and existing guidelines do not show direct relevance to the landscape as a whole.

Provisions of the law the existence most of the policies and guidelines based on administer affairs, manage, develop and protect the land based on the quantity and quality on the physical landscape. If the expanded dimensions of the landscape needs to identify those areas or landscapes which are considered distinctive, interesting and important aspects of the character to be considered for protection needs, planning and management has been overlooked even though not yet to neglected. A hierarchy of landscape position must be developed and highlighted for national interest. An effort in this direction is to provide landscape character assessment in national, regional and local levels. As a result of landscape character assessment should be implemented with a thorough and systematic ways will contribute to national development and in addition, an alternative to the protection, planning and landscape management.

*Table 1.0 Landscape connections with the implementation of legislation, programs, policies and guidelines on natural resources and culture in Malaysia.*

No	Program/Acts, Policies, Guidelines	Strategy	Correlated with the aspects and areas of landscape
1	Landscape resources		
	National Landscape Policy 2011	Strengthen and enhance landscape quality for achieving the most beautiful National Parks	Developing a Landscape Plan and Urban Area which has a distinctive landscape character, harmonious and sustainable natural resources and to remain in the current socio-cultural development and modernization.
2	Land Resources		
	National Land Code 1965 Town and Country Planning Act 1976, 1994	Comprehensive legislation relating to land, the gazetting of land, transfer of land, land registration, land transactions and others in Peninsular Malaysia	Development of the urban landscape, countryside and specific areas  Areas beautification
		increase standards in land use planning	Landscape maintenance

Land Conservation Act 1960	Reducing negative impacts of land use such as erosion and landslides	Preservation of landscape
Street, Drainage, Building Act 1974	To plan the physical development and socio-economic	Landscape management Areas beautification
Soil Erosion Model		Landscape maintenance
State Plan under the State Planning Committee to manage natural resources and man-made products	Advisory and Governance Development Stage of the Federal Government , State and Local Authorities	Landscape development
–The National Physical Plan (NPP) State Structure Plan (SSP) and the District Local Plan (DLP), Special Area Plan (SAP)	Development plan of states, districts and special areas	Planning and design of special landscape areas, sensitive and important.
<b>3 Water Resources</b>		
Water Acts 1920, Semakan 1989	To control the development of high land, protect watersheds	Important component of the landscape and the preservation of water bodies
Environmental Quality Act 1974	Monitor and supervise matters related to water quality	Landscape maintenance of water catchment areas and waterfront
Water Usage Guidelines		
<b>4 Forest Resources</b>		
National Forestry Act 1984	Increase capacity and effectiveness of reforestation	Natural landscape and forests
	National forest inventory	Information on forest landscape
	Increase R & D in forestry	Knowledge and the advancement of knowledge

	Protect and manage forests for biodiversity, habitat and water resources	about the forest landscape
	Managing the community forest and forest product efforts	Management of natural habitats and landscape
		Design and management of community forests and culture
<hr/>		
5	Biodiversity / Wildlife Resources	
<hr/>		
National Biodiversity Policy (April 1998)	Enforcement of laws for the protection of biological diversity	Management of natural habitats and landscape
<hr/>		
Wildlife Protection Act 1972.1976	Protection to habitats and wildlife, nature education, research, recreation and eco-tourism, service of ecological processes and integrity habitat	Landscape of outdoor recreation areas
<hr/>		
National Parks Enactment (Terengganu) 1987	Formation of wildlife and vegetation management of the state	Development of landscape design in the natural
<hr/>		
Endau Rompin National Park (Johor) 1993	Creating protected areas where the state and threatened species conservation, outdoor recreation center and research	Landscape of outdoor recreation areas
<hr/>		
Biosafety Act 2007	Complement the Government's intention to conserve the country and making biotechnology as a source of new wealth	Development of landscape design in the natural area for ecotourism in harmony with high biodiversity areas
<hr/>		
6	Heritage resources	
<hr/>		
National Heritage Act 2005	Conservation and	Planning and design of a cultural
<hr/>		

	preservation of national heritage, natural heritage, both tangible and intangible heritage	landscape heritage area
Formation of Langkawi Geo-parks	Conservation and preservation of geological heritage	Planning and design of the cultural landscape in the area of geological heritage
7	Geological resources	
National Mineral Policy 1 (1992)	Enhance mineral sector's contribution to socioeconomic development through the efficient development of natural resources.	Develop and diversify the mineral sector through the discovery and utilization of mineral resources the country with emphasis on environmental protection and sustainable development.
National Mineral Policy 2 (2008)		
Selangor Mineral Enactment, 2000		
Minerals Development Act 1994		
Selangor Quarry Regulations 2003		

## 5. CONCLUSION

The 'benefits that people obtain from ecosystems' include provisioning services (the products obtained from ecosystems); regulating services (the benefits obtained from the regulation of ecosystem processes); cultural services (the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences); and the supporting services (those that are necessary for the production of all other ecosystem services) (MA,2005). The ecosystem services value will be mapped out within the study area and the distribution of ecosystems value will be overlaid with the scenic and distinctive aspect of landscape.

This study with the application of visual quality and sensitivity assessment of the landscape form an effective alternative approach for protection of natural and cultural landscape. Use of Geographical Information System (GIS) and Remote Sensing procedure together with Multi Criteria Decision Making (MCDM) substantially to improve the accuracy of the information and conduct the explorative research to determine the landscape quality index. This landscape quality index will be used as a tool in planning, developing and managing physical development for sustainability.



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## THE EFFECT OF CULTURE AND BEHAVIORAL PERCEPTION ON THE ARCHITECTURAL STYLE OF CLAY BUILDINGS IN HADHRAMOUT REGION, YEMEN

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### ABSTRACT

**Statement of the Problem:** The effect of culture and behavioral perception on architectural style can be achieved on two basic levels. The first level is conceptual-perceptual and the second level is physical-formal. The study of the effect of culture and behavioral perception on architectural style requires an objective tool for testing. It was found from previous literature that there is a special relationship between culture and behavioral perception and architectural style. Thus there is a clear conceptual status for the objective tool and method through which we can study and examine the effect of culture and behavioral perception on architectural style. The thing that makes up this relationship, i.e., the statement of the problem in the present study. **Approach:** This study aims at highlighting the relationship between culture and behavioral perception on architectural style. The thing that can be used as a continuous detective method to study the architecture in a certain region. This can be carried out through the implementation of continuous observation tool in the architectural style in both levels conceptual- perceptual and the physical- formal. The main hypothesis of this study is based on the possibility of adopting architectural style as a method for studying and extrapolating the effect of culture and behavioral perception in the history of architecture. The thing that referred to as permanent system in this study. **Result:** To approve the study hypothesis and achieve its main objective, the researcher has adopted a sequential approach based on an analytical and critical study of previous literature concerning with architectural style as to highlight its conceptual properties. This might lead to finding out the relationship between culture and the perceptual and physical properties of architectural style, so as to achieve the concept of architectural continuity. **Conclusion:** The inhabitants' awareness of the architectural heritage environment will support the study hypothesis. Finally, this study seeks for certain guidelines for sustainable effect of culture and behavioral perception on architectural style of clay buildings in Hadhramout region.

**Keywords:** Culture, behavioral-perception, architectural-style, architectural-continuity.

### INTRODUCTION

Perception is a word linguistically used to refer to the process of sense which differs from the psychological definition of the process of cognition. Besides, perception is used to refer to the mental process that enables human to feel compatible with the environment in an attempt to recognize:

- Human and natural environment and the different effects for the material and moral forces surrounding the man and his reactions towards them.

- Human motives and his perception on life.
- The effect of time, learning and education on human behavior.
- Human's capacity to adapt to different effects they are exposed to.

Perception is considered a complex process created by the current sensations as well as internal factors such as retention, imagination and past experiences, in addition to the external factors. However, sensation is considered as a warning factor activated by the sensational stimulus. Thus, in order to comprehend the process of perception and the individual behaviors in the community, we need to be aware of that the inhabitants in the industrialized and developmental countries hold special conceptions about the architecture spaces which are relevant to cultural and regional content of the architectural area they live in. Besides, these conceptions are related socially and culturally to their lifestyle. Moreover, they are related to the educational and economic level of the inhabitants of a certain area. The thing that constitutes the level of their awareness concerning architecture style. Besides, the self-perception process for the individual is affected by the physical, psychological and social factors. Furthermore, this process is also affected by the past experiences and beliefs and present mood and future expectations, which are responsible for the difference in the perception process. The people's behaviors are not only related to the perception process as a whole but they also expressed by them. Hence, the perception directed behavior, and thus we can link between the general content of the perception process and individuals' behaviors and the development and achievement of the living requirements. These requirements are in turn reflected on the methods they adopt to change the architectural space (internal) as well as the horizontal facades and the urban space (external) which includes facades.

### **Type, Model and Style Triple-Class System**

According to the dictionary, the style is defined as a pattern, and a way of expressing something. In addition, it is a way to convert ideas into words. Style is a way of expressing the spiritual, cultural and human values. Besides, it is a language which is subject to the evolution and adaptation to the time. Thus architectural style is considered a language including the pattern or the design that turns ideas into forms. Therefore, whether models were outcomes of civilized, social, sensory, graphical, functional requirements, they are still governed by their absolute intellectual invisible and physical visual embodied dimension. The thing that shows the possibility of defining and interpreting the models in the light of the (Type & Topology). Type as defined by Rykwart (1963) and others, encapsulates the intellectual dimensional of something. However, it is vague and general and has full symbolic dimensions in mind. The Type is reflected physically in the Model, which represents a special case of a pattern with clear and limited features (Figure 1). The emergence of the architectural style is based on the evolution of a series of buildings with formal properties (Concept Forms) which commonly and intellectually have come to being. Such properties carried within them the solutions for intellectual, functional, religious, cultural and ideological requirements. According to Rykwert (1963), the initial or the original types or (Archetypes) are drawn from a series of architectural models to extract the formal conceptual common basics and elements of the internal structure of the form. However, the prototype characteristics can be deduced through the analysis of a group of architectural repeated models. Consequently, the potential possibilities of interpreting the concept of style is presented within the contexts of Typology Theory. For instance, Schelling, in the nineteenth century, stated that the style encapsulates two existed parts; the first one is intellectual and invisible which is centered in mind. This part is called the absolute part (Absolute) by Schelling. The second part is physical and visible which represents the physical form of the concept of the style.

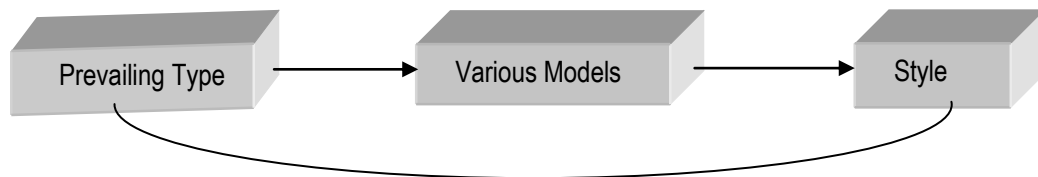


Figure 1: Style Holds tagged Values of Type

## The Problem of Style in the Architecture

The problem in architecture is similar to a lot of concepts related to architecture and its history and the problems of communication among others. This problem came as a product of the eighteenth century and beyond. Its novelty relatively referred back to, over generations, the experience of building which is being transferred from one generation to another. With such experience, special architectural traditions are transmitted in form and style. Thus, when human is unable to come up with a new addition to his experience, this experiment begins to decay and collapse. This has been confirmed by Collins (1971) who points out that until (1750AD), the architecture was concerned with the art of the construction according to the basic principles agreed upon. Besides, the architect's imagination and his artistic feelings can be expressed in full as long as they don't exceeded this framework of these well-known principles. The classic concept of the model have remained in place until the eighteenth century, for example, in the European Ages and early Renaissance, despite the variety and divergence of intellectual and cognitive orientations, the Classical Orders have remained as a basis for the formation of the building's outside, even as an ornamental style. The eighteenth century has witnessed intellectual transformations in terms of the theme of style in architecture. This century is followed by the nineteenth century which is transformed into an intellectual and selective architectural style. In those two eras, several thoughts have been emerged on the subject of style and they constitute an important link in the series of the intellectual development of architecture which has extended to the twentieth century to be the basis for a broader and more comprehensive approach.

## THE PROBLEM OF ARCHITECTURAL STYLE IN HADHRAMI ARCHITECTURE

Mud architecture civilization has prevailed in this region, which represents a great example for human positive relation with the environment in a creative and efficient way. Such civilization has combined with this region's diverse terrain and materials in the valleys and mountains resulting in witnessing a renaissance from its own mud, stones and straw. However, many of the buildings, which have architectural value, in this region have recently exposed to neglect, abuse, misuse, removal and vandalism due to the deterioration of the areas in this region. Besides, the lack of conservation, renovation, and restoration in addition to neglecting the supervision of the work all lead to deterioration of the areas in this region. This study will shed light on the factors that have architectural and historical value with its various planning and architectural styles. Moreover, it will discuss the process of protection, restoration and renovation of such buildings to preserve their architectural identity. In addition, it seeks to bring back the roots and architectural authenticity and continuity as a starting point to preserve the Hadhrami home by linking it to its original nature and traditional environment as an urgent request. Furthermore, the study aims at reaching to implications for the materials that can be exploited to impart unique architectural style on the civilized or new-established areas which face changing circumstances experienced by the Hadhrami people who interact with the environment in such areas.



## Approach to the Study

In order to have a general understanding of the physical changes in architectural style for the structure of the clay buildings in the cities of Hadhramout region. This region has been divided into zones approximately. There is the old region (the traditional area), and the modern region (the random). This spatial division, however, is based upon the historical growth of the cities in this region and the events that had a clear impact on the physical structure of architecture style of the buildings of these cities. These events were caused by the immigrants who came from abroad with a new culture in the art of architecture.

## The Study Hypotheses

In this study, it is hypothesized that the continuous change of architectural style of clay buildings in the cities of Hadhramout region is reflected in constructing a random environmental settlement. Consequently, the physical architectural style of Hadhramout region is subject to degradation".

## METHODOLOGY

The methodology of this study is designed based on the study objectives which seek to examine the extent to which the random architectural style of the clay buildings has dominated the building form. Specifically, the present study methodology is based on:

- 1- Physical Survey: This is mainly concerned with the layout and facades of a sample of buildings.
- 2- Site Observation: This measure is adopted to record the physical conditions of the residential environment.
- 3- Physical Check-List: Physical check-lists and photographs are conducted with the major aim of collecting information about the physical site and the type of buildings in the zones.

## The Design of the Historical Zones

Case studies presented in (Figure 2) demonstrate the availability of public buildings in the locations situated in the outdoor spaces and not the most important squares in which extra buildings can be built. Therefore, a clear distinction between the private and public areas should be made. To distinguish between the aforementioned squares and to minimize the number of the inhabitants in the outdoor spaces, the following suggestions are made:

- 1- The public buildings after the planned extensions should be semi-private green areas that serve as back squares controlled by the residents, rather than being semi-public open green spaces run by local authorities. Such places as the green areas are constructible in places where not only closed spaces are required but also privacy.
- 2- The ground floors of buildings could be used as commercial places, as demonstrated and planned in the commercial center in a mass public housing buildings. Consequently, several rooms in the houses located on main streets have been changed to be commercial shops. That would likely increase residents' income.

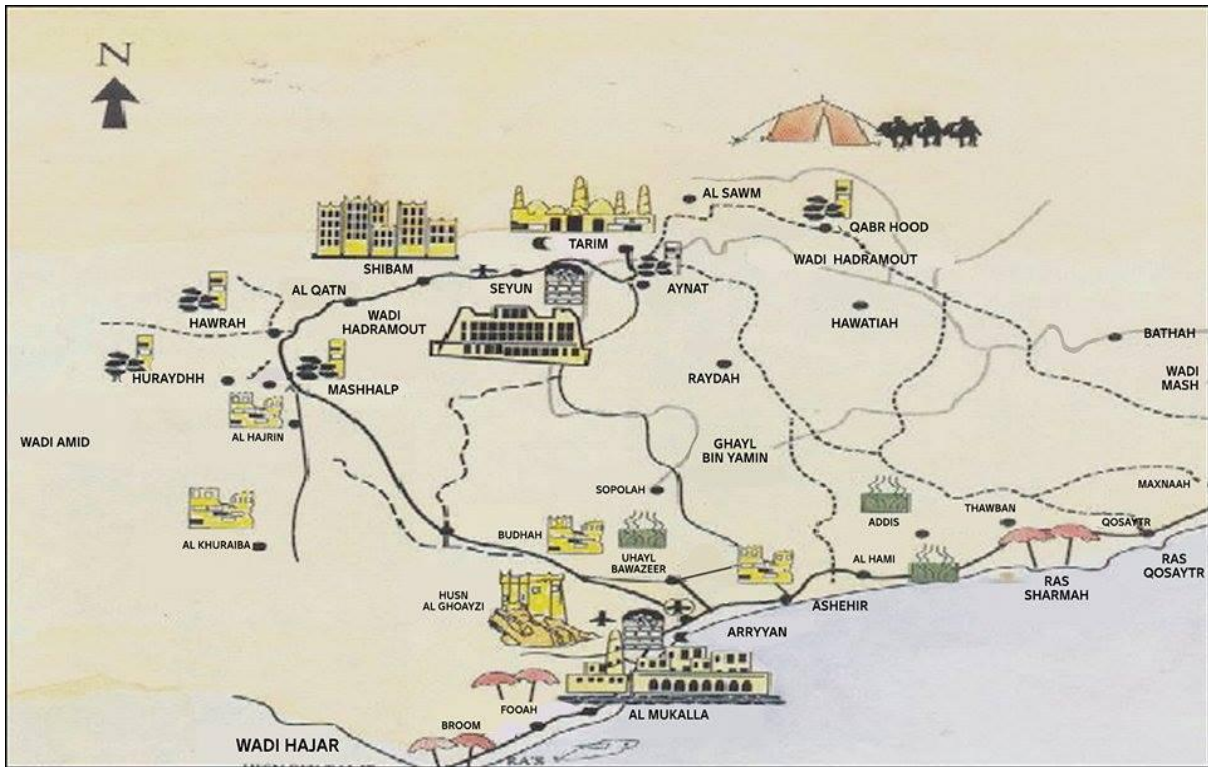


Figure 2: Main Map of Historical Zones in Hadhramout Region

### Architectural Style of Clay Buildings in Hadhramout Region

The architectural style of Hadhrami architecture has received a great attention by Hadhrami architects (Figure 3). It has been dealt with in several ways by giving solutions that has been developed in accordance with the cumulative, knowledge-based, cultural architectural approach. The Hadhrami architectural engineer has processed the ultimate ability, which enabled him to deal with the temporal and spatial variables to form the most suitable style for the natural and social environment. Thus, it is through his experience, the Hadhrami architect was able to produce architecture which is consistent with the environment with regard to thermal and optical satisfaction in addition to the psychological satisfaction of its artistic style. However, many of the architectural elements of the mud building had been adopted at the beginning in the civilized regions. The architectural style of mosques were erected near tombs of saints or by wealthy returned merchants, their number increased greatly, until in Tarim alone there were said to be 360 mosques, (Lewcock, 1986). Consequently, such artistic style has been rapidly formed and has its own specific and distinctive features since the facades and spaces have formed a complete illustration of the perfect sense of human scale, functional, aesthetic, and visual relationships in the old zones were given a quick cosmetic paint with lime (*Al-Noorah*) to blend with new buildings, (Damluji, 2007). Rehabilitation work will help to sustain local interest and the value of the architectural style heritage, (Damluji, 1992). Thus the study of the principles and confirming the construction elements and the relationship of each of them and its relationship with the streets and the surrounding areas have been discussed.



Figure 3: Architectural Style of Clay Buildings in Hadhramout Region

### Towards the Architecture of the Continuity

The previous examples implied that multi-storey public housing transformation is not unique in Hadhramout region and other regions in Yemen. Yet, authorities and professionals continue in implementing conventional, inflexible mass housing projects on the one hand, and the inhabitants also proceed in such projects due to the changing needs and lifestyle that continue to change their living physical environment on the other hand. (Turner 1976) argues that "housing is not what it is, rather it is what people do"..., besides housing is not an outcome. This confirms the needs of design solutions that facilitate the actual structural expansion to be made without rapid degradations of the newly built housing areas. The concept of the design of continuity or the designs allowing transformation will be presented in the following examples (Figure 4).



Figure 4: Continuity Architectural Style of Clay Buildings in Hadhramout Region

### The Role of Culture and Behavioral Perception on Residential Building

The cultural and personal concepts represent a key dimension in the analysis of social facts which cannot be compared with their counterparts. Such concepts are interpreted in the light of the mutual relationship between them and other types of cultural, economic, political, psychological, and historical facts. Thus the inhabitant in a certain housing unit both in civilized or developing societies is merely a member of a large community formed by groups of people living on one area of land which makes them in constant communication that allows interaction between individuals. This thing that



shows the cohesion of society through a general social and cultural format that regulates their living activities and shows the cultural dimensions, and their distinct behavioral.

The members of a certain community vary in their behavior and ethical ideas that control their relations. Such relations include a set of rules and objective principles that are compatible with the logic of their time and approved by their community either voluntarily or as a matter of commitment to the laws. The members are agreed to respect these laws as long as they are for the benefit of the group. These laws include everything related to cultural and behavioral awareness, and legislation and laws that govern individual relationships with others. However, the behavior is usually influenced by traditional values, and the existing heritage of literary, poetic, artistic and philosophical concepts among others (Figure 5). Thus, the social researcher can know which social class a person belongs to through studying his social behavior and his behavioral poise.

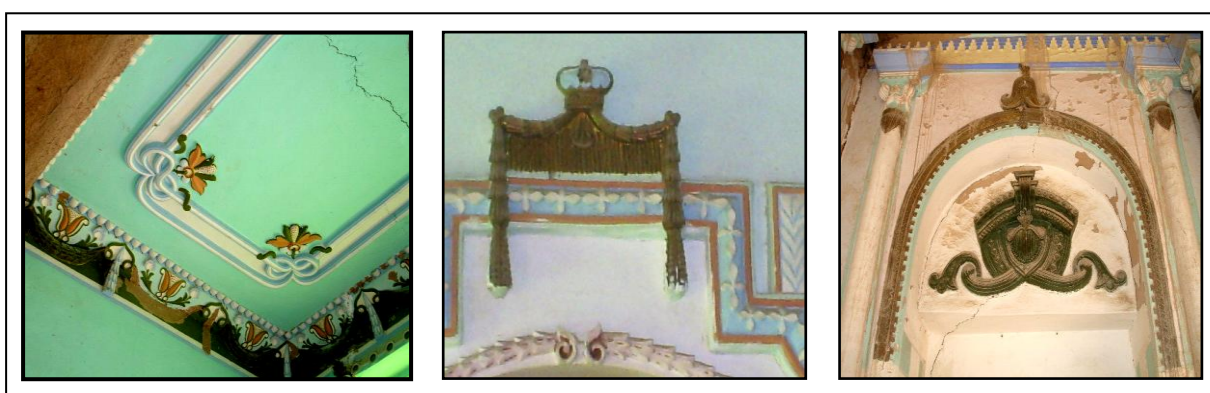


Figure 5: The Effect of Culture and Behavioral Perception on Interior Design of Clay Buildings

## FACTORS AFFECTING TRANSFORMATION

One of most important factors affecting the transformations in architectural design and style is the shortage of alternative accommodation when the building do not meet the function and social needs of inhabitants in urban housing, and thus it becomes difficult to find adequate dwelling (Figure 6). Therefore the housing buildings which are built according to a list of modern architectural factors are unlikely to be able to continue in the foreseeable future. If inhabitants need different accommodation, (in a way different from the traditional norm of living) therefore, they must alter what they have of technology of the original building, in addition to utilizing the amount of space available. Such factors are influencing the occurrence of transformation in multi-storey concrete buildings in preventing actual transformation in style and design in such buildings. However, concrete buildings are considered a structure exposed for a total transformation, the thing that results in changing such buildings to merely a building with one storey. Consequently, it is possible to see that urban expansion in building for cities do not need to be constructing in the same local original materials used in constructing such buildings. However, utilizing these materials helps in providing free wide areas around the buildings, which is considered a major factor in facilitating transformations in architectural design and style through building an additional random part in the house.



Figure 6: New Buildings Affecting the Transformations in Architectural Style

Another factor in transformation is the social economic homogeneity of the families living in the same zones of cities. This factor is particularly important in the case of vertical expansion where it is expected that those families co-operate and contribute financially in constructing the initial structure of the building. Nevertheless, the changes in the original structure of the building may lead to unsafe construction. This particularly important in the case of the buildings located within floods prone zones where informal building construction can be disastrous. Therefore, this reason may suggest a need for solutions with regard to the design which enables residents to change their building without facing problems of the strength and stability of structures.

### **FIRST: THE STUDY OF THE DIMENSIONS OF THE CHANGE PROCESS IN RESIDENTIAL BUILDINGS**

This part deals with the analysis of the phenomenon of change in residential buildings, and the reasons why individuals resort to the decision of change and adjustment in the plans and facades of their residential units. The thing that leads to losing harmony and integration in these units which are considered two demands of at least the facade of one building.

### **The Conditions of the Process of Change in Residential Buildings**

With the identification of cultural and personal dimensions, and the behavior of individuals and society, and the individual perception and behavior in the community, we find that there is a considerable major relation between them and the interpretation of the process of change in the dimensions of the housing units. The following are some pictures that illustrate this point. (Figure 7).





Figure 7: Conditions of the Process of Change in Residential Buildings

## Second: Reasons for the Change in Residential Buildings

The second part of the study deals with investigating the reasons for the change in residential buildings, through introducing the functional and constructional reasons, that connect residents of the residential units. In addition, these reasons will be highlighted through examining the performance of architects, and various structural and legislative conditions affecting the exterior buildings' facades. This in turn influences the urban spaces, through which the process of change and the nature and spirit of the place and time are reflected. The architectural change is influenced by the change in the time factor which is linked to the increased human development achieved by and moving to different developed and underdeveloped societies alike. This development goes along with another development in different social systems that determine the communities' attributes, and the members' ideas. This is to meet their requirements that are related to the reality of personal and cultural problem that forms the perception and behavior. What follows are some reasons for the change in residential buildings:

### The Economical-Functional Reasons

The researcher traced the economical functional reasons as follows:

#### The External Change made by Inhabitants

The change and the evolution of social conditions have an effect on the family and the form of elements of the residential unit. The thing that leads to population increase, and inability to move into more spacious residential units for the reason that there is only few units offered for sale, and the lack of financial capacity to get more space. Thus the urban architectural change in the residential unit comes as a result of economic reasons with the motivation to increase space of a room or adding another useful unit. This can be shown in the horizontal plan (layout) (Figure 8).

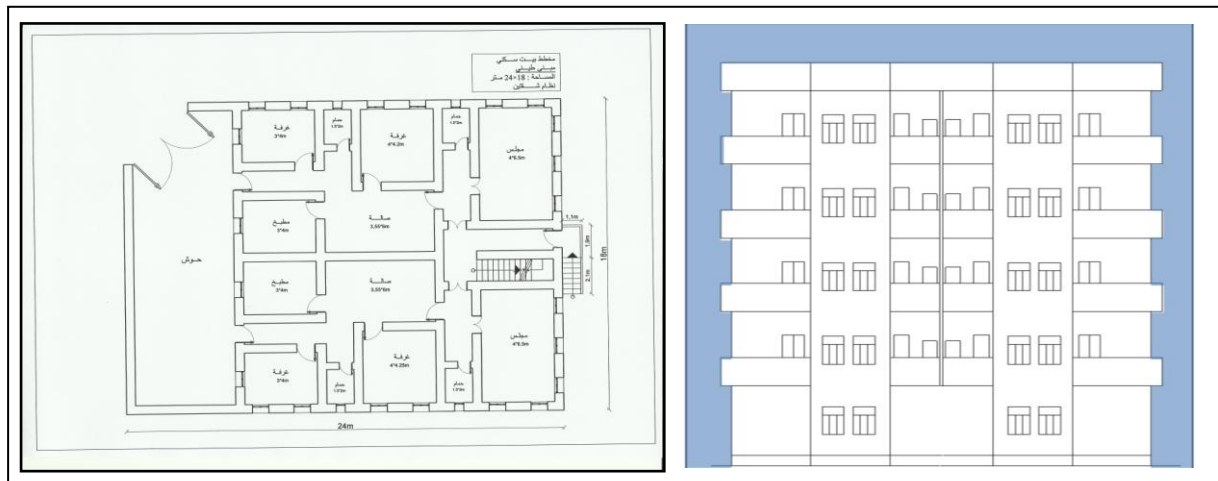


Figure 8: Plan of Clay House after Changes by Inhabitant

### Justification for the Change by the Inhabitants

- The reasons for the change appears in the facades of residential buildings by the inhabitants who live in these buildings. Such reasons are made clear through cognition factors, personal behaviors, psychological and personal features that reflect the different social, economic and cultural conditions. These reason are reflected through various methods as follows:
  - The desire to be distinct in the community, the thing that leads to the development and civilization of the societies if they are in the right track. However, this factor has created inappropriate change in the imitation process of the local tradition in architectural nature.
  - The will of being distinct in the community through the use of frontage which has led to the use of the most expensive and newer materials than the original ones in the buildings even if there was no need to use them.
  - There are also some political and psychological reasons due to the attempt of the ordinary people to be distinct in an environment characterized with monopolizing power and absence of freedom of expression. Therefore, there is no way to express themselves except by making a difference in the front part of the house, even by painting it with a different color.
  - The change of personal vision and taste with the course of time as a result of the private experience gained with the increasing migration of Hadhrami people to abroad, where there is an openness to different cultures.

### The Change the Facades by the Buildings' Owners

The process of changing the residential construction is considered a common phenomenon brought about by the buildings' owners. Thus, this change is made clear in the shape of the facades which are different from the local traditional characteristics of old buildings. This leads to a distortion of the exterior part of the building. Besides, the change may lead to a difference in the architectural character of the new buildings which appear different from the rest of the traditional old buildings due to the absence of legislation for the construction process.

### Construction Reasons

Different human societies are exposed to a range of economic, social and technological developments. The thing that is reflected on the loss of cultural features and originality in environmental

design concepts such as architecture, and functional construction. Further, these developments lead to many attempts to meet the needs of the inhabitants of the residential units and the attempt to reach the standards and factors of aesthetic values that achieve comfort. At the present time, we are experiencing difficulties and cons most important of which is the abandon of our architectural heritage originality and the unawareness of aesthetic sense. Consequently, patterns of architectural buildings which lack originality have appeared. Such buildings reflect the ease of making changes in the facades of residential buildings. Further, the inhabitants do not resort to any regulatory organization concerning with the system of residential buildings ownership and organizing the relationship between the landlord and tenant with regard to maintenance and continuity condition. The absence of urban planning of buildings, and the presence of exceptions and the weak supervision of construction regulation laws that are consistent with the modern developments of construction methods have led to infringement and contrast in facades construction. Thus, if the models of the buildings' facades are renewed and clean, and the heights and the styles are similar and close, this indicates the existence of a society governed by rules and regulations that consider architectural details and master them. This can be added to the existence of a strict executive body that monitors what is happening and punishes the wrong doers. Among the most prominent reasons leading to the spread of the change in residential buildings are the following:

1. The absence of binding rules by the authorities responsible for issuing license, the thing that necessitates consistency between the elements of unity in the buildings and the design of raw materials and colors, in addition to the lack of respect for laws and legislation governing the construction process.
2. There is no specification for giving certain characteristics or style for the area and the zone within the framework of architectural conditions of each region that considers the heights and the distances between the borders of neighbors.
3. The absence of commitment in the part of the owners of residential units and being careless regarding the law and its consequences, which state not to allow anything to change the external facades or making slots without prior approval.
4. There is a lack of the cultural clarification among a large part of the members of the society who do not consider the importance of the architect's role in architecture. Consequently, people resort to other workers to do the same role of the architects regardless of their specialization. This results in many serious deficiencies in design and making the unit's owner exert effort to repair things to increase the lighting, ventilation and areas... etc. In addition, there is a neglect among some architects to give enough time to study their projects.

### **Environmental Reasons**

Among the environmental reasons that led to the spread of the phenomenon of change in residential units are the increased population, and the high density rate of buildings represented by the emergence of high-rise towers. Consequently, there is a decrease in privacy and lack of vision in the outdoor spaces and the green spaces. Besides, there is a low level of cleanness in the part of the inhabitants and their neighborhoods for which they are responsible. Furthermore, the streets are crowded with cars, noise and pollution, making the area a source of inconvenience and noise.

### **RESULTS AND ANALYSIS**

Based on what has been mentions before, the study has revealed that there are some effects that influence human behavior, the thing that plays a major role in the realization of the user on how to deal with its own housing unit. Moreover, the study found that though there are some differences in the

perception and behavior among the inhabitants of residential units according to differences in culture, all of them have certain needs as follows:

### **ENVIRONMENTAL NEEDS (CLIMATE AND NATURAL ENVIRONMENT)**

These needs include the appropriate and adequate house that provides protection from climatic factors of temperature, humidity and rains throughout the year periods without disruption regarding any of the needs (socio-economic). Moreover, the house should be an appropriate dwelling that provides the ordinary needs of inhabitants such as the lighting, the ventilation as well as the sense of being a human being.

### **Social Needs**

These needs include appropriate psychological environment of the home internally and externally. Such home environment should provide security and privacy and residential place for the inhabitants. Further, it should achieve consensus and harmony among residents and neighbors in the residential dwelling unit, and the neighboring building and zone through having almost the same social level and manners. In addition, it should provide security and basic tranquility for the inhabitants to contribute to family stability and achieving the desire of owning their homes and maintaining, improving and developing it.

### **Economic Needs**

This refers to the appropriateness of the residential unit to its inhabitants in terms of construction, cost and the cash value of exploiting it. Besides, it should be compatible with the inhabitants' financial level in terms of doing maintenance and furnishing it internally in a way compatible with the spacing specified for furniture. Therefore, there must be a link between the general development of the interior of the residential unit and the change in its price.

Thus, there are some outcomes of the change process in the horizontal facades or the frontage in the residential unit as follows:

1. The change in the residential unit reflects the inhabitants' needs for a certain functional requirements inside the unit. Consequently, they ask the architect to consider these requirements when building it. The thing that is reflected on the outside form of the residential unit.
2. The prevalence of individual's desires over other considerations to do changes in the interior part of the residential unit is reflected in turn in its exterior part. Consequently, many negative effects are resulted and shown in the demolition of the architectural values of the facades' design as a whole. This in turn leads to incompatibility among the flats in the exterior part of the residential unit, in addition to using various materials for constructing the openings. Further, there would be contrast and difference in colors of paints of the materials used in finishing the exterior part of the residential unit.
3. Considering the fact that the process of change should be thought of as a predictable phenomenon. Besides, it is linked to the time evolution and social needs of man.
4. The process of observing the methods and procedures of the architectural design which occur in the exterior facades of the residential buildings clarifies that the inhabitants of those buildings are unaware of the collaborative thinking that form their perceptual, behavioral, and cultural aspects.

These aspects are built upon comprehending the aesthetic, and artistic taste which is necessary to preserve the general design of buildings.

## THE OUTCOMES RESULTED FROM THE PROCESS OF CHANGE IN RESIDENTIAL BUILDINGS

- Random and irregular work leading to disrupting the element of homogeneity in the buildings.
- The high cost of buildings due to implementing the work conditions twice by the contractor and then by the inhabitant of the residential unit.
- General pollution which includes: environmental pollution, visual pollution, and health pollution.
- Wasting the artistic taste of individuals, which is the opposite of considering aesthetic values.
- Losses in materials, time and effort as a result of repeating architectural work and modifying the inside part of the residential building.

## Recommendations

There are three basic elements to control the process of change in residential buildings as follows:

### The Design Element

- Designing facades that are difficult to modify or close terraces located in them.
- Flexibility for future design with the anticipation of possible adding of spaces in plan and changing in a specific direction.
- Utilizing some materials whose colors are difficult to change.

### The Social and Cultural Element

There should be upgrading for the culture of individuals in all stages of education and raising their awareness of the importance of preserving buildings that have architectural and historical value. This can be done through giving lectures, seminars and information about them. Besides, exhibitions can be held to contribute to familiarizing inhabitants with the construction of certain material (mud) and preserving the architectural style.

- Understanding the historical and artistic value of the area in which the buildings occur through giving more attention to the restoration of mud buildings and the preservation of this unique style.
- Highlighting the modern architectural projects which are built using mud in the developed countries in order to correct the erroneous impression that is held by many people in the developing areas where there is a link between using this material and poverty, underdevelopment and disease.
- Teaching the use of the mud material as construction material in the syllabuses of architecture and engineering colleges and institutes at the university. Consequently, this will give students some technical information about this material and its characteristics and some simple possible ways to develop them.



- Raising the interest of people through the media with the development of aesthetic taste and artistic sense of the individuals and the community. This thing is reflected in the surrounding environment at all levels.

### **Economic and Environmental Component**

Highlighting the economic aspects of mud building at all levels through specialized studies, both in the initial or operational cost that include energy consumption, maintenance among others. In addition to comparing such buildings and their cost with other similar buildings constructed with other materials as to contribute to the adoption of mud buildings as a solution to the housing problem that many developing countries suffered from. Focusing on the environmental dimension of mud building, especially in industrialized countries, and highlighting the environmental aspects of this material (mud) both with regard to production issues and the use of appropriate technology that reduces pollution or any other related waste which is considered not harmful and not distorted to the environment resulting from the construction process using this material and taking the necessary means to highlight it.

### **Organizational Element**

- Observing and controlling all elements of the amendments, both on the horizontal plan or the facades.
- Binding the offender to pay the costs to re-construct the amendments to its former status.
- Imposing Fines on all violations of the change when the inhabitant does not refer to the building's owner or when breaking the construction laws.

### **CONCLUSION**

This study has highlighted the relationship between culture and behavioral perception on architectural style and how this transformations phenomenon of residents' buildings from traditional to random design happened. Below are some conclusions of the present study:

- 1- Transformation activities of buildings range from simple closing balcony to major extensions to suit the original building size. Besides, extra area is used to meet the inhabitants' needs. They may resort to use public place outwards or even upwards hanging from the original the layout of the buildings. Extra space is used to meet household needs and the changing lifestyles.
- 2- The original tendency of the housing policy in Yemen generally and Hadhramout region especially affects the construction of random housing projects.
- 3- The absence of housing policy and committing the building owners to implement layouts of buildings approved by the Ministry of Housing and Urban Planning and preventing random housing projects.
- 4- Extending the design known as the "continuity design" and the suggestions presented through both planning the design of the neighborhood and the actual expansion of the external structure of the building and through the internal private spaces.

- 5- This study recommends planned transformation approach in order to allow the residents' participation supported by the participation of the concerned people so as to avoid a rapid degradation of the newly built housing environment.
- 6- The spatial organization for the blended urban built environment of the cities and considering the random type of housing as a feature of degradation in the housing environment.
- 7- This deterioration in the traditional housing derived mainly from a lack of understanding the random settlement problems. Random settlements were considered as a choice of misery belts. They are populated by new migrants from the country, who were not aware of the conception of transformation as a revolution in the transformation done in the forms and styles of architectural design.

However, random settlements are observed today as a major solution of the housing problem of the poor people living in the urban areas. Therefore, there is an urgent need, at the national level, to find out and recognize the causes and consequences of the rapid and massive urban transformations and changes in the cities. This is also, at the local level, where there is a call for continuous field monitoring, careful evaluation of existing random housing problems and for the mobilization of buildings energies. To sum up, the cities will grow and the needs for buildings will continue. Instead of being chaotic and uncreative in the random settlements, buildings need to be built in a compatible way. The thing that can be supportive, contributive to a new generation to enhance the life of residents in the housing areas.

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## LIVEABILITY ANALYSIS OF GATED AND NON-GATED LOW MIDDLE INCOME COMMUNITIES IN KUALA LUMPUR, MALAYSIA

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### ABSTRACT

The aim of this paper is to examine the liveability conditions in gated and non-gated low middle income communities in Kuala Lumpur where rapid urban growth has led to many disruptions in the urban living environment. Hence, a livability framework was developed with dimensions from housing condition, economic condition, functional environment, social relations and community safety towards achieving the research objectives of – a) to study the liveability level in gated and non-gated communities, b) to compare the level of liveability between gated and non-gated communities, and c) to determine the dimensions and indicators which influence the level of liveability in both communities. Residents' views were collected through a questionnaire survey which consisted of twenty-four indicators of liveability belonging to five dimensions from three communities in Kuala Lumpur. Two communities belong to non-gated and one community had gated living status. The findings of the research revealed that gated community has a better living conditions compared to the non-gated community. Thus, this research can be used as a turning point to improve the living environment of both gated and non-gated community

**Keywords:** Liveability, gated and non-gated communities, quality of life, living environment,

### INTRODUCTION

Studies on the liveability of cities have been on the increase due to their perceived aftermath significant contributions to the quality of life (QOL). Although the quality of life (QOL) has been studied from different disciplines, however, it does not mean absence of diseases or sickness rather QOL depends largely on the living environment that encompasses both the built and natural environment. Malaysia is currently experiencing a high rate of urbanization and housing challenges which require immediate policy attentions. According to World Urbanization Prospects, Malaysia has 72.8 per cent of its population living in urban areas in 2011. This is expected to increase to 77.9 per cent by 2020 with an average urban growth rate of 2.1 per cent between 2015 and 2020.

Rapid urban growth in any country is spatially manifested in imbalanced distribution of urban population where some cities grow at a higher rate over other cities. At the micro level, rapid growth of the cities often leads to imbalanced development pattern which is manifested in some neighbourhoods which prosper while others deteriorate. Usually, it is the low income neighbourhoods which face a decline of liveability and pose enormous challenges that include providing adequate urban services and

amenities, alleviating urban poverty, designing new infrastructure and establishing governance systems for authorities managing the cities. Therefore, it is necessary to investigate the liveability of low middle income communities who are under stress in Kuala Lumpur - a city which is growing faster than other cities of Malaysia, with accompanying problems of congestion, environmental degradation and above all, a rise of crime rate (Sidhu, 2005; Mohit and Hanan, 2012).

## AIM AND OBJECTIVES

The aim of this paper is to examine the level of livability of low middle income communities in Kuala Lumpur that consist of gated and non-gated neighbourhoods and make a comparative study between the two in order to fulfill the following objectives:

### *Objectives*

- a) To develop a community liveability framework with appropriate dimensions and indicators.
- b) To investigate the level of liveability in gated and non-gated low middle income communities in Kuala Lumpur.
- c) To compare the level of livability for both gated (GC) and non-gated (NGC) low middle income communities.
- d) To provide recommendations that will help to improve the level of liveability and living conditions of both GC and NGC residents.

## LITERATURE REVIEW

The term "liveability" is closely related to the living environment. According to Cambridge Advance Dictionary (2008) the word "Liveable" means a place or a building fit for living. Liveability is a concept that describe the existing conditions of a particular area or a city in relation to what ought to be and the reality of the situation of the inhabitants. Also, environment has been defined as the external conditions that can affect the life of an individual or group of citizens (Omuta, 1988). The problem with the concept of liveability has been that scholars created definitions that were appropriate for their research. Consequently, various meanings, definitions, dimensions and indicators of liveability circulate in the literature (Van de Heuvel, 2013).

The Centre for Liveable Cities Singapore in 2011 define liveability as the city with excellent planning, create a lively, attractive and secure environment for people to live their life, work and play. It also encompasses good governance, a competitive economy, high quality of life and environmental sustainability. Economic Intelligent Unit (2011) described liveability as one of the determinants of quality of life. Shuhana et al., (2012) opined that high quality of living will affect citizen's lifestyle, health condition and shows stability of the built environment. Liveability according to Castellati (1997) means experiencing oneself as a real person in the City. Similarly, Southworth (2007) consider it as determinant of how well the City works for its inhabitants. Pacione (2003) opines that liveability is a relative term of which the actual meaning depends on the place, time and purpose of the assessment, and on the value system of the assessor.

From empirical perspective, many cross-cultural studies have been conducted to examine liveability of cities or areas or communities. Chaudhury (2005) examined the liveability of the capital city, Dhaka and the third largest city, Khulna, Bangladesh. The evaluation focused on consumer goods, utility services, housing affordability (rent), social security and environmental conditions. The study

findings showed that economic growth of Dhaka makes it more liveable than Khulna. However, the residents of Taman Melati in Kuala Lumpur Malaysia have expressed to continuing living in the area. The residents were satisfied with their living environment although their satisfaction was low on some physical environmental parameters such as noise pollution, air pollution and no brightness of streetlight at night. Non brightness of the streets light at night is linked to insecurity of the resident at night. The study seeks the perception of residents of residential environment areas of Taman Melati on air, noise, streetlight illumination, and traffic volume through the questionnaire survey. The study recommends improvement of the physical environment of Taman Melati especially in terms of safety (Abdul Azeez *et al.*, 2010). Similarly, the quality of the living environment of Seremban in the state of Negeri Sembilan, Malaysia had been assessed to be moderate; this is based on the perception of the urban dwellers of Seremban. Seremban according to Azahan *et al.*, (2009) has the potential to provide a better living condition to inhabitants if the planning authority takes cognizance of its potentialities. Leby and Hisham (2010) studied social, physical, functional and safety dimensions of neighbourhood liveability in Malaysia. Also, urban density and liveability relationship of Fairfield, Newtown in New Zealand and Churton Park in Canada was investigated through a triangulation methodology i.e. quantitative, qualitative and literature review. The measured variables include - connectivity, accessibility, mixed use and density. The study results revealed that more amenities are needed in the area, and improvement of the existing facilities is required. However they (residents) believed their neighbourhood is liveable (Betanzo, 2009).

Omuta (1988) investigated the environmental problems of Benin City, Nigeria through conceptual standards such as employment, housing, amenity, education, nuisance and socio-economic dimensions. The study adopted stratified random sampling of which twenty-one neighbourhoods of Benin City serves as units of assessment. The study analysis shows that the quality of life in the areas and overall environment and liveability of the city is too low. Furthermore, Olajuyigbe *et al.*, (2013) assessed the quality of life of Benin City and found that the quality of life of the area is below average. Hypothetically one would have expected to see improvement in the area to follow its current status as the state capital. The study used Geographical Information System (GIS) Approach; twelve determinants grouped into three different domains of life were used to assess the QOL such as social, economic and physical. Asiyanbola *et al.*, (2012) studied neighbourhoods' liveability of Ago-Iwoye and Ijebu-Igbo in Ogun State, South-West Nigeria. The findings show that necessary facilities and amenities in the areas were in a disrepair state. Ekop (2012) conducted principal component analysis to explain the variability of the set of data input for housing quality of Calabar metropolis, Nigeria. The inter-correlations of the data set revealed that socio-economic, housing characteristics and neighbourhood features are essential determinants of the liveability of the Calabar metropolis.

Besides informal housing environment/settlement, Ilesanmi (2012) examined the quality of public housing in Lagos state, Nigeria. His finding shows that public housing in Lagos State, Nigeria were of the low quality. Some studies on public housing in Nigeria focus on housing policies (Aribigbola, 2008; Olotuah, and Bobadoye, 2009). Some researchers focus on housing delivery strategies (Olayiwola, Adeleye and Ogunshakin, 2005; Makinde, 2013; Ifesanya, 2012) and a number of researchers examine public-private partnership in housing development (Musa and Usman, 2013; Ibem, and Aduwo, 2012). It is against the above background this study is critical given that a study on the liveability of low middle income communities is still almost not being researched in Kuala Lumpur in particular and Malaysia in general.

## CONCEPTUAL FRAMEWORK



Based on the literature review and an analysis of various definitions provided by different authors, a conceptual framework has been developed which consists of five dimensions and 52 indicators for assessing the liveability of low middle income residents of Kuala Lumpur, Malaysia (Fig.1).

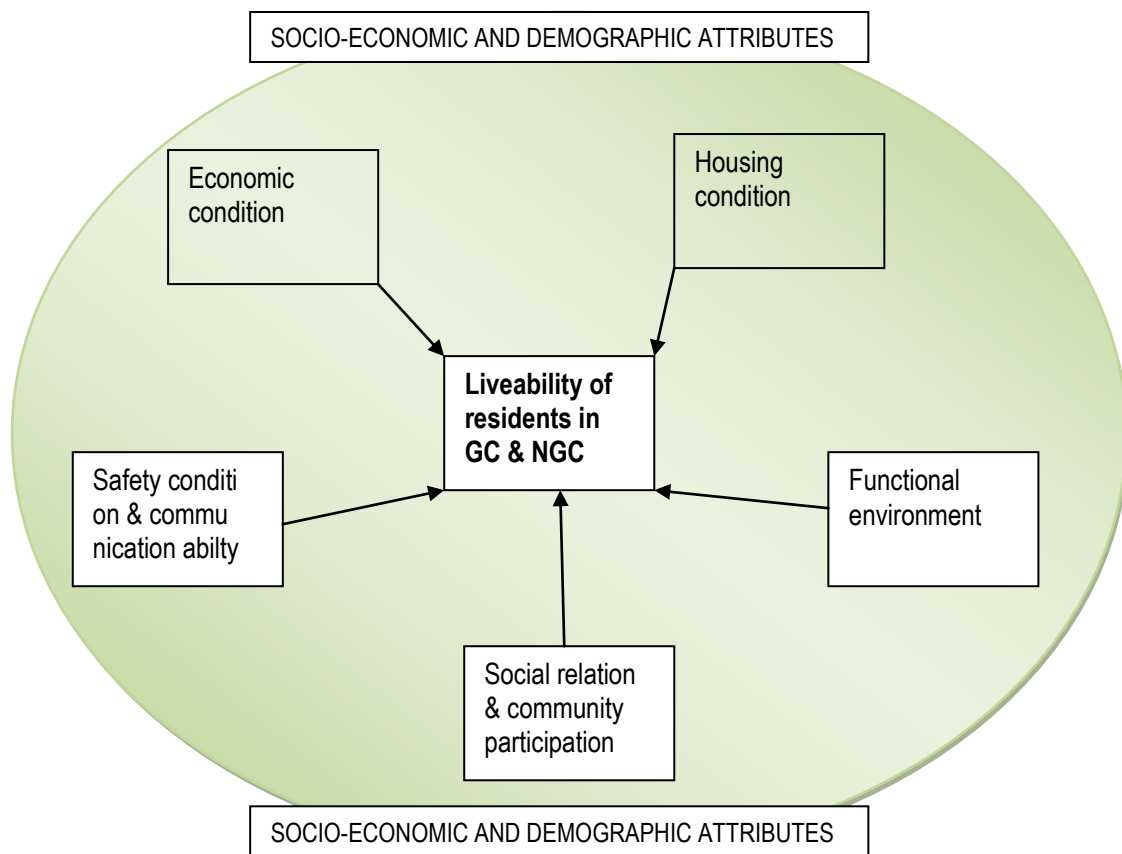


Fig. 1 Liveability framework developed based on literature review.

The framework so developed indicate that five dimensions determine liveability of gated (GC) and non-gated communities (NGC) and all these dimensions and their indicators are impacted by the socio-economic and demographic attributes of the residents.

## METHODOLOGY

Methodology of the study includes research design, sampling frame and design, and sample selection. Then, it explains data collection and techniques of analysis as well.

### Research Design

Based on an analysis of different definitions of liveability, five dimensions and 52 indicators were derived/ elicited to describe the livability condition of GCs and NGCs. We adapted Heylen's (2006) model of the perception of residential environment to fit model as shown in Fig.2. Based on the research design, appropriate/ relevant indicators were developed as shown in Table1.

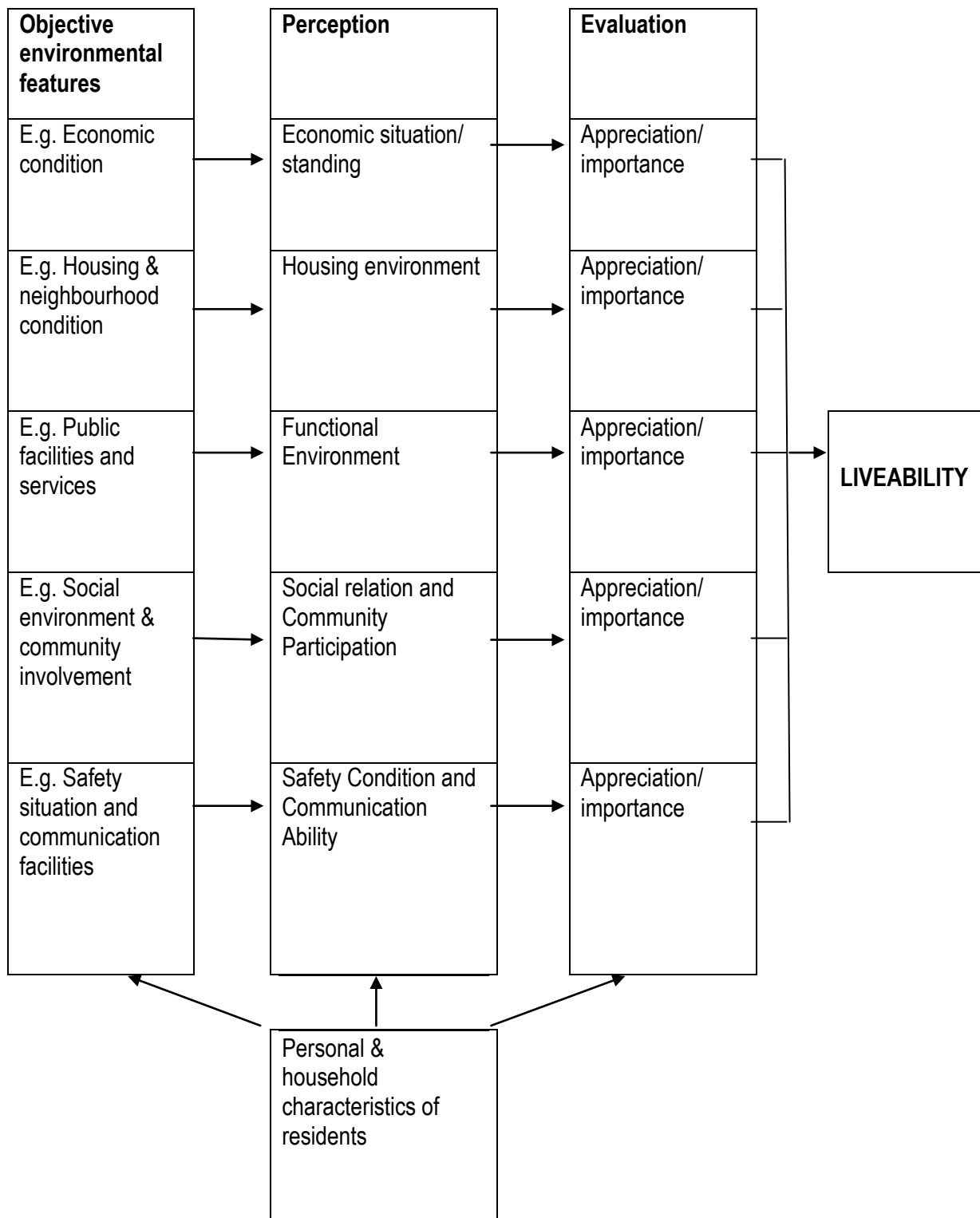


Fig.2 Model of Liveability based on the perception of objective condition.  
(Source: Adapted from Heylen, 2006).

## Data Collection and Analysis

Both primary and secondary data were collected for the study. Three methods - observations, interviews and questionnaire survey, were used for primary data collection while secondary data collected were from government publications and reports, books, scientific articles, dissertations and relevant portion of academic literature. A questionnaire was designed for field survey which was administered during January-February 2015. The questionnaire contained close-ended questions measured at 5-point likert-scale. Likert-scale questions enable the respondents to choose the rank given which represents their level of satisfaction towards several liveability aspects of their neighborhood areas.

Table 1: Dimensions and indicators used in the study.

Dimensions	Indicators	Dimensions	Indicators
Economic condition	<ul style="list-style-type: none"> <li>a) Monthly household income</li> <li>b) Dependency rate</li> <li>c) Monthly payment/loan</li> <li>d) Travel time and cost</li> </ul>	Social relations and community participation	<ul style="list-style-type: none"> <li>a) Social relations and community involvement</li> <li>b) Opportunity to engage in community</li> <li>c) Community activities</li> </ul>
Housing condition	<ul style="list-style-type: none"> <li>a) Size of living area</li> <li>b) Number of bedrooms</li> <li>c) Maintenance of facilities</li> <li>d) Housing area cleanliness</li> <li>e) Solid waste management</li> <li>f) Parking</li> </ul>	Safety condition and communication ability	<ul style="list-style-type: none"> <li>a) Availability of security service</li> <li>b) Safety from road accident</li> <li>c) Quality of communication service</li> <li>d) Communication ability</li> </ul>
Functional environment	<ul style="list-style-type: none"> <li>a) Accessibility and provision of facilities</li> <li>b) Recreational facilities</li> <li>c) Public transportation service</li> <li>d) Employment opportunity</li> <li>e) Suitability for all ages</li> </ul>	Socio-economic and demographic attributes	<ul style="list-style-type: none"> <li>a) Age, sex, ethnicity, marital status</li> <li>b) Education</li> <li>c) Income</li> <li>d) Occupation</li> <li>e) Length of residency</li> <li>f) Ownership of transport</li> <li>g) Loan/ savings</li> </ul>

Data analysis was done by using SPSS version 21. Both descriptive and inferential statistics were used to make the data meaningful

## Sampling Design

A two-stage sampling was used for this study. These are – (a) selection of study neighbourhood from gated and non-gated clusters; and (b) selection of households for questionnaire

survey from each GC and NGC. Based on the location and type of neighbourhood, three low middle income communities were selected for questionnaire survey. These are – Mahsuri Apartment as a gated community and Andhika Flat and Taman Sentul Utara as non-gated communities. The selection of sample size is presented in Table 2.

Table 2: Sample size

Type of community	Study area	Total unit	Sample size	Percentage (%)
Gated community (GC)	Mahsuri Apartment	800	70	8.8
Non-gated community (NGC)	Andika Flat	240	50	20.8
	Taman Sentul Utara	1920	30	1.6
TOTAL	-	2960	150	31.2

Source: Field Survey, 2015

## STUDY AREA

The selected study sites for this research included three housing areas – two of which are Mahsuri Apartment and Andika Flat which are located in Setiawangsa, and another one is Taman Sentul Utara Flat which is located in Sentul town. Setiawangsa is a suburban area which is situated at the eastern part of Kuala Lumpur at approximately 4 kilometers from the city centre. According to Kuala Lumpur Structure Plan 2020, Setiawangsa is located in strategic zone of Wangsa Maju – Malur which consists of an area of 46.5858 sq. km with a population of 380,000 (2005). The population of the area is projected to be 443,712 by the year 2020. Total employment provided in the area in 2010 was 135,000 and is projected to increase to 160,000 by the year 2020. The zone is predominantly residential with some commercial centres.

Sentul is a satellite town of Kuala Lumpur and is divided into two parts - West Sentul and East Sentul. It is located at the northern part of Kuala Lumpur City centre in strategic zone of Sentul – Manjalara. Sentul is highly accessible through Duta – Ulu Kelang Expressway (DUKE), Middle Ring Road 2 (MRR2), Jalan Ipoh and Jalan Kuching.

## ANALYSIS AND FINDINGS

This section has been organised with socio-economic and demographic attributes of residents followed by the factors that determine the liveability conditions of gated and non-gated communities. The factors include - economic and housing condition, functional environment, social relations and community participation, and safety and communication condition of the residents.

### **Socio-Economic and Demographic Characteristics of Respondents (20 indicators)**

The main findings of socio-economic and demographic characteristics of gated and non-gated community residents are summarised as follows:

- 62.5% respondents of GC are female while 54.3% of NGC respondents are female.
- Majority of NGC respondents are between 51-60 years while majority of GC respondents are between 31 and 40 years. Mean age of NGC and GC respondents are 44 and 39, respectively.
- 88.6% of GC respondents are Malays, followed by 5.7% Chinese and 5.7% Indian while 94% of NGC respondents are Malays followed by 5.0% and 1.2% of Chinese and Indian respondents, respectively.
- 75% of both GC and NGC respondents are married while 21.9% of total respondents were single or unmarried and 3% were divorced and widower.
- Whereas 78% of NGC residents owned houses, the corresponding figure for GC residents is 53% who owned houses.
- Mean house price of GC is RM290,357 while the mean house price of NGC is RM71,153 which indicates that majority of houses in GC are apartments while NGC houses are dominantly low cost flats..
- For GC, the mean of monthly housing payment (rent/ loan) is RM760.50, while the mean monthly housing payment for NGC is RM480.45
- Residents of GC showed higher level of educational achievements compared to NGC residents.
- Mean monthly household income of GC residents is RM5,300 while the mean monthly household income of NGC residents was RM2,300.
- Mean family size (4.9) of NGC residents is slightly higher than GC residents (4.4).
- Mean number of working members in GC households is 2.2 as compared to 2.3 in NGC households.
- Mean duration of residency of GC residents is 9.3 years compared to NGC residents in which case it is 10.3 years..
- On average GC residents moved to Kuala Lumpur 15.4 years ago compared with the NGC residents who moved to Kuala Lumpur 20.7 years ago.
- Vehicle ownership of GC residents is 1.9 as compared with NGC residents in which case the average is 1.7.
- Mean monthly savings of GC residents is RM328 compared to the NGC residents' mean monthly which is RM118.
- Mean monthly loan payment of GC residents is RM436 while for NGC residents the amount is RM191.
- With regard to the ownership of amenities, GC residents are better off than their counterpart NGC residents.

### ***Economic Condition of Residents (8 indicators)***

- GC residents are little over slightly satisfied with monthly household income with mean satisfaction score (MSS) of 3.37 compared to NGC residents who are dissatisfied (MSS-2.90) with their monthly household income.
- GC residents are little over slightly satisfied with their daily travel cost and time with mean satisfaction score (MSS) of 3.14 compared to NGC residents who are dissatisfied (MSS-2.76) with their daily travel cost and time.
- Further. GC residents are little over slightly satisfied with the rising cost of living with mean satisfaction score (MSS) of 3.21 compared to NGC residents who are dissatisfied (MSS-2.64) with the rising cost of living in the city.



- Most of the GC residents stated that the housing loan or rental did not give much impact to them where the MSS is 3.42 while most of NGC residents perceived adversely the impact of housing loan or rental with MSS of 2.64.
- Majority of the GC and NGC residents feel satisfied with the accessibility to public transport with MSS are 4.04 and 3.88, respectively. This is because the location of both gated and non-gated community areas are nearby and highly accessible to public transportation services.
- On the overall economic condition both GC and NGC residents are little over slightly satisfied with MSS-3.40 and 3.11, respectively. However, the GC group appears to be slightly in a better economic condition compared with the NGC group.

### ***Housing Condition of Residents (15 indicators)***

- On the housing unit characteristics such as house area, number of toilets, size of living and kitchen areas, GC residents are more than moderately satisfied (MSS>3.5) compared with the NGC residents whose satisfaction levels are below the moderate levels (MSS<3.5).
- Whereas GC residents feel satisfied with the affordability of renting or owning the house with MSS of 3.52, NGC residents feel slightly satisfied with the affordability of renting or owning a house where the MSS is 3.35 which indicates slightly satisfied.
- On housing maintenance such as cleanliness of housing area, conditions of staircase and lift, lighting, maintenance of common areas and solid waste management, the GC residents have expressed satisfaction (MSS>3.5) compared to NGC residents who have expressed dissatisfaction with those variables except lighting in which aspect they have expressed slight satisfaction with MSS of 3.01.
- Parking is a common issue in low middle income housing areas and in this regard, GC residents are fairly satisfied with MSS of 3.30 while the NGC residents are very dissatisfied with MSS of 1.88.
- On the level of neighborhood satisfaction, GC residents have expressed their better satisfaction with MSS=4.0 while the NGC residents have revealed their moderate satisfaction with MSS=3.51
- On overall housing condition, GC residents are satisfied with MSS=4.0 while the NGC residents are moderately satisfied with MSS=3.53.

### ***Functional Environment (16 indicators)***

- On the adequacy of public transport, health and educational services both GC and NGC residents expressed their high level of satisfaction.
- On the upkeep, accessibility and provision of recreational facilities, GC residents are satisfied with MSS>4.0 while the NGC residents are moderately (MSS>3.50) satisfied.
- On the provision of pedestrian and bicycle paths, GC residents are more than moderately satisfied while NGC residents are slightly satisfied with those provisions.
- GC residents are quite satisfied with environmental conditions such as protection and conservation of natural environment, socially inclusive environment and liveable built environment while the NGC residents are moderately satisfied with those environments.
- On the satisfaction of neighbourhood suitability for children, teens, elderly and disabled people, the GC residents are quite satisfied compared with the NGC residents who are a little over slightly satisfied.
- Residents' overall satisfaction with function environment shows that whereas the GC residents are quite satisfied (MSS>3.5), NGC residents are little over slightly satisfied (MSS<3.5).

### ***Social Relation and Community Participation (10 indicators)***

- With respect to residents' supports from friends, family and neighbors during needs, both GC and NGC residents are satisfied on those social aspects.
- On the opportunities for social interactions, sports, recreation, arts and culture, the GC residents have expressed their moderate level of satisfaction (MSS=3.5) while the NGC residents are slightly satisfied (MSS=3.0) with those social aspects.
- On the acceptance of non-Malaysian neighbor, the GC residents are fairly satisfied while the NGC residents have expressed their dissatisfaction with it.
- On the level of involvement in local community affairs, both GC and NGC residents have expressed their fair level of satisfaction.
- On the effectiveness of local authorities dealing with community/ neighbourhood needs, both GC and NGC residents have expressed their moderate level of satisfaction.
- Residents' overall satisfaction with social relations and community participation indicates that both GC and NGC residents are moderately satisfied with this component of liveability.

### ***Safety Condition and Communication Ability (8 indicators)***

- On the safety of residents from crime and accidents, the GC residents are quite satisfied compared to the NGC residents who are dissatisfied with safety condition.
- Regarding police protection, the GC residents are quite satisfied while the NGC residents are fairly satisfied.
- On the availability of fire brigade and security services, GC residents are quite satisfied but the NGC residents have divided perceptions. Whereas NGC residents are fairly satisfied with the availability of fire brigade, they are dissatisfied with the security services.
- On the level of safety in public areas, the GC residents are quite satisfied while the NGC residents are moderately satisfied.
- On the satisfaction with internet services, the GC residents have expressed their satisfaction; on the other hand the NGC residents are fairly satisfied with this service.
- Overall satisfaction with safety and communication indicates that whereas the GC residents are quite satisfied, the NGC residents are fairly satisfied.

### ***Comparison of Liveability Conditions Between Gated and Non-Gated Communities***

Attempts were made to compare the different components of liveability between the GC and NGC residents through the radar diagram (Fig.3) which shows that all the components of liveability such as economic condition, housing condition, functional environment, safety condition including the overall liveability except social and community relations, the GC residents are better-off than the NGC residents. This probably justifies why communities who can afford intend to live within gated and guarded environment in Kuala Lumpur in Malaysia.

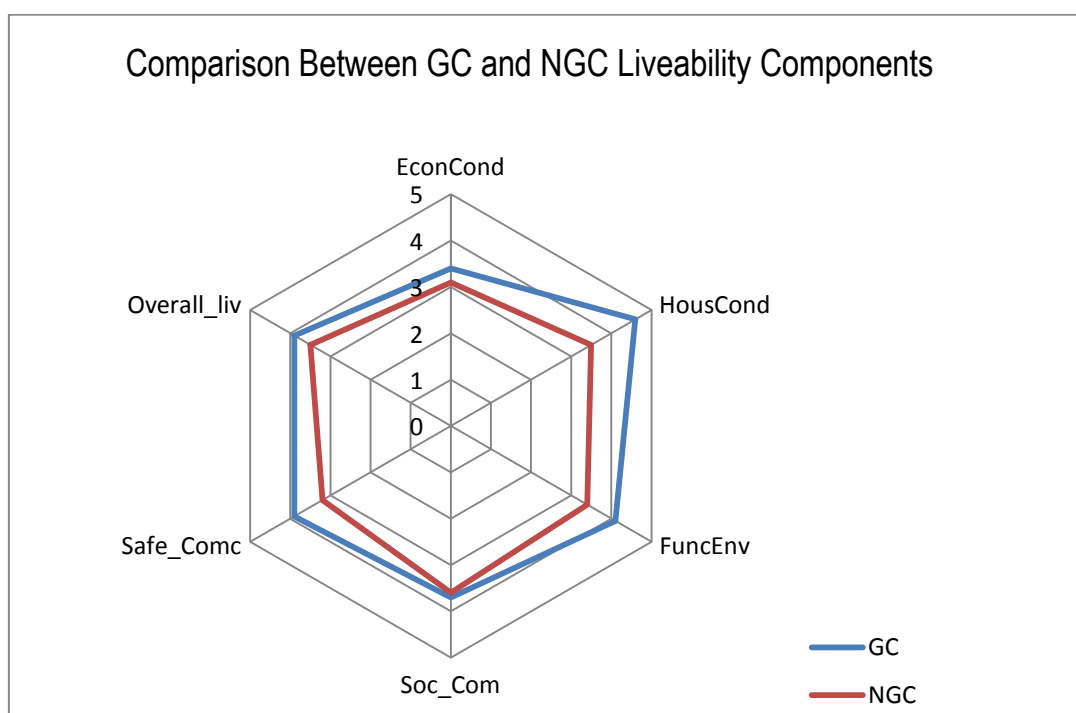


Fig.3: GC and NGC residents' liveability analysis by components.  
(Source: Field Survey, 2015).

### RESIDENTS' SUGGESTIONS TO IMPROVE THEIR LIVABILITY CONDITIONS

The residents of both GC and NGC were asked to suggest measures which can improve their liveability conditions. The suggested measures are ranked in order of their importance and the result of the exercise has been presented in Table 3.

Table 3: GC and NGC residents' suggestions to improve their livability conditions

SUGGESTIONS FOR IMPROVEMENT	GATED COMMUNITY (n=70)		NON-GATED COMMUNITY (n=80)		TOTAL (n=150)	
	(%)	Rank	(%)	Rank	(%)	Rank
Water and sewerage system	38.6	5	76.2	7	57.4	6
Public transportation	21.4	7	75.0	8	48.2	7
Community organizations	40.0	4	81.2	5	60.6	4
Education service	10.0	10	53.8	9	31.9	9
Health service	10.0	9	53.8	10	31.9	10
Parks and recreational facilities	31.4	6	85.0	3	58.2	5

Garbage collection	48.6	2	87.5	1	68.1	2
Market and shopping facilities	20.0	8	76.2	6	48.1	8
Infrastructure, bicycle and pedestrian facilities	45.7	3	81.2	4	63.5	3
Public safety	54.3	1	85.0	2	69.7	1

Source: Field Survey, 2015

It appears from Table 3 that a large percentage of NGC residents have given suggestions on improvement items than the GC residents. This indicates that NGC residents' liveability environment is not as good as GC residents' living environment. Despite the fact that GC residents' liveability is better than NGC, yet GC residents' have given suggestion towards further improvement of their living environment. In order of priority these improvement suggestions include – public safety, garbage collection, infrastructure, bicycle and pedestrian facilities, community organization, water and sewerage system, park and recreational facilities. Based on priority, the improvement suggestions by NGC residents, in order of priority, are – garbage collection, public safety, infrastructure, bicycle and pedestrian facilities, park and recreational facilities, community organization, market and shopping facilities, water and sewerage system, public transportation – all of which reflect the needs of more than 60% of the residents. However, majority of the items suggested for improvements are common both for GC and NGC residents.

## CONCLUSION AND RECOMMENDATION

This paper has identified the key factors and indicators of low middle income residents' living conditions within gated and non-gated environment. The findings of the study indicate that gated community is better off than non-gated community in terms of liveability assessment and the five components that were used to study community liveability. In all five components and their indicators, the NGC residents have expressed lower level of satisfaction compared to the GC residents. This difference provides a justification as to why communities in Kuala Lumpur like to live in enclosed environment. Nevertheless, the study findings also indicate that although more than 60% NGC residents have suggested improvement of living environment items such as garbage collection, public safety, infrastructure, bicycle and pedestrian facilities, park and recreational facilities, community organization, market and shopping facilities, water and sewerage system, public transportation; similarly a significant percentage of GC residents suggested for further improvement of their living environment items such as public safety, garbage collection, infrastructure, bicycle and pedestrian facilities, community organization, water and sewerage system, park and recreational facilities. There are a lot of similarities of the items suggested for improvements by these two communities which indicate that living within enclosed environment marginally enhance liveability of the residents. This implies that despite differences in liveability by the two communities the scope for improvement still exist in the neighbourhood. Therefore, in order to reduce the liveability gap between the two communities, some improvements need to be adopted to non-gated community and help them to achieve a better quality of life. Provision and maintenance of basic facilities should be strictly taken into action. Finally, this research hopefully can be used as a benchmark for local authority to implement key strategies to enhance the quality of living environment in Kuala Lumpur

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## RETAIL DESIGN: FORMULATING PHYSICAL DESIGN ENVIRONMENT FACTOR IN RETAIL STORE IN SHOPPING MALLS IN MALAYSIA.

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### ABSTRACT

The emerging retailing trends in Malaysia, pose the need to understand how customers derive expectation intention from retail physical environment design factor within retail settings and study their impact on customers behavior. However, until today there are no specific guidelines and limited information in designing a retail store especially on the physical design factor in fashion apparel retail store in Malaysia context. Past retail studies have identified several consumer-oriented store attributes. However the studies overlooked how the physical design factor affects retail store customers. The purpose of this study is to examine and formulating the various dimensions influences of physical design factor in fashion apparel retail store in Malaysia towards perception of customers. The research study used an exploratory case study as part of qualitative research methodology. It was employed to analyze and documents the information from the observation, interviews, and survey process on a selected fashion apparel retail store in Queensbay Mall in Penang. The results reveal that physical design factor components and brands related factors induced the purchase intentions among customers. The results of the study show a positive effect of physical environment components in retail preferences on developing purchase intentions for fashion apparel among customers.

**Keywords:** Retail Design, Store Image, Fashion Apparel, Retail Physical Environment

### 1.0 INTRODUCTION

A retail store that depend focuses on selling product hardly survives in today modern world. Customers demand more than just a product when shopping in a store. In today 21st century, customers hunger for an exciting retail shopping experience atmosphere and creative design of the store as well. Hence, it is a trend for retailers to create store with high attractive power in order to stimulate the sales and to increase popularity of store and ensure future visit from customer that made up the customer intention. Understanding the customers perception influences in human environments is important in designing an interior space. The perception play critical roles in human experience and the memories and emotions tied to it. In retail design brands associated to experience attract customers and influence strong, positive, and distinctive impression across all five senses. A successful retailing business requires that a distinct and consistent image be created in the customer's mind that permeates all product and service offerings. Through physical environment design factor in visual merchandising can help create that positive customer image that leads to successful sales. It not only communicates the store's image, but also reinforces the stores advertising efforts and encourages impulse buying by the customer. Thus, it may be of increasing importance for apparel retailers to

establish and maintain favorable total store image, and quite possibly, this positive reinforcement can begin with the understanding design of store physical environment design factor.

## 2.0 LITERATURE REVIEW

### 2.1 Store Atmosphere

The retail store environment has a major influence on customer's inferences about merchandising. In the earliest literature on retail environments, stated that environmental dispositions in and around a retail store can evoke perceptions about store image and customers intention. There are various studies have been done on the influences within the store environment categorized group. Baker (1987) identified environmental influences in a store to be either ambient factors, design factors, or social factors. She stated that ambient factors; music, scent or air quality do not motivate purchase decisions when they are simply meeting customer expectations. She defines design factors to be either aesthetic or functional: Aesthetic factors are physical cues which customers observe (colour, architecture, style, materials etc.) and influence the level of pleasure in the service experience (Aubert-Gamet, 1997). Functional factors encourage the customers behavior in the servicescape and include layout, signage and comfort (Baker, 1987). Social Factors include the influence by human presence in the servicescape (Baker, et al., 1992). The service personnel present in a customer environment, size, appearance, and behaviour, has been shown to impact on customer behavior (Turley and Milliman, 2000). Proposing an alternative, Berman and Evans (1995) presented a larger number of atmospheric design factor variables which is more appropriate for the purpose of this study. They propose a five separate category covering external variables, general interior variables, layout and design variables, point-of-purchase and decoration variables, and human variables.

#### 2.1.1 Exterior Variables

The number of research into effects of external variables is limited. An objective measure of the effect of window display design on sales has been developed (Edwards and Shackley 1992). One study included external variables as items in a general measure of store atmosphere (Exterior of building, outdoor exhibition area and etc.), however failed to present evidence for a relationship between atmosphere and purchasing behaviour (Pan, at al., 2008). The type of storefront display used was shown to have a 'spillover' effect onto the store image. Innovative displays such as column stands, standing flags, window display, and signage have led to customers perceiving a store to be more 'sophisticated', 'modern', and 'trendy' (Cornelius, et al., 2010).

#### 2.1.2 General Interior Variables

Colour schemes applied in elements of the interior design of environments have been shown to have an effect on shopping behaviour (Chebat and Morrin 2007). Shoppers can be more attracted to a retail display (Bellizzi, at al., 1983), are more likely to purchase, be induce, have a different image of store and merchandise or spend more time in the environment induce Bellizzi and Hite 1992), depending on the colours applied. Music in a shopping environment has attracted much attention (Garlin and Owen 2006, Broekemier, at al., 2008). Several studies point out that the outcome of ambient music is mediated by its congruity with other environmental influences. Finally, if customers like the music, they tend to evaluate the environment more positively (Dubé and Morin 2001). Also, scents and aroma as an interior variable have been examined, albeit with varying outcomes (Mattila and Wirtz 2001). Several studies have confirmed that the only presence or absence of a scent has a significant influence on customers behaviour, irrespective of the odour. In general it can be assumed that pleasantly scented environments lead to approach behaviours while unpleasant environments

cause avoidance. Positive perceptions of the environment of a shopping mall have been shown to have some positive effect on the level of excitement, which in turn leads to higher re-patronage intentions. The decor, layout, music, etc. of a mall are especially important to keep customers in a mall once they enter (Wakefield and Baker 1998).

### 2.1.3 Layout and Design Variables

Store layout as a means to provide customers space to shop easily rather related to the concept of crowding or to control traffic flow on the floor ( Hasty and Reardon, 1996; Levy and Weitz, 2009). For example, a prominent floor display of a product increases sales significantly irrespective of the type or size of retail store (Gagnon and Osterhaus 1985). Another article reports that the layout of merchandise in power aisle has an effect on perceived price levels (Smith and Burns 1996).

### 2.1.4 Point-of-purchase and Decoration Variables

In-store displays can be product displays, including point-of-purchase or shelf space, signs, or wall decorations. They play an important role in any retailers strategy (Levy and Weitz 2009). Product displays in store increase customers perception to promotions and prices and decrease brand loyalty (Bawa, at al., 1989). Studies showed also that the way how a product is displayed has an impact on the effect. Product displays increase the probability of unplanned purchase, but not of planned purchase. This effect is significantly stronger for product categories that are purchased relatively often (Inman, et al., 2009). Attaching signs stating a promotional price in large letters to certain brands increases the likelihood of choice (Inman, et al., 1990). Furthermore, not only the content but also purely the amount of information contained on in-store displays positively influences customers choice. When customers need to decide between two very similar products, they would prefer those which contain most information. However if a product is of superior quality to another, it is advisable to provide less information (Patton III, 1981).

### 2.1.5 Human Variables

Retail staff number, appearance and behaviour impacts customers perception of a store and therefore influences behaviour (Milliman 2000). The number and friendliness of employees has a positive impact on levels of pleasure and arousal, which in turn impacts willingness to buy (Baker et al., 1992). Stores with more sales personnel on the shop floor greeting customers were perceived as providing a higher service quality than stores with less staff not offering a greeting. The effect of other customers' presence. The perception of crowding can be either human crowding (a closed confined feeling experience from high human density) or spatial crowding (feelings of restricted physical body movements due to high spatial density). Note that the feelings associated by the proximity of others can be related to both presence of people (a human variable), but is also to questions of store layout. Crowding has a negative influence on atmospheric perceptions, lead to negative emotions (unhappy, irritated), has a negative effect on satisfaction (Machleit et al., 2000).

Therefore retail store physical environment design factor is a complex task. The main objective is to maximize sales with customer satisfaction. Many factors affect the store physical design factor dimension like the exterior, interior, floor merchandise, and store atmosphere. Retail physical design factor can affect customers perceptions of a retail environment and thus there is a likelihood of approaching or avoiding the product or store. Hence creating superior customer experience seems to be one of the central objectives in today's retailing environments.

## 2.2 Shopping Experience.

Due to the variety of retailers customers can now choose from, the importance of conveying value and reason as to why they should choose one store over another has escalated (Baker et al., 2002). Failure to implement these important steps may result in severe consequences for the retailer, such as lost business or inferior brand perception. Many retailers are differentiating themselves by enhancing the in-store experience (Howell, 2002). For years, researchers have agreed that individuals have emotional responses to their physical environment (Ergolu et al., 2001). Thus, the shopping environment directly affects the experience a customer's realizes in a particular store setting. Additionally, the shopping environment may profoundly influence customers feelings and emotional reactions towards a store, clearly impacting the customers decisions (Ergolu et al., 2001).

## 3.0 RESEARCH OBJECTIVES AND DESIGN

### 3.1 Research Objectives

1. To identify the physical environment design factor in fashion apparel retail store in Queensbay Mall, Penang
2. To determine the design physical environment characteristics and the components in the retail store in terms of apparel segment.
3. To study the impact of design physical environment on the store image from the consumers perceptions.

### 3.2 Research Design, Sample and Data

The research design employs a qualitative research method which is divided into two parts, the first part is exploratory observation in nature and the second part is survey descriptive. In the exploratory observation study the approach to the observational research was based within the fashion apparel retail stores in Queensbay Mall, Penang. In the survey descriptive store physical design factor; random respondents and manager of the store were interviewed to understand and find the dimensions of store design factor. The study was intended to focus on the impact of store physical design elements in terms of merchandise apparel segment as a product category. The sample size of the research was 80 respondents. The sampling technique was mall store intercept used to administer the questionnaire. Participants were intercepted at the mall while they were shopping and asked to complete a survey. The observation and survey was conducted in Queensbay Mall, Penang for a week period. Finally, a table containing major types of in-store physical design factor techniques which groups the types of mostly practiced was produced. From the literature review it is inferred that in terms of store physical design; exterior, interior, floor merchandising, and store atmosphere, are very important dimension to be studied in store physical design factor. If these dimensions of store design factor are properly and innovatively developed, the stores' sales may increase drastically. Storefront will increase the walk-ins of the store. Customer once enters the store; the next encounter of the customer with the store happens only if the experience with the store is memorable. In that case store exterior, interior, floor merchandising, and store atmosphere will play a vital role in making the experience memorable to customer (Table 1). Therefore, it is important to study the impact of these dimensions on customer perception, to find out effectiveness of store physical environment.



### 3.3 Research Hypothesis

- H1: Customers are influenced by in-store physical design exterior.
- H2: Customers are influenced by in-store physical design interior.
- H3: Customers are influenced by in-store physical design floor merchandise.
- H4: Customers are influenced by in-store atmosphere.

Table 1.  
Factor Analysis

Variable	Attributes descriptors
Exterior design	Nice architectural (Façade) style of the store Signage or logo (Brands) of the store Interesting/inspiring display windows The image of the display windows The apparel/ merchandise presented in the display windows
Interior design	Pleasant transition zone Theme and scheme (Brands) environment of the store The usage of apparel/ merchandise display fixture in the store The mannequins display The usage of signage graphic (Brands) in the store Display with many props/ fixtures
Floor merchandise	The overall layout of the store The apparel/ merchandise positioning in the store Enough space to move around and reach apparel/
Atmosphere	Pleasant lighting in the store Pleasant music in the store Pleasant scent in the store Pleasant colour in the store

### 3.4 Theoretical Framework

The research attempted to understand the store physical design factor environment components that were required in creating an exciting store design towards influences the customer's intention interest and store image. As shown by the previous studies, the store design environments affect the customer's behavior and purchases. It is important to know which factors or combination of factors influence their purchasing behavior. The modified varies of store design factor environment components in retail along with influences response model below provide a good explanation of the effect of the components in retails environment towards the customers intention. Below are the conceptual that influence store merchandise display design components in retail environment (Figure 1).

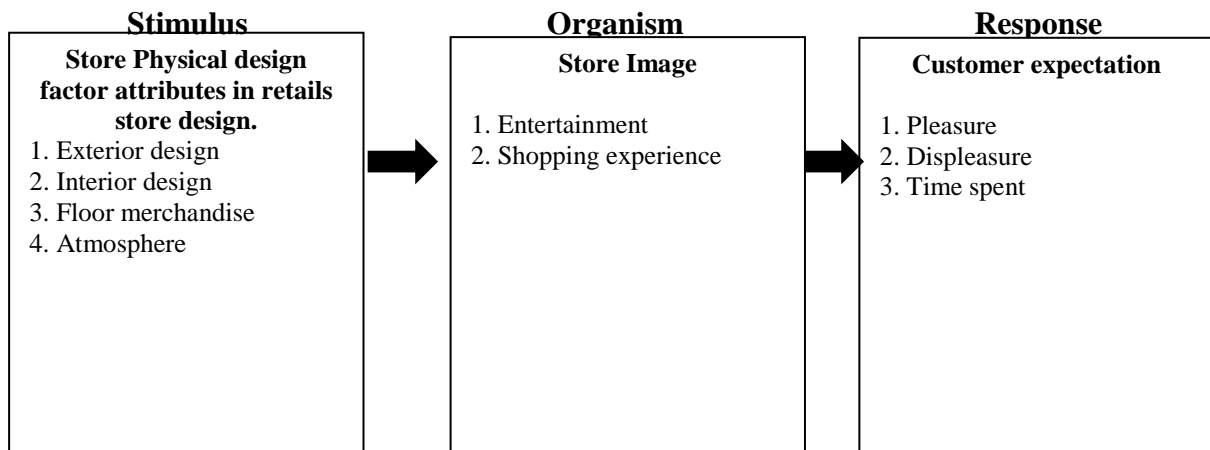


Figure 1

Model connecting store attributes to personal perception towards store Physical design factor.

## 4.0 FINDINGS

### 4.1 Observation.

The observation was conducted during different days at Forever 21 Queensbay Mall, which in weekends and weekdays. From all 7 days observations, exterior design; it could be seen that their advertised well, by having a good simple façade with the logo of “Forever 21” on each of the store entrances (figure 3). Also well-presented were the window display and arrangement of the merchandise in it which so eye-catching to the customers walk by (Figure 4).

Overall they pay attention to the customers shopping experience. Interior design; they have shopping bags that can be used by the customers while browsing through the store. They do focus to the decompression zone and image theme of the store (Figure 5). They are very well intentioned to offer customers comfort and care for their shopping experience. There are enough dressing rooms, which allow many people to go and try their garments. They also offer enough of space between aisles and cash registers counter. However the downside with it is that they do not have sitting places inside the store for people to sit, while waiting for other people to finish shopping. The only sitting spaces were located at the outside in front of the store. They have good selections of display fixtures, props and lightings fixture enhancing more the store environment in shopping experience (Figure 6). Influence customers’ purchasing behavior, level of satisfaction and the attachment towards the brand. The store properly used signage and graphic in which allow explaining the customers about the merchandise, reducing time spent by customers, and creating the feeling of effectiveness for customers. The store is also well signaled, having directions towards each sections, emergency exits, dressing room and cash registers. The floor merchandise layout; the way they display their merchandise, arranging them in a logical order by allowing enough space between stands, which makes it easier for customers to browse. Having separate sections also gives the customers a certain degree of privacy while shopping (Figure 2). Store atmosphere; they do have a pleasant lighting, music, scent and colour in the store which make the shopping experience feel comfort and stress-free.

Comparison between the observations, it can be seen that when it comes to advertising the store, they do a good job. But considering the shopping experience, it is clear that the stores take this to another dimension by offering classy store appearance and product display. The way they present

their apparels and accessories inspires the uniqueness of the stores. These give a first impression idea to the customer towards the store image.

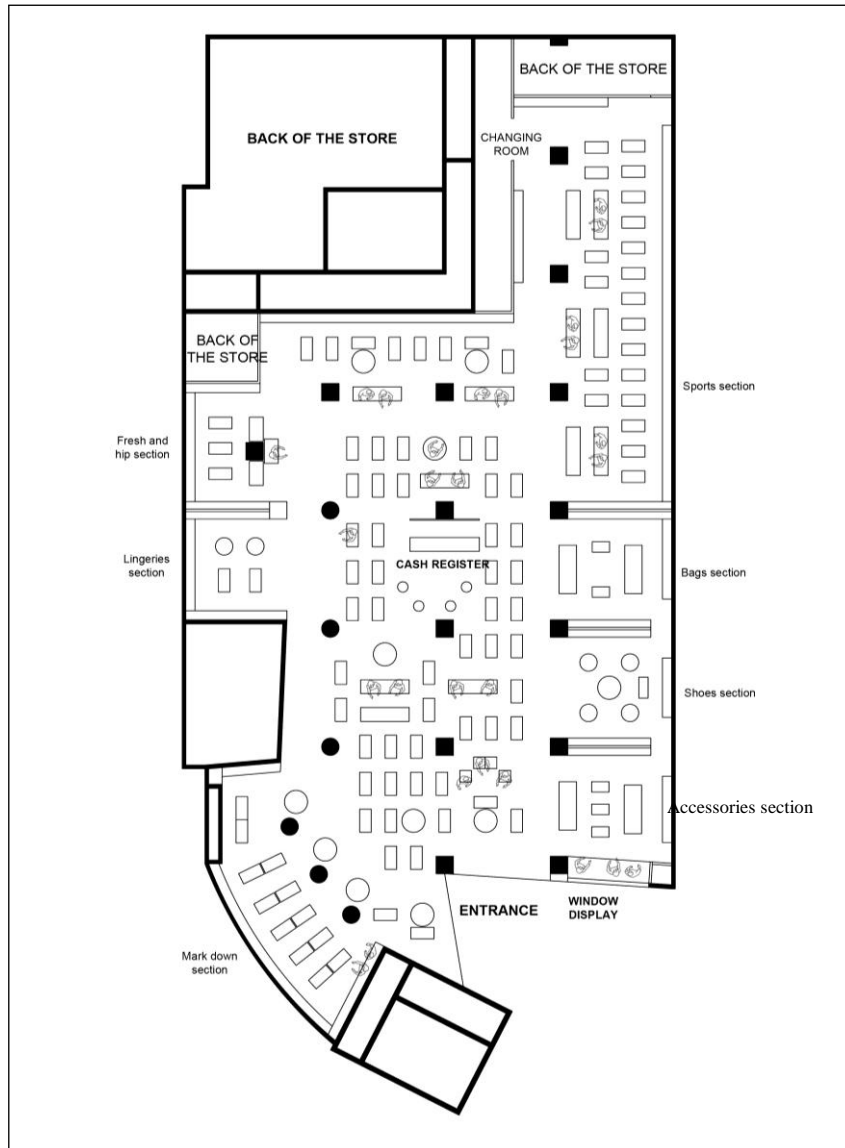


Figure 2  
View layout plan of the Forever 21 retail store in Queensbay Mall Penang .  
(Source: Mohd Azri /2015)



Figure 3  
View of the overall Forever 21 apparel store façade  
and signage.  
(Source: Mohd Azri /2015)



Figure 4  
View of the store window display setting.  
(Source: Mohd Azri /2015)



FIGURE 5  
View of the store transition zone. Combination of  
merchandise apparel, merchandise display and  
mannequins props.  
(Source: Mohd Azri /2015)



FIGURE 6  
View of the few store gondola merchandises  
displays.  
(Source: Mohd Azri /2015)

## 4.2 Interview

There was one successful interview performed with the supervisor of Guess store Queensbay Mall, Penang. Throughout the interview she strongly said that the store appearance and visual merchandise is very important in fashion retail. The other main concern is keeping the good image of the store is very important that why they always maintain changing their merchandise display regularly and neatly display and continue updating their store arrangement occasionally. The Topman assistant manager, replied that the arrangement overall of the floor space are very important in retail store. Also he stated that having a well presented window display is important too. Well-designed layouts are extremely important because they strongly influence in-store traffic patterns, shopping atmosphere and shopping behavior. Consistently upgrading store standards on par with others retail store. Gap supervisor, they pointed out that the display windows are very important to them. Having proper well merchandise display, arrangement and up-to-date windows display on the latest merchandise may hence the customers purchasing decision making. Other than that is the store customer service. Lastly Forever 21 supervisor, she mentioned that the store appearance, window display and merchandise display are crucial to the store as it's a main point in selling the merchandise. Store image and appearance affect customers' preference for the stores and shopping experience. Developing a strong positive appearance has become essential to the maintenance of sustained competitive advantage.

Even though the information gathered from the assistant manager and supervisors were seems different in opinion point of view from one another, it could be seen that the overall store appearance, visual merchandise and window display elements of design is important. This element has to be similar with one another in portraying the store brand. All the brand store should be identical with all the other brand chain store, which means that their in-store appearance, visual merchandise and window display acts like an identification element not only as advertisement. The others important elements pointed out by the them are that well manage of store planning, clean and tidy store places are a goal, which must be taken into account and improved.

## 4.3 Survey

After collecting the data from the respondents from the 11<sup>th</sup> of March 2015 to 17<sup>th</sup> of March 2015, with 90 respondents in total, the following analysis were done according to the gathered information below.

### 4.3.1 Demographic Characteristics of Respondents

According to Table 2, 62 (68.89%) of the respondents were female and 28 (31.11%) were male respondents who participated in the study. The results reveal that women are the predominant shoppers. Based to the age, most of respondents were classified "between" aged 26 - 30; 34 (37.78%) and 21 - 25; 24 (26.67%) aged of ranges which is young working middle group aged. The present data analysis suggests that the age 21 - 30 group has an impact on the fashion stores. On the frequent of visiting attributes, 68 (75.56%) of respondents indicated that they did their shopping once in a week, while 12 (13.33%) go for shopping once a month and 6 (6.67%) of them did their shopping once a fortnight. The results illustrates that a significant portion of respondents did shopping every once a week. The results show consumers love to shop often. For the time spent in the apparel store, 84 (93.33%) of the respondents indicated that they spend less than an hour in the retail store, while 6 (6.67%) of the respondents would allocates an hour to two hours inside the store. Therefore, the customers would like preferred to do quick survey, browsing or purchasing towards the store. In the purpose for visiting to the store dimension, 58 (64.44%) of the respondents went to the fashion store for



shopping to do purchasing, while 16 (17.78%) of the respondents came to the store to examine the new merchandise that the store had to offer. Only small group of respondents with 6 (6.67%) visit the store for entertainment. The result, therefore, shows majority of the customers came out from the store by making few purchases.

Table 2  
 Summary of Respondent Demographic Profile.

	Response Percent	Response Count
<u>Gender</u>		
Male	31.11	28
Female	<b>68.89</b>	<b>62</b>
<u>Age</u>		
21 - 25	26.67	24
26 - 30	<b>37.78</b>	<b>34</b>
31 - 35	17.78	16
36 - 40	11.11	10
41 - 45	4.44	4
46 - and above	2.22	2
<u>Frequent of visiting</u>		
Once a week	75.56	68
Once a fortnight/ two weeks	<b>6.67</b>	<b>6</b>
Once a month	13.33	12
Others	4.44	4
<u>Time spent</u>		
Less than 1hr	<b>93.33</b>	<b>84</b>
1hr – 2hr	0.00	0
More than 2hr	6.67	6
<u>Purpose for visiting</u>		
For entertainment	64.44	58
For shopping/ purchasing	<b>11.11</b>	<b>10</b>
To have a good time out with friends/ families	17.78	16
To know and examine new apparel/ merchandise	6.67	6
Answered question		90

### 4.3.2 Participants Perception Towards The Current Store Physical Design Factor Attributes in the Mall

#### Exterior Design

According to the data analysis in Table 3, for the storefront of the store physical design factor dimension, most of the respondents chose to answer the question option “important” for each of the elements presented outside the store with 40 (44.44%) on the nice architectural style of the store and 44 (48.89%) for the of exterior signs. In windows display elements, all the elements were also choose as “important” which the highest “important” score was given to the image of the display windows 50 (55.55 %) followed interesting/inspiring display windows 46 (51.11%). Apparel/ merchandise presented in the display windows 40 (44.44%). Few of the respondents indicated as “very unimportant” in the attributes. In conclusion, good design exterior signs and window display can attract customers’ attention to entering the store which interested by the store promoting.

#### Interior design

Table 3, majority 38 (42.22%) of respondents mentioned “important” for the decompression zone that were located in the store as it is the first area in the store for the customer to feel what the store would like to offer. Very little selected as very “un important”. In theme and scheme section respondents marked the elements with the biggest amount of “very important” was regarding the theme and scheme environment of the fashion store. From 90 respondents 48 (53.33%) chose this option. Therefore, store design theme has an impact on store customers store image. Having well usage of merchandise fixture in the store was important for most of the respondents that chose options like “important” with 44 (48.89%). Hence, the result suggests that encountering problems with merchandise display in stores is an important factor in influencing shopping at fashion stores. For the mannequins display usage in the store, around 38 respondents (42.22%) answered with “important” and only small group of respondent selected as “unimportant”. Therefore, it is found out that retail store customers are impacted by perceptions of store mannequins display strategies. Effective merchandise display strategies can reap big rewards in today’s marketplace by boosting sales. The elements regarding the usage of signage and graphic in the store, 38 (42.22%) of the respondent classified as “important” and 36 (40.0%) as “very important”. Therefore, the direction signs have an impact on customers purchasing behaviour. At display with many props/ fixtures section, total of 44 (48.89%) of the respondent classified as “important” for the props/ fixtures usage in the store. Few respondents indicated as “neither important nor unimportant” with 6 (6.67%).

#### Floor merchandise

However according to Table 3, of the 90 respondents interviewed, the importance of floor layout section; overall layout floor 44 (48.89%), merchandise positioning in the store 36 (40.00%) and enough space to move around and reach the merchandise 46 (51.11%) was characterized as “important” by most of the respondents, and it only had a small part of respondents categorizing it as “very unimportant”. Therefore, the results may have an impact on store layout, design, traffic and merchandise display. Floor space can directly affect moods, especially when it comes to shopping space, which will have a big impact due to the sheer surface area it covers.

#### Atmosphere

According to the data analysis in Table 3, importance of lighting and fixture section, appropriate pleasant lighting was also categorized as “important” with respondents of 52 (57.78%) and only had few respondents stating it is “neither important nor unimportant” as the lowest. This result confirms the importance of store lighting towards merchandise display and store customers. The importance of

pleasant music and pleasant colours in the store was characterized as “important” by most of the respondents which both had same total of respondents 48 (53.33%), and it only had a small part of them categorizing it as “very unimportant”. According to the 90 respondents pleasant scent 36 (40.00%) of the respondents classified itself as neither important nor unimportant for these respondents sample.

Table 3  
Summary of Respondent Towards Store Physical Design Factor Attributes in Mall Apparel Store Perception

	Very Unimportant	Unimportant	Neither Important Nor Unimportant	Important	Very Important
<u>Exterior Design</u>					
Nice architectural (Façade) style of the store	2.22 (2)	6.67 (6)	31.11 (28)	<b>44.44 (40)</b>	15.56 (14)
Signage or logo (Brands) of the store	4.44 (4)	4.44 (4)	13.33 (12)	<b>48.89 (44)</b>	28.89 (26)
Interesting/inspiring display windows	0.00 (0)	2.22 (2)	17.78 (16)	<b>51.11 (46)</b>	28.89 (26)
The image of the display windows	0.00 (0)	8.89 (8)	22.22 (20)	<b>55.55 (50)</b>	13.33 (12)
The apparel/merchandise presented in the display windows	0.00 (0)	4.44 (4)	20.00 (18)	<b>44.44 (40)</b>	31.11 (28)
<u>Interior design</u>					
Pleasant transition zone	2.22 (2)	8.89 (8)	33.33 (30)	<b>42.22 (38)</b>	13.33 (12)
Theme and scheme (Brands) environment of the store	0.00 (0)	0.00 (0)	4.44 (4)	42.22 (38)	<b>53.33 (48)</b>
The usage of apparel/merchandise fixture in the store	0.00 (0)	0.00 (0)	6.67 (6)	<b>48.89 (44)</b>	44.44 (40)
The mannequins display	2.22 (2)	0.00 (0)	17.78 (16)	<b>42.22 (38)</b>	37.78 (34)
The usage of signage graphic (Brands) in the store	4.44 (4)	2.22 (2)	11.11 (10)	<b>42.22 (38)</b>	40.0 (32)
Display with many props/ fixtures	0.00 (0)	0.00 (0)	6.67 (6)	<b>48.89 (44)</b>	44.44 (40)
<u>Floor merchandise</u>					
The overall layout of the store	0.00 (0)	2.22 (2)	4.44 (4)	<b>48.89 (44)</b>	44.44 (40)
The apparel/merchandise positioning in the store	2.22 (2)	4.44 (4)	20.00 (18)	<b>40.0 (36)</b>	33.33 (30)
Enough space to move around and reach	0.00 (0)	2.22 (2)	6.67 (6)	<b>51.11 (46)</b>	40.0 (36)

apparel/					
<u>Atmosphere</u>					
Pleasant lighting in the store	0.00 (0)	0.00 (0)	11.11 (10)	<b>57.78 (52)</b>	31.11 (28)
Pleasant music in the store	2.22 (2)	6.67 (6)	20.00 (18)	<b>53.33 (48)</b>	17.78 (16)
Pleasant scent in the store	2.22 (2)	15.56 (14)	<b>40.00 (36)</b>	33.33 (30)	8.89 (8)
Pleasant colour in the store	0.00 (0)	2.22 (2)	6.67 (6)	<b>53.33 (48)</b>	37.78 (34)

#### 4.3.3 Participants Shopping Experience Satisfaction Regarding Store Physical Design Factor Attributes In The Mall

According to the table number 4, most of the respondents agreed with the statement “I am satisfied with the shopping experience in fashion stores”. Only few were selected disagree.

Table 4  
Summary of Respondent Towards Store Shopping Experience Satisfaction in Store

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
Fashion specialty apparel retail store	0.00 (0)	4.44 (4)	20.00 (18)	<b>62.22 (56)</b>	13.33 (12)

H 1: There is a significant relationship between store physical design exterior dimension and customer patronage intention.

In the result of respondents perception, significant relationship was shown between physical exterior dimension about the store image. The quality of a store front is a major determinant for a customer, particularly a new customer, and should not be underestimated. The exterior appearance of one store, silently announce what customers can expect inside. This suggested that that a good exterior visual merchandising attracts attention, creates interest and invites the customer into the business. Hence, making storefront attractive would definitely fetch more footfalls in local retail store.

H2: There is a significant relationship between store physical design interior dimension and customer patronage intention.

The result of respondents survey found a significant relationship between customers' behavior and physical design interior dimension. The analysis suggested that when planning interior displays remember that the theme and image presented on the exterior must be carried throughout the interior of the store to provide consistency for the customer. Well-designed displays and in-store promotions are essential for a consistent theme and to help the customer find advertised items. The data provides sufficient evidence that there was a significant directional relationship between apparel store customers' behavior and physical design interior dimension.

H3: There is a significant relationship between store physical design floor merchandise dimension and customer patronage intention.

From the respondents' survey found a significant relationship between customers' behavior and floor merchandise towards store image. The respondent indicated that the layout of a store was quite important to them as they wanted to move freely between all the merchandise in a store. They also wanted to be able to see from outside the store what the store was offering and whether they thought the store was too crowded or not. It was also important to the participants not to feel "claustrophobic" in a store. The recommendation to apparel retailers is to ensure that the layout of the store is not too cramped and confusing, as consumers want to move more freely between the merchandise

H4: There is a significant relationship between store physical design atmosphere dimension and customer patronage intention.

Research findings indicate that atmospheric variables have a positive influence on consumers' intention; have insignificant impact on store image. The atmospheric dimensions such as the non-ambient scent in the store, can lead to customers pleasure and which in turn leads to their impulse purchases. It should be pointed out other factors of store atmosphere such as appropriate background music, color decoration, and lighting inside the store can lead to shoppers' positive emotions. Even though these factors cannot directly influences customers to make impulse purchases, they can encourage customers approach behavior such as spending more time shopping in the store and having positive attitudes to the store and its products.

## CONCLUSION

After gathering and analyzing the information presented above the drawn conclusion was that the experience customers get in stores will stay with them, making them like or dislike the store, according to the characteristics of the atmosphere and facilities present in that particular store. Forever 21 try to attract customers and offer them a good shopping experience in their stores. Most of the stores give a great importance to the quality and the idea assuming they will manage to attract more customers and to keep their regular ones. Part of the stores uses store front and window display as a tactic in attracting the customers' eyes. Others adopt an ordered way of displaying the products by the categories they best fit in, in order to make it easy for the customer to find them. Another approach is to place in the stores examples of how to combine the latest products by having manikins wearing the clothes to inspire the customer and to give them a good example of the newest arrivals.

After collecting the primary data and analyzing it, it can be seen that a great importance was given to the store appearance, visual merchandise, window display and store planning. It was a matter brought up by all the assistant managers and supervisors in the interview and customers that classified this as "important" and "very important" according to the questionnaire. By applying the questionnaire it could be seen that customers pay high attention to the store window displays and to what is been displayed. Also are the store exterior signs. When it comes to elements present in the store, store appearance on theme and scheme of the store image, pleasant music, lighting and colour, were categorized as important as well. Therefore, it can be concluded the store physical environment design factor are important towards designing a good retail store.



## RECOMMENDATIONS

Throughout this study there are certain things mentioned that could help improve if needed fashion apparel retailers. The suggestions of this report, according to the primary and secondary data are the following:

### Exterior design elements

The result of respondents survey found that the store front and display window is accepted as the most important part of the store design because it is the first meeting place the customer has with a brand and it gives passerby a quick impression of the store. A passerby can hold an opinion about the type of merchandise sold inside. The layout of the display windows should not take focus away from the clothes and it should suggest a feeling. Their purpose is to create a special aura to draw in customers and also attract media attention. Therefore it is recommend that storefront and its display windows are the most important communication channels for fashion stores.

### Interior design elements

It is recommended that effective shop interior is a significant part of merchandising because designing an interior retail store can affect the profit and image of the brands. It is important that the main purpose is to create an attractive shopping environment and to enhance the presentation of merchandise. To create a distinctive image should be the main task because such an image will create a brand recognition which will be immediately perceived by the customers.

### Floor merchandise

It is also recommended that store layout is an important factor affecting customer behaviour and a critical determinant towards the creation of store image. Well-designed layouts are extremely important because they strongly influence in-store traffic patterns, shopping atmosphere, shopping behaviour, and operational efficiency.

### Atmosphere

It is recommended that, in maintain that a store's atmosphere is important due it has the ability to influence customers shopping satisfaction, the physical time spent browsing and evaluating the merchandise, the eagerness of customer to communicate with store personnel and to make use of store facilities such as dressing rooms, the customers' willingness to spend more money than originally planned and the possibility of future customers. These elements do not only contribute to the overall image of the store, but can also be used as an effective marketing tool to differentiate one store from other stores/competitors, to effectively communicate with their customers and to attract customers' attention

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## CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN FOR ACHIEVING LIVEABILITY

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### ABSTRACT

Liveability concept is well known for improving the quality of life. Besides, crime prevention through environmental design (CPTED) has been proven as an effective strategy to reduce crime. Thus, there is a perception that CPTED is only employed to improve the safety feature of liveability but in recent years CPTED has developed beyond its basic concepts. In spite of the broad spectrum of liveability indicators, it is argued that other than providing safety, CPTED dimensions might be able to fulfil some more features of liveability. However, the relationship between the individual dimensions of CPTED and concepts of liveability has rarely been explored. Hence, the present paper sought to investigate if CPTED can achieve liveability. Several kinds of literatures on the subjects were reviewed to check the compatibility between various aspects of these two concepts. Moreover, a systematic comparison of the common components were developed. The results of the study showed that most of the measures of liveability related to peoples' demographics are directly linked with the territoriality concept of CPTED. All dimensions of First-Generation CPTED could contribute to features of liveability. Similarly, Second-Generation could assist the strategies of liveability through social cohesion, community culture and connectivity. The study concludes that nearly 50% of liveability features can be achieved through dimensions of CPTED. However, this is subject to change based on different scale and time of analysis. An exact empirical study measuring both liveability and CPTED simultaneously in a single context could further confirm the results of the present study.

**Keywords:** Liveability, CPTED, Dimensions, Compatibility

### INTRODUCTION

50% of the world's population live in urban areas since 2010 which is expected to rise to over 60% by 2050 (UN, 2011). Therefore, the 3.5 billion urban population will escalate to about 6.3 billion in 2050 (UN, 2009). The majority of the cities are not well-planned to accommodate large populations. In addition, urban spaces are not effectively equipped to meet the needs of the residents. Henceforth, urbanization negatively impacts the ecosystem (Green & Baker, 2003), climate change (Grimmond, 2007), wealth (Mehta, 2000) and health of inhabitants (Moore, 2003; Turan & Besirli, 2008).

The uncontrolled urbanization has reduced the individual well-being in large metropolitans (Winters & Li, 2015). Socioeconomic disparities, poverty, unemployment, and climate change occurring because of urbanization have adversely affected the well-being of the people. Many researchers believe that urbanization is also one of the underlying causes of crime (Mishra, 2015). Hence, CPTED and liveability have been developed to battle the consequences of issues related to urbanization.

Liveability tool has been deployed to assess the quality of life in a region by measuring the physical and social elements of the environment which contribute to the well-being of people. Namazi-Rad et al. (2012) recommended different factors of liveability in six categories with their individual features which consist of (1) home: size, affordability, quality and communication networks (2) neighbourhood: safety, attractiveness, cleanliness, friendliness, cultural diversity (3) transport, (4) entertainment, (5) services and (6) work. Besides, concepts of CPTED namely natural surveillance, access management, territoriality, maintenance, image/management and activity support are known as effective strategies to reduce/prevent crime.

There is a perception among built environment professionals, planners, designers, and policy makers that CPTED is a tool to serve the safety feature of the liveability. Yet, many of the dimensions used for measuring the liveability seem to overlap with the measures of CPTED concept. Therefore, this study sought to explore the likely connections that might exist between the different dimensions of CPTED and the features of liveability.

### LIVEABILITY INDICATORS AND CRIME

“Environmental quality, noise, lack of community involvement, traffic and lack of services and facilities” reduces the quality of life (Howley, et al., 2009). One of the components to improve the quality of life is having a safe and clean environment which can make the city more livable (Douglass, 2000). Moreover, investing in making the neighborhoods healthy, walkable and safe is one of the major domains of livability (Partnership for Sustainable Communities, 2011).

Figure 1 shows the basic model, which consists of several factors influencing liveability.

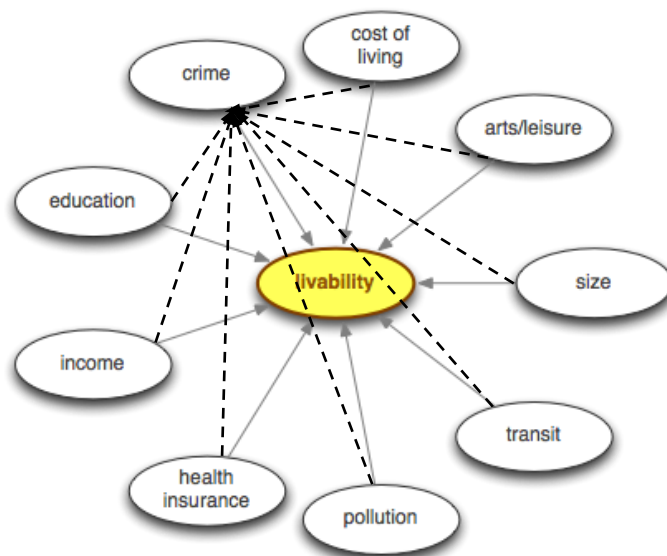


Figure 1. Liveability model with its basic variables; Adapted from Burrsettles, (2014).

The study by Burrsettles, (2014) showed that crime had the highest negative magnitude of influence on liveability. In addition, the constructs of liveability also influence crime. The relationship between crime and CPTED has been proven in many studies. Hence, the liveability indicators which are in connection with crime can influence CPTED. In next section, the link between individual dimensions of first and second generation CPTED with liveability has been discussed.

### FIRST-GENERATION CPTED AND LIVEABILITY

First-generation CPTED includes design principles that alter the environment to deter criminality (Atlas, 2008). The dimensions of CPTED mentioned by Cozen, (2002) viz. surveillance, access management, territoriality, maintenance, image/management, activity Support have been compared with indicators of liveability. Table 1 shows the compatibility between dimensions of First-Generation CPTED and the indicators of liveability.

**Table 1:** Link between dimensions of First-Generation CPTED and Liveability

Dimensions of First-Generation CPTED	Indicators of Liveability
Surveillance	Friendliness
Access management	Transport, Transit, Walkability
Territoriality	Home Size
Maintenance	Neighbourhood Cleanliness, Pollution
Image/management	Neighbourhood Attractiveness
Activity Support	Neighbourhood Safety

Natural Surveillance is promoted through physical design that provides opportunities of watching the environment by residents and their agents as a part of the capable guardianship (Painter and Tilley, 1999). This dimension of CPTED is a mean for neighbours to get to know each other as recognizing the residents and non-residence is an important part of this strategy. Territoriality is enhanced by the provision of natural surveillance hence, both the dimensions help in making friendship or create the sense of care within people of neighbourhoods that increases liveability.

CPTED has guidelines on managing the access to the neighborhoods, houses and streets. Similarly, research has shown that “Livable communities are healthy, safe and walkable” (Young & Hermanson, 2013). Increasing pedestrian movement and use of bicycles can promote health and safety in neighborhoods. According to a research by Riggs and Gilderbloom, (2015) conversion of a one-way street to two-directional traffic promotes safety, mobility and livability in cities. Walkability has a positive impact on neighbourhood crime (Gilderbloom). Good public transport can reduce the use of cars inside residential places.

There is no doubt that neighbourhoods with better image management are more attractive. Image/ management dimension of built environment have strong support in research for reducing crime (Eck, 1997; Spelman, 1993). Lastly, Joh et al., (2012) reported that more people’s activity in an area enhances neighbourhood’s safety.



In addition to the list of liveability attributes mentioned in Table 1, Home size affects crime and fear of crime through resident’s level of territoriality and control over their living spaces and surrounding areas (Newman & Franck, 1982). Thus, providing a suitable home size which is one of the dimensions to measure territoriality of CPTED also contributes to resident’s state of well-being which has been measured by Naramzi-Rad et al., (2012).

## SECOND-GENERATION CPTED AND LIVEABILITY

Second-Generation CPTED uses four strategies/ Cs viz. Social cohesion, Connectivity, Community Culture and Threshold capacity to deal with people’s cultural, social and emotional needs for reducing crime (Atlas, 2008). The set of activities introduced in Second-Generation CPTED to achieve safety is predicted to enhance liveability of communities. Table 2 shows the compatibility between dimensions of Second-Generation CPTED and the indicators of liveability.

**Table 2:** Link between dimensions of First-Generation CPTED and Liveability

Dimensions of Second-Generation CPTED	Indicators of Liveability
Social Cohesion	Neighbourhood friendliness
Community Culture	Neighbourhood Cultural Diversity
Connectivity	Transport
Community Culture	Entertainment

Neighbourhood friendliness feature of liveability can be fulfilled by applying the social cohesion dimension of CPTED. Friendliness evolves when positive esteem and social glue brings the people of community together. In fact the events of social cohesion organized amongst the members of neighbourhood for taking responsibilities of their neighbourhood to deal with crime risks (Atlas, 2013), can promote liveability through the creation of friendliness in residents.

Neighbourhood Cultural Diversity and Community Culture: Festival, events, traditional and cultural activities (Atlas, 2008) and even simple cultural strategy like “Stories in a Park” (Sarkissian et al.,2003) makes people share a sense of place to have territorial control over their neighbourhood (Adams and Goldbard, 2001). This dimension of CPTED also promotes liveability through neighbourhood cultural diversity.

Furthermore, the entertainment measure of liveability could be fulfilled by providing access to various cultural, sport and social venues which is part of community culture activities. “Whether an offender will be a likely offender can depend on the presence or influence of ‘handlers’ (Felson, 1995). Engaging youths in art/leisure could fill up their free time wisely with healthy activities and avoid them to make friend with offenders or friends with a bad attitude who could influence them and encourage them to commit crime.

Transport and Connectivity: Connectivity feature of Second-Generation CPTED focuses on the provision of adequate transport facilities for linking the neighborhood to outside areas. According to Barton and Silverman (1994), apart from internal cohesiveness the neighborhood must not be isolated. This dimension of CPTED includes some of transport facilities of liveability concept such as access to public and private transport and its reliability, flexibility and cost (Namazi-Rad et al., 2012).

## SCALE OF ANALYSIS

The scale of CPTED analysis is important. The measures which are suitable at the neighbourhood level may not be appropriate at the level of the individual dwelling. Hence, three scales were introduced by Minnerly, (2005) viz. "(i) the individual dwelling and its lot, (ii) the street immediately adjacent to the dwelling and lot, and (iii) the neighbourhood in which the dwelling is located". The same scaling is implied to the assessment of liveability; for instance in the study by Namazi-Rad et al., (2012) liveability indicators were measured at two separate group; home level and neighbourhood level.

## CONCLUSION

Cozen, (2002) already confirmed that there is conceptual overlap between CPTED and sustainability. Moreover, there is substantial overlap between sustainability and livability (Young & Hermanson, 2013; Allen 2010; Sanford, 2011). Hence, the possibilities of CPTED to have common ground was highlighted in various studies. However, this study confirmed many of the components that result in liveability can be fulfilled by achieving the dimensions of CPTED. For instance, natural Surveillance can promote liveability by creating a sense of neighbourliness in a community. Access management overlaps with many of liveability strategies such as walkability and good transport.

However, liveability indices are large in consistency. Moreover, scale and time are two important factors while evaluating the liveability of a place (Perez, 2013). Hence, a balancing activity is important to control congestion of places with adequate liveability features before they fall into an uncontrolled use. Threshold capacity dimension of Second-Generation CPTED balances the human-scale and density of use through tipping which supports the intended use of a spaces (Saville, 1996) hence, it acts as an overall glue to keep different parts of activities together for appropriate operations towards safety and liveability.

While relating the dimensions of CPTED to attributes of liveability; scale and time are two important factors. Sometimes, people find their neighborhood extremely livable but the city as whole has not scored high in overall livability indices as compare to other cities; safety and perceptions of safety function in the same manner. Moreover, gathering demographics data is an important part of conducting a CPTED survey. Important information such as age, sex, job, income, education are necessary for evaluation of CPTED in a community (Crowe, 2000). Demographics is also essential for liveability planning. For instance, placing schools in the proximity of neighborhoods with more number of children/teens or facilities for elderlies. Hence, all aspects of CPTED and liveability planning can vary according to the demographics of places. Moreover, they effect nearly the entire functions of the involved dimensions and features. Hence, they are beyond the scope of this paper and need a broad and complete study. The majority of transportation planning is out of the scope of CPTED. Besides that, some of the services, work and education-related components and policy and government based. However, a good CPTED planning is able to provide nearly 50% of liveability features including safety.

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## BEIJING NEW COURTYARD HOUSING LIVING: AN EXAMINATION OF *JU'ER HUTONG'S* RESIDENTIAL SATISFACTION ON THE COURTYARD HOUSING DESIGN

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### ABSTRACT

This research aspires to challenge *Ju'er Hutong's* (Community/Place) courtyard design, which has been highly regarded as the most successful *Siheyuan* (Courtyard housing) renewal project in China. Since *Ju'er Hutong* was established in 1991, many designers have honored its new courtyard format as a classic Chinese living model. However, the situation of *Siheyuan* development in China today becomes very complex. Based on two previous investigations of *Ju'er Hutong* in 1992 and 2008 that the residential satisfaction of living in this new courtyard became lower, author starts doubting the success of *Ju'er Hutong's* courtyard design after a long-term. Author believes that it is timely and significant to re-evaluate *Ju'er Hutong's* courtyard design after its 25 years of use. Do the residents of *Ju'er Hutong* still satisfy living in the new courtyard? By using a redeveloped theoretical framework of residential satisfaction and place attachment, this research aims to examine *Ju'er Hutong's* residential satisfaction from four aspects: place identity, place dependence, natural setting and neighbor relation. With the methodology 'Qualitative Assessment', participating residents of *Ju'er Hutong* are divided into different groups based on six variables of age, gender, nationality, home ownership, family structure and living experience in the old *Siheyuan*. In the research results, the subjective data shows a moderate level of residential satisfaction, while the objective data illustrates a negative level. Based on these findings, author demonstrates the importance and necessary of new approaches towards new courtyard housing development in China, and provides suggestions for future *Siheyuan* renewal projects.

**Keyword:** *Ju'er Hutong*, *Siheyuan*, New Courtyard Design, Residential Satisfaction, Place Attachment

### 1. INTRODUCTION

In past decades, with the rapid population increase and urban internationalization, many old urban areas with single and lower-rise housings could no longer meet the needs of urban residents, and have been replaced by multi-units and high-rise buildings. The contradictions of housing supply and demanding, the contrasts of the housing styles between the old and new, have been an ongoing



debating issue for the urban planners and architects. Particularly, when the conflict as a common concern issue appearing in the heart of the historical city - Beijing, it challenges the wisdom of the urban housing planners and architects. How to maintain and recreate new urban housing forms with local identity and also meet the demands of increased population? It has been the question with both theoretical and practical meanings. However, the voice from urban heritage protection can only focuses on the protection and excludes any unnecessary alteration; the view from the urban planning history and theory can only talk about the characteristics of old housing styles; and the approach of practicing architects can only respond to the demanding of increasing the housing scales and sizes...

Until 1991, after massive research and discussions, an urban housing renewal project - *Ju'er Hutong* was finally developed by professor Wu Liangyong, from Tsinghua University in Beijing, as the first experimental exercise that tries to bridge the gap between the traditional Beijing courtyard housing and new form of urban residential building. *Ju'er Hutong* inherits the traditional Beijing courtyard housing (Figure 1) form with a squared central courtyard in the middle, while changes the traditional dwelling height from one level into 2-3 levels, in order to increase the units numbers to meet the needs of residents. It not only brought the new creation of old housing renewal (Figure 2), but also solved many confidential problems such as low capacity, poor living conditions, insufficient facilities and lost of city urban fabric. These issues were all very important during 1990s. Shortly after the execution of this renewal project, the project was recognized as the most successful example of such a kind of approach. It won the prestige award of the best human settlement environment from the UNESCO in 1992, and was highly regarded by the government administration, urban heritage protection bureau, as well as the local scholars and practitioners.

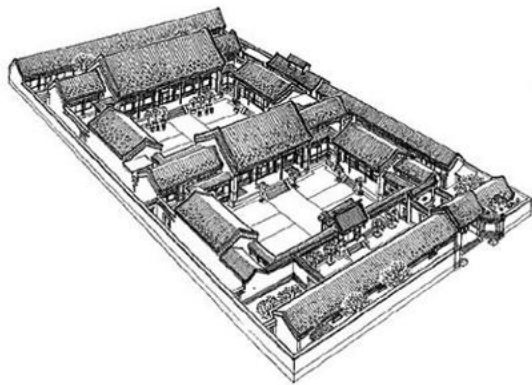


Figure 1. Traditional Beijing Siheyuan  
 Source: Zheng, 2011



Figure 2. *Ju'er Hutong*  
 Source: Wu, 1993

In the following 25 years, only a few scholars gave negative comments on some less important aspects like economy benefits and community maintenance. There is no thorough research and systematic review of this important project, although *Ju'er Hutong* had such an important historical impact in the topic of urban housing renewal in the history of the modern Chinese urban housing renewal practice and development. Today, the contexts of social, cultural and economic situations are dramatically different from 1990s. The debated issues related to urban housing renewal are also getting more complicated. It will be very meaningful to review the *Ju'er Hutong* project again, and ask question: if *Ju'er Hutong* still can satisfy its residents' living needs after many significant changes.

Therefore, this research focuses on this aspect and prepares to provide an examination on the *Ju'er Hutong's* courtyard design. *Ju'er Hutong's* design demonstrates the relations among human beings, buildings, city and nature, which hopefully develops a balance among these factors. As the main users, residents' attitudes can mostly reflect *Ju'er Hutong's* value and meaning. There were two investigations conducted by Wu Liangyong in 1991 and Sun Jian in 2008 on discussing the satisfaction of residents living in *Ju'er Hutong*. Author concludes these investigations and makes a comparison between them (Figure 3). It can be found that residents' satisfaction on various aspects became much lower from 1992 to 2008, which rises author's doubt on the success of *Ju'er Hutong's* courtyard design after 25 years of use. From the previous findings, author gives a prediction that *Ju'er Hutong's* residential satisfaction currently shows a negative result and is much lower than before.

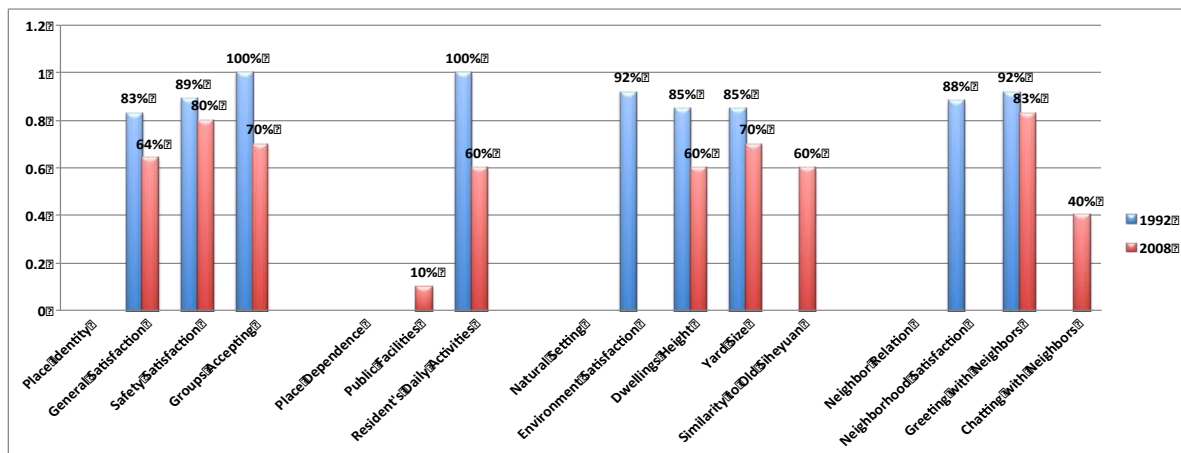


Figure 3. A Comparison of *Ju'er Hutong's* Residential Satisfaction Between 1992 and 2008  
Source: Author

In this research, some confidential points need to be addressed for the audiences. Firstly, the two previous investigations lack sufficient systematical theories supporting them. Secondly, the concept of residential satisfaction has not been well studied and researched in China. Thus, this research fills up with this gap using residential satisfaction knowledge to examine *Ju'er Hutong* courtyard design. Also, it should be demonstrated that this research is the first academic study challenging the success of *Ju'er Hutong's* courtyard design from residential satisfaction perspective. Author hopes finding out the reasons from *Ju'er Hutong's* courtyard design that cause low level of residential satisfaction and provides some appropriate suggestions avoiding these issues in future *Siheyuan* renewal projects.

## 2. LITERATURE REVIEW

### 2.1 Residential Satisfaction

#### Definitions:

In the last 30 years, various scholars have studied the concept of residential satisfaction. Weideman and Anderson (1985) firstly defined residential satisfaction as 'the positive and negative feeling that the occupants have for where they live'. Then Mesh and Manor (1998) fixed it into 'the evaluation of features of physical and social environment'. Lastly, Bonaiuto, Aiello, Perugini, Bonnes

and Ercolan (1999) described it as 'a multidimensional construct focusing on different specific aspects of a place that becomes integrated at the level of people's place-evaluation'. Overlooking these definitions, it is not difficult to find that 'resident', 'place' and 'evaluation' are three key terms being demonstrated in these definitions. Therefore, this research efficiently regards residential satisfaction as 'an overall evaluation of a place from its residents.

### Aspects and Models:

Residential satisfaction contains two research aspects, environmental analysis and personal influence, which has been proved by many researchers (Fried, 1982; Lalli, 1992; Bonaiuto, Breakwell & Cano, 1996; Bonaiuto & Bonnes, 2000; etc.). Moreover, environmental component can be discussed from two detailed perspectives that are physical environment and social environment (Amerigo & Aragonés, 1990; Lee, Oropesa & Kana, 1994; Mesch & Manor, 1998; Han, 2003; Hipp & Perrin, 2006; etc.).

**Physical and Social Environments:** Researchers hold different opinions on the importance of physical and social environments. Some scholars believe that physical environment has more significant influences than social environment. In 1982, Fried pointed it out that residential satisfaction is based largely on the features of physical environment but far less on the relationships in the social environment. Lee, Oropesa and Kana (1994) did research and supported this opinion. They found that negative physical environment positively relates to low residential satisfaction and leads to individuals' thoughts of moving out. Later on, many academics focused on the physical appearance and explored some specific physical items that significantly affect residential satisfaction, such as temperature in the certain area, outside view from living space, position of the room in the building, noise from living place and green area in the community (Lévy-Leboyer, 1987; Maramotti, 1997; Gifford, Hine, Muller-Clemm, Reynolds D'Arcy & Shaw, 2000; Fleury-Bahi, Felonneau & Marchand, 2008).

However, some other scholars argue that social environment is more important. As early in 1988 and 1992, Amerigo and Aragonés have indicated that psychosocial aspects of residential satisfaction are stronger predictors than those relative to physical features. Recently, Hur and Morrow-Jones (2008) also found that social problems are much more significant influences than physical factors in unsatisfactory areas. They all proved the importance of social environment related to residential satisfaction. It should be aware that among various research, neighbor relation is regarded as the most confidential aspect of social environment by many researchers (Kasarda & Janowitz, 1974; Hunter, 1975; Fried, 1982; Connerly & Marans, 1985; Austin & Baba, 1990; Sampson, 1991; Lee et al., 1991; Cowell & Green, 1994; Mesch & Manor, 1998; Han, 2003; Hipp & Perrin, 2006; Fleury-Bahi, Felonneau & Marchand, 2008; Hur & Morrow-Jones, 2008; Hipp, 2009, 2010).

**Personal Perception:** Same with physical and social environments, personal perception is also used for evaluating a place's residential satisfaction. Not a few scholars have proved that through personal experience and identification in the certain place, their perceptions are closely related to their satisfaction towards living place (Lalli, 1992; Bonaiuto, Breakwell & Cano, 1996; Bonaiuto & Bonnes, 2000). Some researchers believe that only social environment connects to one's perception effecting his satisfaction (Fleury-Bahi, Felonneau & Marchand, 2008), however, argued by some other scholars that physical environment also creates and maintains individuals' cognitions to their living place (Korpela, 1989; Twigger-Ross & Uzzell, 1996; Twigger-Ross, Bonaiuto & Breakwell, 2003). There are more academics supporting the idea that both physical and social environments cause the change of emotional connections between human and a place and lead to the change of residential satisfaction

results (Riger & Lavrakas, 1981; Korpela, 1989; Stinner, Van Loon, Chung & Byun, 1990; Bonaiuto et al., 1999; Fleury-Bahi, 2000).

**Conceptual Model:** In the earliest period, residential satisfaction was studied by scholars from two perspectives, a criterion of residential quality (Marans & Rodgers, 1975; Galster & Hesser, 1981; Cutter, 1982; Weidemann, 1982) and a predictor of behavior (Speare, 1974; Newman & Duncan, 1979). Until 1990, Amerigo and Aragone firstly set up a conceptual model of residential satisfaction that connects personal perception, environments and residents' behaviors together, in order to analyze and evaluate a place's value for its residents. This model clearly represents the relations between individuals and environments and explains the influences and limitations between these two aspects. However, it only considers environment as an entire aspect rather than dividing it into more details, which is recreated in this research.

## 2.2 Place Attachment

Place attachment is another concept that closely connects to residential satisfaction (Amerigo & Aragones, 1990; Bonaiuto, Aiello, Perugini, Bonnes & Ercolani, 1999; Mesch & Manor, 1998). Place attachment refers to the sentiments that develop toward a place, while residential satisfaction refers to the evaluation of features of the physical and social environment (Mesch & Manor, 1998). They are two different concepts but highly correlated with each other. In some points, place attachment could assist evaluating a place's residential satisfaction by analyzing residents' emotional connections to the place.

### Definition:

Similar residential satisfaction, scholars have been studying place attachment for a long time. In 1974, Tuan brought up the concept 'sense of place' that explains an emotional bond between an individual and a particular place. Later, Steele (1981), Russell and Ward (1982) researched more about 'sense of place' and described it as 'an experiential process created by the setting combined with what a person brings to it' and 'the psychological or perceived unity of the geographical environment'. In 1983, Shumaker and Taylor came up with the concept of place attachment developed from 'sense of place'. He stated place attachment is a person-place bond that evolves from specifiable conditions of place and characteristics of people. Until 1992, Altman, Low, Brown and Perkins provided place attachment definitions separately after deeply researching this concept. Altman and Low (1992) defined place attachment as 'a positive emotional bond that develops between individuals or groups and their environment', while Brown and Perkins (1992) offered more details on this concept. They indicated that 'Place attachment involves positively experienced bonds, sometimes occurring without awareness, that are developed over time from the behavioral, affective, and cognitive ties between individuals and/or groups and their socio-physical environment'. In this research, we would like to use the definition of place attachment from Brown and Perkins because it not only explains the meaning of this concept but also clearly clarifies its researching aspects. Although Hidalgo, Hernandez (2001), Williams and Vaske (2003) offered another two definitions to place attachment, they did not fully follow the contexts in the concept.

### Aspects and Models:

Place attachment contains three research aspects that are physical environment, social environment and personal perception, which could be considered the same as residential satisfaction. Tuan (1974) initially pointed it out that 'sense of place' encompass more than physical component.



Shumaker and Taylor (1983) demonstrated that attachment to a place could affect people's and places' characteristics and influence individuals' attitudes and behaviors towards a place. Altman and Low (1992) added social component to this concept and ensure the three research aspects of place attachment. Later on, many scholars neglected physical component and person context and also misunderstood place attachment as social networks living in a place. Significantly, Hernandez (2001), Stedman (2001), Williams and Vaske (2001) pointed out these mistakes and clarified the three aspects of place attachment. Brehm, Eisenhauer, and Krannich (2006) proved the relations between environmental aspect and personal context. Trentelman (2009) explored the connections between physical settings and social networks. Recently, Raymond, Brown and Weber (2010) created a 4-dimensional model representing the relationships among physical environment, social component and personal context, and confirmed its reliability and practicality. They carefully divided personal component into two aspects, place identity and place dependence, which more detailed explores the differences between personal experience and functional dependence of the place. This research redevelops this model under the background of Beijing *Siheyuan* culture and applies it into examining *Ju'er Hutong's* residential satisfaction on the courtyard design.

### 2.3 Theoretical Framework In This Research

There are many scholars talking about the connections between residential satisfaction and place attachment, but few of them tried to combine these two concepts into one model for evaluating a place. In this research, author puts them together and reforms a 'residential satisfaction and place attachment' conceptual model (Figure 4). Residential satisfaction can be examined from social aspect, personal context and physical environment, which can be further separated into 4 detailed sections: neighbor relation, place identity, place dependence and natural settings. These 4 sections reflect one's place attachment, and then results back to the residential satisfaction. Place identify refers to the mixture of feelings about specific physical settings and symbolic connections to place that define who we are (Proshansky, Fabian, & Kaminoff, 1983). Place dependence refers to functional connects between individuals and settings (Raymond, Brown & Weber, 2010). Natural setting refers to a place's physical appearance without human beings. Neighbor relation refers to relationships among neighbors.

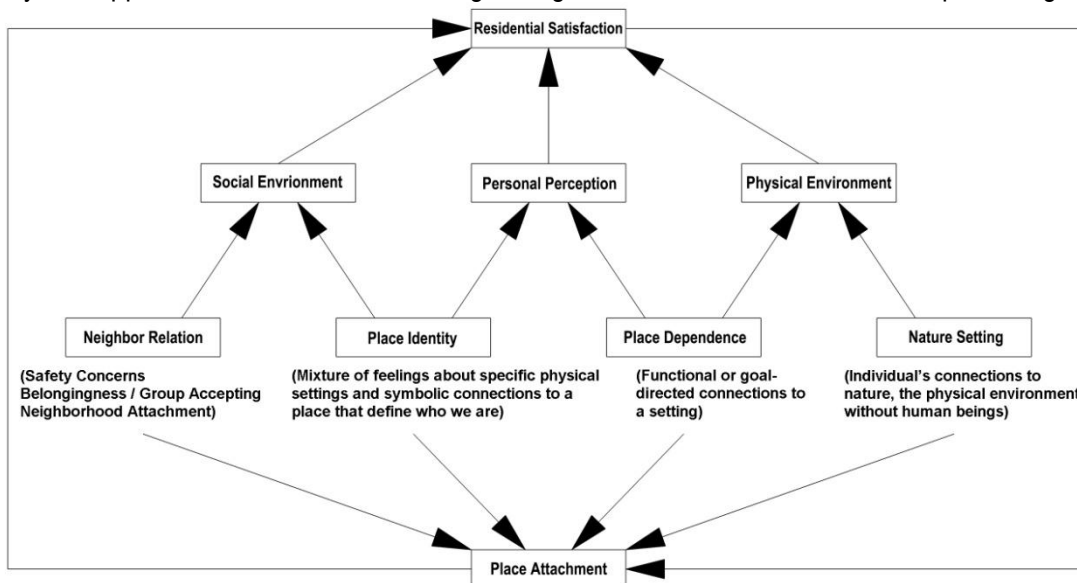


Figure 4. Integrated Conceptual Model of Residential Satisfaction and Place Attachment  
Source: Author



## 2.4 Community Structure

Different from the evaluating aspects environmental component and personal context, community structure as a vital influence variable significantly affects a place's residential satisfaction from various perspectives such as community mobility (Weidemann & Anderson, 1985), community stability (Hipp, 2009), family structure (Mesch & Manor, 1998), age (Schwirian & Schwirian, 1993), living duration (Galster, 1987; Lipsetz, 2000; Speare, 1974; Fleury-Bahi, Félonneau, & Marchand, 2008; Riger & Lavrakas, 1981; Stinner, Van Loon, Chung, & Byun, 1990), gender (Hidalgo & Hernandez, 2001; Marcouyeux & Fleury-Bahi, 2011) and socioeconomic status (Beyerlein and Hipp, 2006; Miner and Tolnay, 1998; Oliver, 2000; Oliver, 1984; Swaroop and Morenoff, 2006; Hipp, 2009). There is another additional item in this research considered as a influence factor of community structure that is living experience in the old *Siheyuan*. In previous investigations, Wu Liangyong and Sun Jian both used this factor measuring the change of community structure. Han (2003) also indicated the importance of living experience in the old *Siheyuan*. He pointed it out that old *Siheyuan* residents are more attached to their living place. Therefore, all perspectives of community structure mentioned above are as variables to explore the specific reasons causing low residential satisfaction on *Ju'er Hutong's* courtyard living.

## 3. INVESTIGATION

### 3.1 Research Methods

The methodology applied in the research is Qualitative Assessment that compares subjective data with objective data to examine residents' real attitudes living in *Ju'er Hutong's*. Those who provide positive responses to the subjective questions might conduct negative behaviors through objective observation. It could be checked by using this methodology. Interview, questionnaire and mapping analysis were chosen as the research tools to achieve subjective answers from the participants, and observation including photography and daily recording was applied to obtain objective data.

### 3.2 Participants and Procedure

As discussed in community structure section, participants in the research were divided into different groups based on 7 variables: age, nationality, home ownership, family structure, socioeconomic status, gender and living experience in the old *Siheyuan*. These variables will assist exploring the factors that could affect *Ju'er Hutong's* residential satisfaction in the analysis stage.

Author spent 14 days in the *Ju'er Hutong* communicating with residents and recording their responses to the questions based on the theoretical framework. Meanwhile, author also recorded residents' daily behaviors living in the *Ju'er Hutong* including neighbor greeting and chatting, courtyard using and community activities. 120 *Ju'er Hutong* residents were invited into this research and 70 of them finally participated in the investigation and provided useful information for this research.

It needs to be addressed that the variable of socioeconomic status and research method of mapping analysis were not successfully achieved from participants because they were unwilling to provide related information. From this point of view, it reflects the safety concerns and less patience of most residents in *Ju'er Hutong*. For the data that could not be obtained from mapping analysis, author used interview and questionnaire methods to replace it by asking participants direct questions about which parts of *Ju'er Hutong* they use, favor and dislike mostly. Therefore, there are still sufficient data

supporting the findings of this research.

### 3.3 Residential Satisfaction Measures

Questions in the interviews and questionnaires are designed based on the 4 perspectives that have been researched in the literature review section. Author measured place identity by examining general satisfaction, safety and group accepting. Place dependence was examined with items including public spaces, public facilities and residents' daily use of courtyard. Items concerning natural settings were considered about courtyard size, dwelling height and general physical environment. An additional item 'similarity to old *Siheyuan*' was also included based on the previous investigations of Wu Liangyong and Sun Jian. Items related to neighbor relation were examined with expectation, greeting and chatting behaviors, community activities and courtyard design influence.

In the survey, author processed scale items by asking the following directions, 'these questions or statements are related to your satisfaction on the different aspects about *Ju'er Hutong's* courtyard design. Please indicate whether you are satisfied or unsatisfied about the situations mentioned in the questions or statements.' Items were presented on a 5-point scale where '1 = Unsatisfied, 3 = Neither Satisfied or Unsatisfied, and 5 = Satisfied'.

## 4. RESULT ANALYSIS

### 4.1 Subjective Results

#### 4.1.1 A Comparison of Residential Satisfaction with 2008 Investigation

Figure 5 provides a clear comparison between 2008 and 2015 surveys about *Ju'er Hutong's* residential satisfaction on the courtyard design.

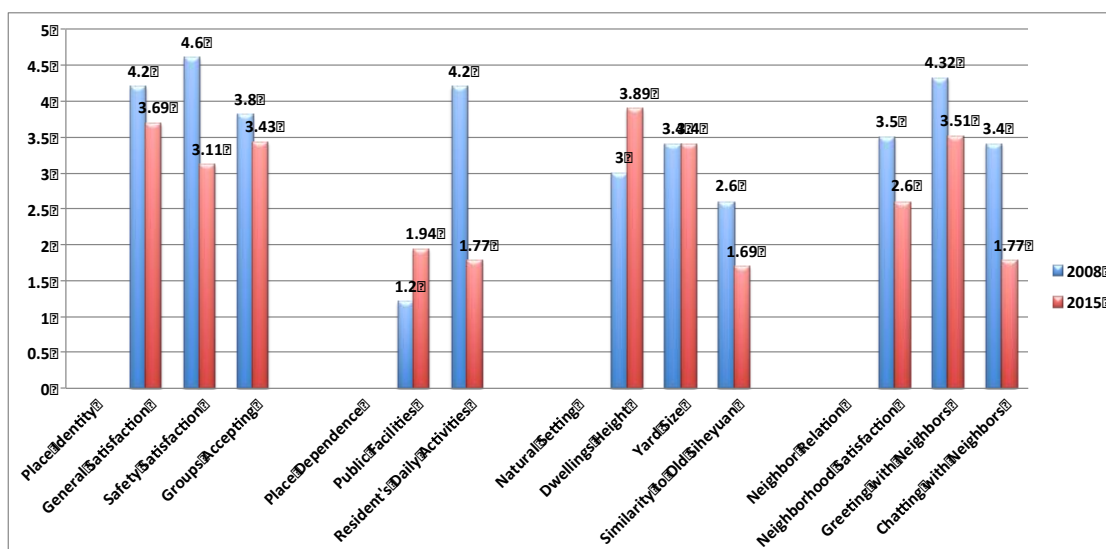


Figure 5. A Comparison of *Ju'er Hutong's* Residential Satisfaction between 2008 and 2015  
Source: Author

**Place Identity:** All questions score lower. Opened courtyard construction and the change of community structure could be concluded as two main reasons. Firstly, residents indicated that due to the opened

construction of *Ju'er Hutong*, there are many strangers appearing in the courtyard, which leads to their safety concerns. Some residents have to personally set up a community gate in order to increase their safety senses. Secondly, inhabitants demonstrated that because of significant change of community structure, there are too many old neighbors leaving and new people arriving, which causes their lost of belongingness. Thus, a number of residents started refusing accepting new groups of people, which raises the conflicts between neighbors.

**Place Dependence:** There is an interesting situation in this section that more residents are satisfied public facilities but fewer of them use *Ju'er Hutong's* courtyard conducting their daily activities. After analyzing the data, author finds that higher satisfaction on the public facilities is because many residents are not caring about these facilities as before. They are not 'really' satisfying. Therefore, it is understandable why there are fewer residents conducting activities by using *Ju'er Hutong's* courtyard.

**Natural settings:** It shows more positive results than that in 2008 investigation. *Ju'er Hutong's* courtyard spaces and dwellings height currently are satisfied by most residents. Although fewer residents think *Ju'er Hutong's* physical appearances are similar to old *Siheyuan*, it is not a reason for them not enjoying living in this architectural form.

**Neighbor relation:** This section shows very negative results on all questions. Many residents stated that they have less greeting and chatting behaviors with their neighbors than before. Firstly, current neighbors hardly know each other except a few old original residents. They feel shy or embrace greeting or communicating with others in the community. Secondly, there are not sufficient and appropriate spaces and facilities for them to talk with each other. Thirdly, *Ju'er Hutong's* courtyard design does not provide high frequent opportunities for residents to meet each other, which reduces the chances of interactions among neighbors.

Based on this comparison, it has already approved author's prediction that *Ju'er Hutong's* courtyard design cannot meet its current residents' living needs. Some new suggestions need to be considered in future Beijing courtyard housing renewal projects. Author needs more detailed information to find out the specific reasons that influencing *Ju'er Hutong's* residential satisfaction.

#### 4.1.2 Groups of Variables

Figure 6 shows the results from different groups of the 6 variables. It can be recognized that different groups of residents hold different satisfactions and attitudes on different aspects.

Items	2015	Age			Nationality		Home Ownership			Family Structure			Gender		Experience			
		Young	Middle	Old	China	N-China	Original	Bought	Rent	Share	Single	Couple	2 Gene	3 Gene	Male	Female	Lived	N-lived
<b>Place Identity</b>	<b>3.41</b>	<b>3.94</b>	<b>3.05</b>	<b>3.13</b>	<b>3.03</b>	<b>4.71</b>	<b>2.92</b>	<b>2.76</b>	<b>4.12</b>	<b>4.47</b>	<b>4.01</b>	<b>3.22</b>	<b>2.80</b>	<b>3.67</b>	<b>3.67</b>	<b>3.15</b>	<b>3.06</b>	<b>3.93</b>
General Satisfaction	3.69	4.11	3.36	3.53	3.34	4.88	3.00	3.16	4.37	4.80	4.14	3.67	3.00	4.00	3.91	3.46	3.38	4.14
Sense of Safety	3.11	3.67	2.71	2.87	2.74	4.38	2.88	2.36	3.84	4.00	3.76	2.92	2.53	3.25	3.29	2.94	2.90	3.43
Groups Accepting	3.43	4.04	3.07	3.00	3.00	4.88	2.88	2.76	4.16	4.60	4.14	3.08	2.88	3.75	3.80	3.06	2.90	4.21
<b>Place Dependence</b>	<b>2.17</b>	<b>2.24</b>	<b>1.79</b>	<b>2.78</b>	<b>2.10</b>	<b>2.42</b>	<b>2.21</b>	<b>2.04</b>	<b>2.40</b>	<b>2.00</b>	<b>2.27</b>	<b>2.28</b>	<b>1.78</b>	<b>2.42</b>	<b>2.03</b>	<b>2.28</b>	<b>2.14</b>	<b>2.00</b>
Public Spaces	2.80	2.93	2.50	3.13	2.67	3.25	2.50	2.84	3.11	2.60	2.90	2.92	2.41	3.00	2.66	2.94	2.86	2.71
Public Facilities	1.94	2.04	1.86	1.93	1.70	2.75	1.63	1.56	2.47	2.40	2.24	2.08	1.47	1.75	1.97	1.91	1.81	2.14
Daily Activities	1.77	1.74	1.00	3.27	1.93	1.25	2.50	1.72	1.63	1.00	1.67	1.83	1.47	2.50	1.46	2.00	1.76	1.14
Genres	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>Natural Settings</b>	<b>3.14</b>	<b>3.52</b>	<b>3.04</b>	<b>2.63</b>	<b>2.90</b>	<b>3.94</b>	<b>2.32</b>	<b>3.04</b>	<b>3.82</b>	<b>3.40</b>	<b>3.45</b>	<b>3.19</b>	<b>3.06</b>	<b>2.31</b>	<b>3.24</b>	<b>3.03</b>	<b>2.74</b>	<b>3.61</b>
General Satisfaction	3.57	4.11	3.36	3.00	3.26	4.63	2.63	3.56	4.16	4.00	3.86	3.75	3.47	2.50	3.74	3.40	3.29	4.00
Dwellings Height	3.89	4.26	3.86	3.27	3.67	4.63	3.00	3.88	4.47	4.20	4.33	3.75	3.94	3.00	3.97	3.80	3.26	4.29
Courtyard Size	3.40	4.04	3.14	2.73	3.07	4.50	2.50	3.24	4.16	3.80	3.86	3.50	3.24	2.25	3.57	3.23	3.05	3.93
Similarity	1.69	1.67	1.79	1.53	1.59	2.00	1.13	1.48	2.47	1.60	1.76	1.75	1.59	1.50	1.69	1.69	1.34	2.21
<b>Neighbor Relation</b>	<b>2.70</b>	<b>2.75</b>	<b>2.58</b>	<b>2.82</b>	<b>2.49</b>	<b>3.30</b>	<b>2.67</b>	<b>2.21</b>	<b>3.21</b>	<b>3.00</b>	<b>2.89</b>	<b>2.54</b>	<b>2.57</b>	<b>2.88</b>	<b>2.79</b>	<b>2.59</b>	<b>2.51</b>	<b>2.93</b>
Expectation	4.20	4.04	4.36	4.20	4.07	4.63	4.13	3.80	4.79	4.20	4.33	3.83	4.41	4.50	4.49	3.91	3.86	4.71
General Satisfaction	2.60	2.85	2.21	2.87	2.30	3.63	2.00	2.44	3.00	3.20	2.90	2.67	2.41	2.00	2.66	2.40	2.38	2.93
Greeting Behaviors	3.51	3.52	3.57	3.40	3.22	4.50	3.38	3.00	4.16	3.80	3.86	2.83	3.59	4.00	3.57	3.46	3.19	4.00
Chatting Behaviors	1.77	1.59	1.64	2.33	1.78	1.75	2.25	1.48	1.95	1.40	1.57	2.08	1.47	2.00	1.63	1.91	1.76	1.79
Community Activities	1.57	1.74	1.43	1.53	1.37	1.63	1.75	1.00	1.84	2.20	1.76	1.33	1.47	2.00	1.69	1.46	1.57	1.21
Courtyard Design	2.54	2.78	2.29	2.60	2.22	3.63	2.50	1.56	3.53	3.20	2.90	2.50	2.06	2.75	2.71	2.37	2.29	2.93

- Question 1: Generally do you satisfy living in the Ju'er Hutong?  
 Question 2: Do you feel safe living in the Ju'er Hutong?  
 Question 3: Can you accept different groups of people living in the Ju'er Hutong?  
 Question 4: Do you think the public spaces in the Ju'er Hutong are sufficient?  
 Question 5: Do you satisfy the public facilities in the Ju'er Hutong?  
 Question 6: Do you think the courtyard provides many opportunities doing activities?  
 Question 7: Genres of residents' daily activities in the courtyard  
 Question 8: Generally do you satisfy the physical environment of Ju'er Hutong?  
 Question 9: Do you satisfy the height of dwellings in the Ju'er Hutong?  
 Question 10: Do you satisfy the size of courtyard in the Ju'er Hutong?  
 Question 11: Do you think the architectural form of Ju'er Hutong is similar to the old ones?  
 Question 12: Do you think neighbor relation is very important in my personal life?  
 Question 13: Generally do you satisfy the neighbor relations in the Ju'er Hutong?  
 Question 14: Do you always greet with your neighbors?  
 Question 15: Do you always chat with your neighbors?  
 Question 16: Do you satisfy the community activities held in the Ju'er Hutong?  
 Question 17: Do you satisfy the courtyard design of Ju'er Hutong?

Figure 6. Scores From Different Groups of 6 Variables  
Source: Author

Generally overviewing current residential satisfaction of *Ju'er Hutong* from the 4 aspects, place identity has a positive middle level of satisfaction; natural setting has an average score; neighbor relation has a negative middle level; and place dependence has a very negative level of satisfaction from residents. Except the similar questions that are compared with the 2008 investigation, other additional questions in this research do not achieve high scores.

**Age:** Generally, young and old residents hold higher level of satisfaction than middle ages. Young people give high scores than old and middle-aged people in the place identity aspect, because they have less attachment to *Ju'er Hutong* than the other two groups. Older people live longer in *Ju'er Hutong* that contributes to their strong belongingness. Therefore, accepting other groups of people becomes harder for aged people, which also loses them the sense of safety. In place dependence aspect, old people are more reliable on using *Ju'er Hutong's* public spaces and facilities to conduct their daily activities like walking and warming clothes. Young people also often use *Ju'er Hutong's* courtyard for parking, smoking and holding parties. However, middle-aged people do not use *Ju'er Hutong's* courtyard frequently because they spend more time outside for their business and career. *Ju'er Hutong* is more like a place for them to rest and sleep but not to enjoy, which leads to their low satisfaction. In natural settings section, with the age getting older, people's satisfaction becomes lower. Older people connect more to the physical environment in the old *Siheyuan* form, which they need more time to get used to the new construction of *Ju'er Hutong*. In neighbor relation aspect, situations of the three groups are very similar, except old people showing more interactions with neighbors in the chatting option. This means that old residents need more positive neighbor relations to enrich their community lives.

**Nationality:** Chinese and international residents hold very different attitudes living in *Ju'er Hutong*. In place identity aspect, because of the different cultural background, international residents feel more fresh living in this architectural form. They are willing to accept more other groups and owning higher safe senses. In the place dependence aspect, it shows that Chinese residents require more public



facilities and larger public spaces because they do more activities in the courtyard. Most international residents are young and middle-aged people who do not use *Ju'er Hutong* courtyard often as Chinese. In natural setting aspect, international residents give a much higher level of satisfaction than Chinese except similarity to old courtyard houses. In neighbor relation aspect, international residents also show a higher level of satisfaction except the chatting behavior. They stated that it is nature and common to greet with neighbors using simple Chinese words, but very difficult to communicate with their neighbors because of language and cultural problems.

**Home ownership:** Overviewing the results, original residents and those who bought houses in *Ju'er Hutong* feel less satisfied than the ones in the renting and sharing situations. In place identity aspect, because of living longer here, original residents and who own houses have stronger attachment to *Ju'er Hutong*, which contributes to their lower group accepting and more safety concerns. Those who are renting and sharing living places move frequently, so that they get used to different living environments. For them, it is easier to accept new neighbors and feel safer in a new place. In place dependence, all groups give negative results, except original residents indicating that they do daily activities more than other groups because courtyard has already become a part of their lives. In natural setting aspect, only original residents provide low level of satisfaction. Before *Ju'er Hutong* was renewed, they had been living in this location for a long time. They witnessed the change of *Ju'er Hutong* and have more memories about old *Ju'er Hutong*, which influences their satisfaction on the new physical settings. In neighbor relation aspect, people in the renting and sharing situations demonstrate that they like greeting with both old and new neighbors because it is common for them to accepting new things. Original residents greet less but chat more with neighbors because they wish to talk to their old neighbors who they familiar with, which other three groups do not have that chance.

**Family structure:** Generally, opinions of these four groups are very different. In place identity aspect, singles give higher level of satisfaction than other three groups because most of them are young people who can easily accept new things. 3-generation families also provide a positive comment in this section because their whole families are living in *Ju'er Hutong* that brings them strong senses of belongingness. In place dependence, all groups are unsatisfied with all questions, especially for 2-general families. Most of 2-generation families are young parents with a little kid. They want more public spaces and facilities like new communities that could provide more functional use for their lives. In natural setting aspect, 3-generation families give much lower scores than the other three groups because they do not think *Ju'er Hutong's* courtyard is good as old *Siheyuan* courtyard form. Some grandparents are afraid that their grandchildren cannot experience the 'real' courtyard housing living from *Ju'er Hutong's* design. In neighbor relation aspect, all four groups have very similar situations with negative middle level of satisfactions.

**Gender:** The factor of gender fails to be proved as one of the factors affecting *Ju'er Hutong's* residential satisfaction. It can be told based on the results that females and males hold very similar attitudes towards *Ju'er Hutong's* courtyard design.

**Living experience in the old Siheyuan:** Analyzing the data, people without experience living in the old *Siheyuan* provide higher level of satisfaction than the ones with experience, except in place dependence section. In place identity aspect, residents lived in old *Siheyuan* before know more about the sense living in a courtyard construction. *Ju'er Hutong* fails to give them the feeling of old *Siheyuan*. For the ones not experienced courtyard living, they said it is like a new experience for them living in *Ju'er Hutong* compared with some modern communities, so that they give higher satisfactions. In place dependence aspect, both groups have similar attitudes not satisfied with current *Ju'er Hutong's* facilities



and spaces in the courtyard. In natural setting aspect, residents with old *Siheyuan* living experience generally satisfy the physical settings of *Ju'er Hutong* but do not think the new construction is similar to the form of old *Siheyuan*. People without experience also think the physical looking of *Ju'er Hutong* is different from the old *Siheyuan*, but feel more fresh and exciting about it. In neighbor relation aspect, no experience residents have higher expectations on *Ju'er Hutong* courtyard living and greet more with their neighbors. However, their satisfactions of general neighbor relation and courtyard design stay a negative middle level because they do not know how to build up social networks in this architectural form.

From the variable analysis, it could be concluded that age, nationality, home ownership, family structure and living experience in the old *Siheyuan* are factors affecting *Ju'er Hutong's* residential satisfaction, but age cannot regarded as a factor influencing Beijing courtyard housing living. Author suggests an analysis of *Ju'er Hutong's* community structure variation since last investigation, which could assist predicting the future change of *Ju'er Hutong's* residential satisfaction.

### 4.1.3 A Comparison of Community Structure with 2008 Investigation

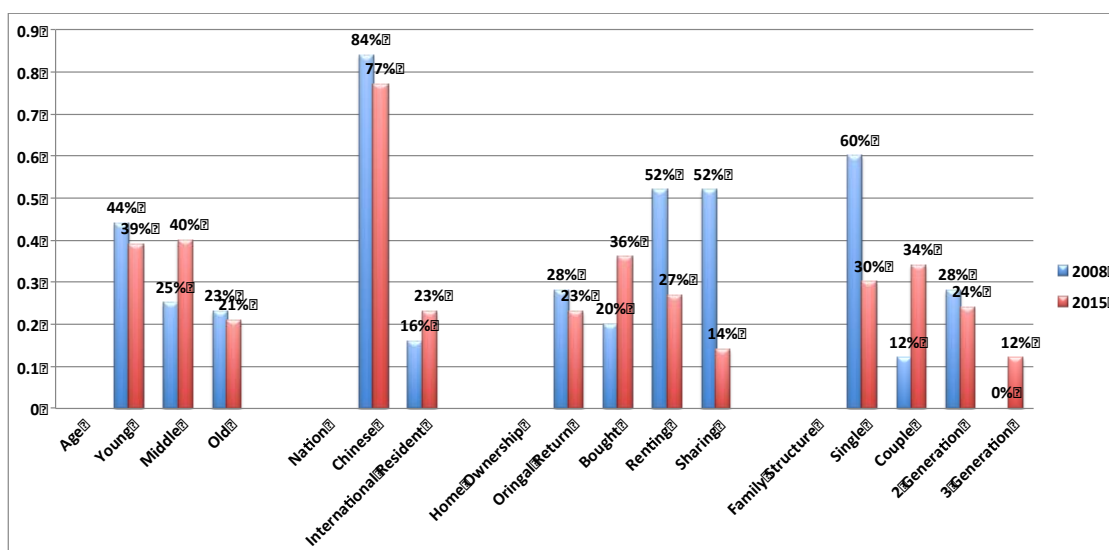


Figure 7. A Comparison of *Ju'er Hutong's* Community Structure between 1992 and 2008  
Source: Author

Figure 7 shows the change of *Ju'er Hutong's* community structure since 2008. The decrease of young and old people number and increase of middle-aged people bring the stability of *Ju'er Hutong's* community structure, but also lead to the low residential satisfaction in the future. More international residents moving into *Ju'er Hutong* brings community structure's diversity and contributes to a higher level of residential satisfaction. Residents who bought houses in *Ju'er Hutong* becomes the main living group, which makes the community structure more stable, however, loses the high satisfaction. Multi-generation families become more and singles become less, which causes lower level of satisfaction.

Summarizing these data, although international resident's number increasing brings the diversity of *Ju'er Hutong* community structure and offers a hope on a higher level of satisfaction, more other groups with low satisfaction become stable that contributes to the final negative residential

satisfaction in the coming duration.

## 4.2 Objective Results

Objective data achieved in the investigation here is made a comparison with subjective data that can reflect the real attitudes of *Ju'er Hutong's* residents on their living satisfaction. Figure 8 shows the comparison on the group accepting and safety senses. It can be clearly seen that objective data demonstrates lower level of satisfactions than subjective data on these two sections. Although some residents think they feel safe living in *Ju'er Hutong* and can accept more neighbors, their real attitudes are different. Figure 9 shows the comparison among residents' daily activities. Fewer residents conduct activities in the courtyard than they think. Except parking and chatting behaviors, other behaviors are much fewer than the answers from residents. Figure 10 shows the comparison on the neighbor relation aspect. Both greeting and chatting behaviors are not many as they expected. A lot of residents indicated that they have a good neighbor relation, however, it needs to be doubted about from the observed data. Overlooking this comparison, fewer residents actually are satisfied living in *Ju'er Hutong* and using courtyard.

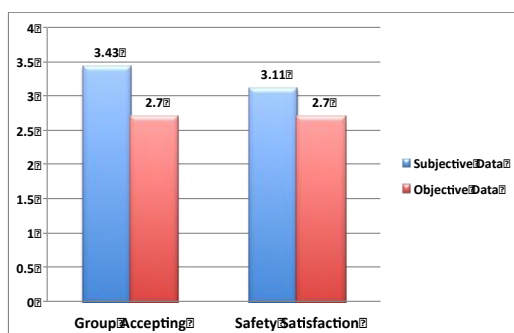


Figure 8. A Comparison of Personal Perception  
Source: Author

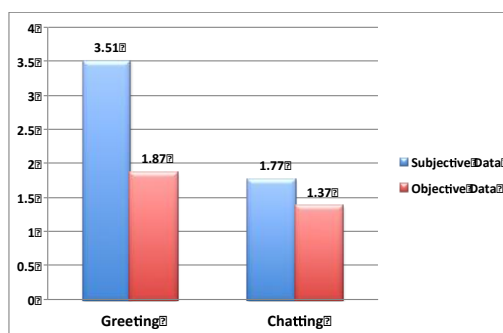


Figure 9. A Comparison of Neighbor Relation  
Source: Author

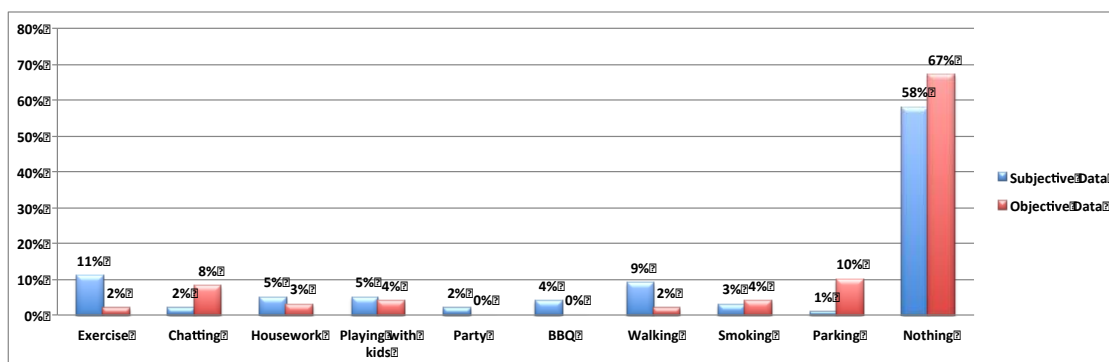


Figure 10. A Comparison of Residents' Daily Activities  
Source: Author

## 5. CONCLUSION

The purpose of this study was to examine *Ju'er Hutong's* courtyard design from residential satisfaction perspective and explore the related factors affecting it. From the results analysis, author successfully finds out that *Ju'er Hutong's* residential satisfaction has become much lower since its

establishment in 1991. Currently, Ju'er Hutong's courtyard design cannot meet its residents' living needs from all aspects including place identity, place dependence, natural setting and neighbor relation. Although *Ju'er Hutong* inherits the essence of old *Siheyuan* and creates a new form of courtyard housing, it fails to be regarded as a positive sample of Beijing courtyard housing renewal project at this moment. Meanwhile, community structure variables of age, nationality, home ownership, family structure and living experience in the old *Siheyuan* are successfully proved in this research as the factors that significantly affect Beijing courtyard housing living. Future studies could focus more on the problems found in this research and provide related solutions in the future courtyard housing renewal projects. The theoretical framework redeveloped in this research also does offer other scholars a valid and inclusive method to examine other courtyard housing projects in China.

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## INTERVENTION IN JULY 9TH: A NEW PLAN FOR MISURATA CITY, LIBYA

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### ABSTRACT

Libya's urban form has changed radically since the second half of the 19th century. Prolonged exposure to non-traditional and non-regional cultural, sociopolitical, economic, and design influences has caused certain developed areas to be plagued with many of the same problems the western world is facing in cities built within a similar framework. These blights include: high energy consumption, contaminated water, air quality, and traffic. This thesis explores the affect of the cultural crisis manifesting within the urban form. In order to design a contextually relevant building typology it is imperative to assess the architectural language of the culture. The portion of this project will include a historical evaluation of building typology in North African cities throughout time and in conjunction with population levels. Based on established patterns, and with the goal of driving future development in the right direction, a regionally responsive urban typology is to be developed. The chosen site for the building typology is one based purely on necessity of intervention. Due to recent revolutionary undertakings, the July 9th neighborhood in Misurata city, Libya, is used as an example to show how a new vision of a hybridized architectural intervention can prove to redefine how a city and its people relate to one another. This project looks to confront the problems of a region left destitute in the wake of war and destruction.

### 1. INTRODUCTION

"Learning from the existing landscape is a way of being revolutionary for an architect. Not the obvious way, which is to tear down Paris and begin again, as Le Corbusier suggested in the 1920s, but another, more tolerant way; that is, to question how we look at things." In the spirit of this quote from Robert Venturi, the success of the project that follows lies in the readers willingness to adhere to the inherent importance of understanding and learning from the current set and setting of the city of Misurata, Libya. Oddly enough, the condition of the city is one that is, at least partly, torn down and ready to be rebuilt. A problem presents itself in the way in which the people of the city go about developing the urban fabric. The solution to this problem rests solely on the design decisions made, which are based on the available information set. The crux of this issue rests upon the vastness of information provided via the digital age superset. When developing a localized typology it is imperative to use localized historical design methodologies so as to remain unaffected by outside elements and the potential detriments posed therein. The goal of this project is to stay true to traditional urban heritage, culture, and climate in an effort to maintain an ecologically sustainable model for future development. Therefore, the aforementioned success of the project extends to its efficacy in relation to the architects of Misurata adherence to the typology as presented herein.

Proper analyses of the existing conditions of North African cities require an historical interpretation of contemporary elements of structures and interstices making up the urban fabric. These

elements include: height, form, and materiality of buildings, street width and materiality, layout, location, and size of open spaces, building and street use by local inhabitants and their community interactions. By analyzing these factors, this project will work to identify which morphological elements need to remain and which can be evaluated for change as development progresses toward a master plan.

Through the varied history of Misurata, a coastal port town located in Northern Libya on the southern shore of the Mediterranean Sea, influences of outside rule have played part to urban development patterns. Turkish and Italian occupiers often sought control of the port so as to control trade routes, but due to recent economic stability provided by oil exportation, Libya was able to secure its independence. While these specific outside forces explicitly influenced said development patterns up until the 1950's, the influence of various non-specific 'Western' forces were allowed to overlay the urban framework due to the ease with which indiscrete and unquestioned information began to flow into the country post-independence.

One example of this occurred in 1974 when the government built housing projects using western building typology blatantly ignoring the more deeply ingrained architecture of the Arab culture. Government run projects opened the proverbial floodgates for a multitude of countrywide application and replication of similar methods, which not only ignored cultural consideration but also climatic consideration. The cascading effects of these design decisions changed the traditional urban heritage by imposing edits to local social patterning concerning: privacy of residential units, human to building scale, physical and social integration, interaction between buildings, enclosed open spaces, and linkages between housing, markets and social facilities, which were previously considered essential cultural assets of the historic cityscape.

It is to be understood that the changes in the development pattern in Misurata required the people to adapt to the new model rather than fitting the model to the people's established way of life. Suddenly, it became necessary for people to drive automobiles just to survive. In this one example it is apparent that there became an inherent lack of social and cultural consideration, which correlates to a multitude of crisis acting to disturb the very core of the community's quality of life. It shows how one seemingly insignificant change can lead to overcrowding, air pollution, lack of proper infrastructure and public space, and poor planning policies that do not consider previous urban settlement practices. In hindsight, it is easy to see the detriment of relentless and unfettered non-local overlays create, or at least play a major role in unsustainable city planning. What to do then once this realization is made? Would it be foolish to believe that designing a contemporary reapplication of traditional modes and methodologies could reverse the damage to a city's cultural identity? What is to be done in considering the inherent/insidious violence of the architectural movement?

To answer this question, simply return to the opening quote of this introduction and reconsider the set and setting. The condition of the city of Misurata is greatly deteriorated due to the 2011 revolution. The opportunity exists to consider historical influences and apply the necessary changes required to develop a culturally and environmentally sustainable building typology. There is a need presented in the storied past of this city and the post-revolution people are looking for an appropriate way to improve their quality of life based on knowledge of past design decisions.

The two elements for a successful implementation of the ideas put forth in this project become: a learning from the existing landscape and a questioning of how we look at things. The project will assess necessary changes to the current patterning of the area so as to accommodate social and

cultural needs as well as future growth projections. This assessment is to be built on planning policies and long-term consideration of infrastructure spending from a national perspective. After the assessment, a successful project will culminate in a large-scale housing typology. The study is to explore urban design with its main emphasis on urban design/landscape and how this affects the city structure.

Design research for this project is based on interpretative historical research, supported by a number of maps showing North African cities including Old Tripoli, Gahadmes, Tunis, Fes and Marrakesh. General information on the cities' design and urban planning will help to gain an understanding of Arabic city structure and building morphology. Qualitative research is intended to study the physical condition and pattern of Misurata city in order to understand the idea of urban design/landscape and how it involves the urban fabric. However, the goal in this study is to integrate a new housing typology with the idea of urban design of architecture and landscape. Through this process, the goal is to find a way to connect these elements within the contemporary urban neighborhood of Misurata. The analysis is to help design a new plan of the housing morphology for July 9th neighborhood in Misurata city, Libya.

## 2. A TYPOLOGICAL STUDY

The following is an analysis of North African cities, which are part of the Arab world. This will show similarities in architectural settlement patterns with regards to the urban form of development (See Figure 1). Each of the demarcated North African cities were influenced by the Andalusian-Spanish and are considered part of the Arab world. This study will help to identify and isolate the architectural elements that belong to the Arab community.

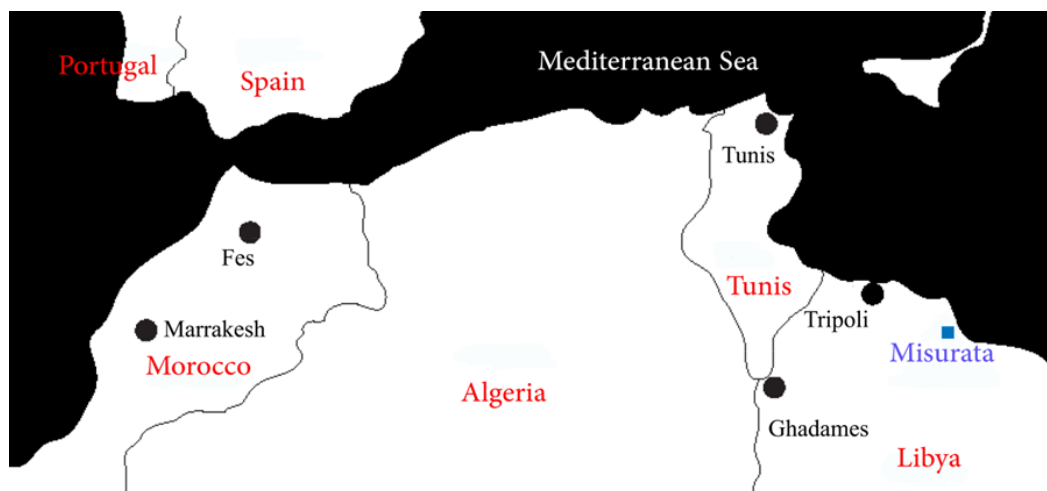


Fig. 1: North Africa cities  
(Source: Aymen Elmagalfta)

“The original locations of Arab settlements depended on availability of natural resources such as water supply, locations of existing trade routes, and sometimes on the religious significance of certain places.”

2 The Arab cities of North Africa illustrate this idea (See Figure 2).

2 Anthony Kiet, "Arab Culture and Urban Form." Focus: Journal of the City and Regional Planning Department 8, no. 1 (2011): 10.

In the center stands a mosque, the spiritual and intellectual center of the city - its brain and heart. Nearby is the palace of the ruler, near the mosque, one finds candle and perfume makers. As the center of learning, the mosque borders the university and library.

Clothes materials can also be found in the area, steps away are hostels for travelers, then the gate. These parts of an Arab city are logically organized in similar fashion to the organs of the human's body. Also, the walkways determine the pedestrian circulation. 3 The study will help to understand the prototype of building typology and how it's interwoven into the city's fabric. It is impossible to identify the urban settlement pattern without understanding the traditional urban forms.4 Selections shown are those based on the traditional urban qualities and climate conditions which still exist in the region. The precise forms that the Medina (Medina is a City in North Africa Language) took in response to these powerful forces are also examined and illustrated.

3 Pauld Spreiregen, Urban design: The Architecture of Towns and Cities (New York, McGraw-Hill, 1965), 21.

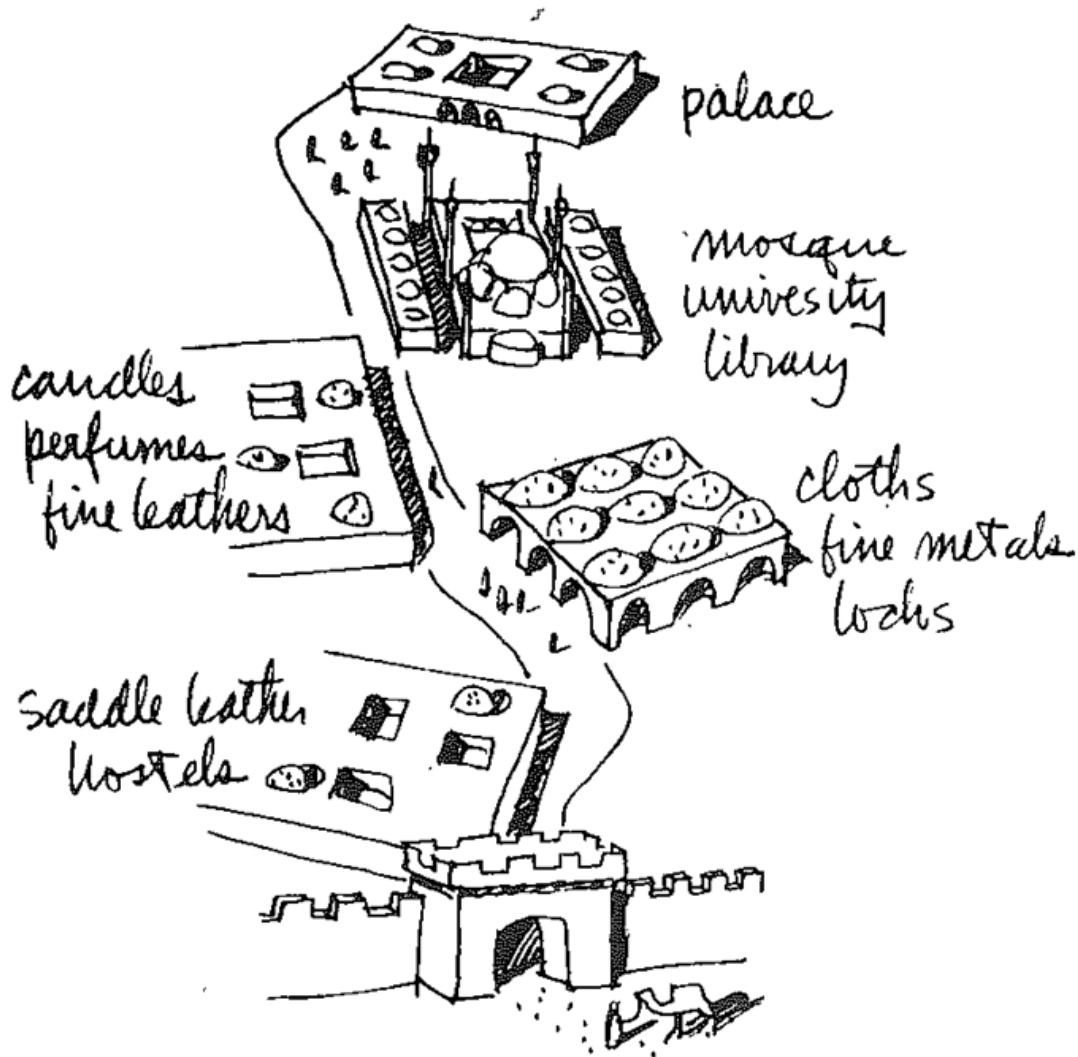
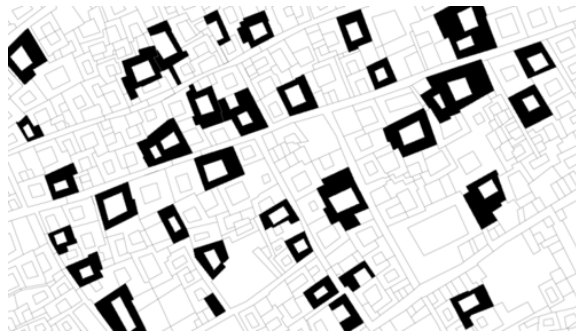


Fig. 2: Structure of Arab City. (Source: Urban design: The Architecture of Towns and Cities)

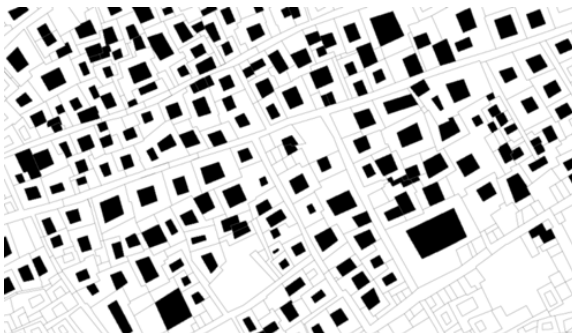
4 Mahmoud Hassan Daza, "Understanding The Traditional Built Environment: Crisis, Change, and The Issue of Human needs in The Context of Habitations and Settlements in Libya" (PhD diss., University of Pennsylvania, 1982).



Building Typology



Street Type



Courtyard Pattern



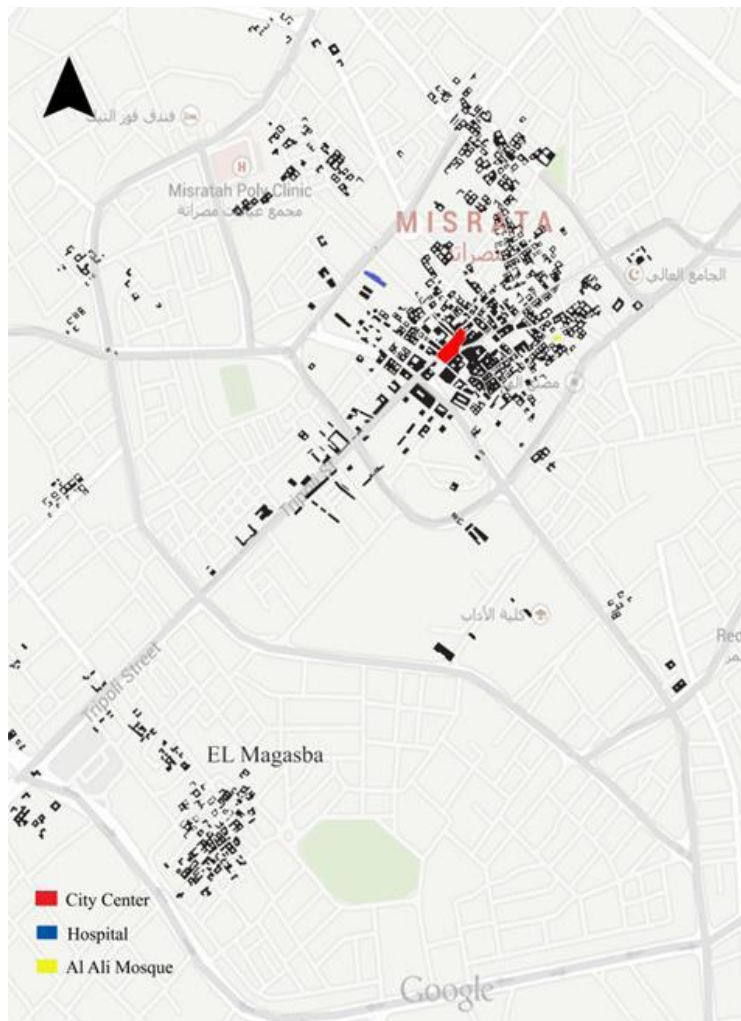
Open space versus building

Fig. 3: Analytique of Urban Form, Old Tripoli  
(Source: Aymen Elmagalfta)



### 3. MISURATA AS A SITE OF NEW URBAN INVESTIGATION

Reconciliation between the two theories is that the city was initially founded by the Romans who referred to the settlement as "Tubartis" or "Thubactis" and it was later reestablished following the Muslim conquests and named "Thubaqt." In any case, in the 7th-century, it served as a caravan supply center and as an important port.<sup>5</sup> In the year 1860, the Turks colonized the city. They built a number of administrative buildings and the market in the second half of the second century decade, which have been retained as well. This is the interpretation of the settlement of the old city under the Turks' colonization (See Figure 4).



5 David J. Mattingly, *Tripolitania* (Michigan: University of Michigan Press, 1994), 132.

Fig. 3: Misurata City in 1860

Misurata is divided into two distinct sections. Older Misurata consists of small stone houses and narrow arched streets. The architecture of the city is divided in four elements (1) the relation of town and state, (2) the market (souk), (3) the relation of religious institutions to the town, (4) the relation of residential and domestic space. The large mosque is the center of the city, both symbolically and physically. This is the only building remaining from the old city, while the rest were demolished. To the people, this is a sign that the hub of the city is based on the spirituality of religion in the Islamic culture. On the other

hand, the newer part of the city, which began to develop in the 20th-century, consists of modern buildings inspired by western countries module, homes, factories, and industrial areas. Misurata has a modern infrastructure, including paved roads, electricity, and communications.

#### 4. URBAN DESIGN INTERVENTION FOR JULY 9TH NEIGHBORHOOD IN MISURATA

The following section will focus on how to incorporate the site into design implementation and how it is to become a module for a new housing typology. The site under consideration is left in ruins after an attack during the revolution on February 17th, 2011. The selection of this site is based on the analysis of the whole city because it is the most damaged area and needs to be redeveloped. It will look at the site's neighborhood and how it can be changed to become a model for a more resilient urban design typology.



Fig. 4: Building Typology  
(Source: Aymen Elmagalfta)

#### 5. URBAN DESIGN/LANDSCAPE

The design project is using a green belt for site intervention. The idea is to introduce a green belt into the city fabric and show how it can help to implant new architectural elements to the site. There is a big park surrounding the site but it is not connected to the city. This segregation affects the social life of the neighborhoods. Green belts can function both as a garden space for reflection as well as a network connection enhancing the experience of the downtown area (See Figure 5). This acts to engage the entire city because it becomes a place for locals and visitors to effortlessly come together. This offers a 'front porch' to the city on the doorstep of the downtown neighborhood. It builds a network of public spaces that connect the green spine pathway to important destinations, nearby neighborhoods, and the city.



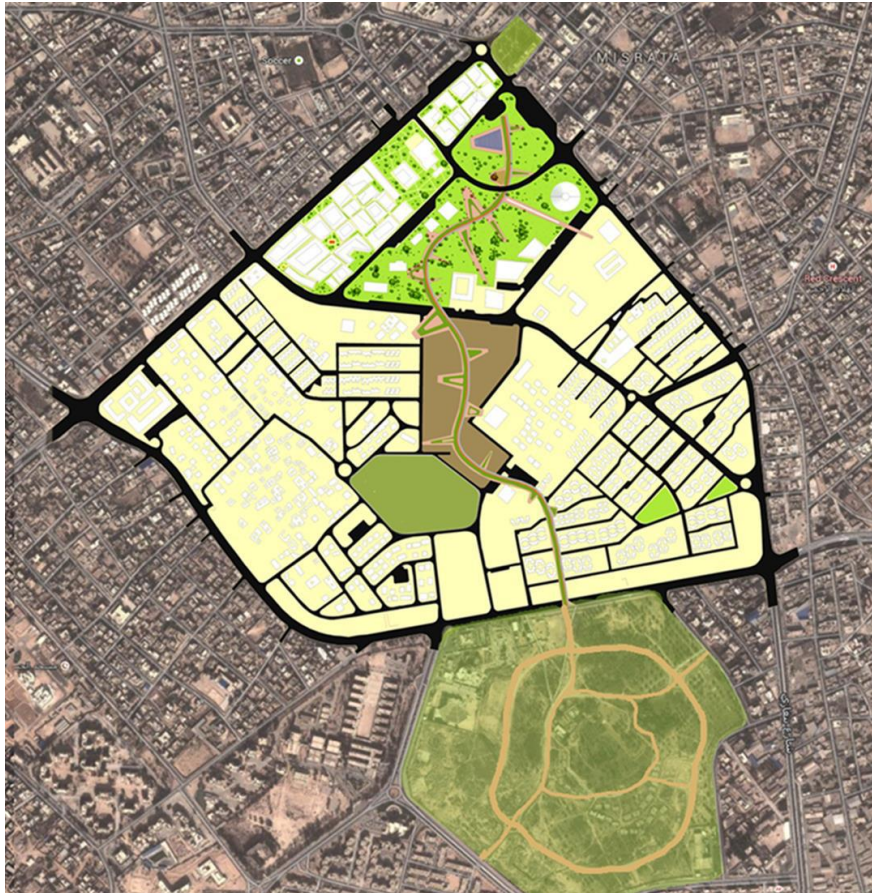


Fig. 5: Green Spine  
(Source: Aymen Elmagalfta)



Fig. 6: 3D view of Site study  
(Source: Aymen Elmagalfta)



Fig. 7: Land Use  
(Source: Aymen Elmagalfta)





Fig. 8: Street view in residential neighborhood  
(Source: Aymen Elmagalfta)





Fig. 9: Street view of Plaza A  
(Source: Aymen Elmagalfta)



Fig. 10: Birdseye view of Plaza B  
(Source: Aymen Elmagalfta)



Fig 11: Prospective bird's eye view  
(Source: Aymen Elmagalfta)

## 6. CONCLUSION

Through the development of this thesis it becomes clear that urban form holds great potential to be the design language for repairing prospective damage from cultural crisis. The design provided herein works both physically and historically by mitigating potential negative impacts on the rest of the country in terms of development and interventions of future building typologies.

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## A LIVEABLE HERITAGE BUILDING - THE ARCHITECTURE OF A SHOPHOUSE CASE STUDY: SUN YAT SEN MUSEUM, GEORGE TOWN, PENANG

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### ABSTRACT

The Sun Yat Sen Museum in Penang is a converted shophouse in the heritage area of George Town. The building is a living example of the architectural heritage of George Town which is a superb example of Straits Settlements merchant's shophouse. This city was added to the UNESCO's world heritage list in 2008 to acknowledge its rich cultural heritage that constitutes of unique architectural and cultural Townscape along the Straits of Melaka. This paper investigates the architectural layout of a shophouse and a liveable cultural heritage building that has been converted into a museum in George Town, Penang. Classified as the eclectic style shophouse, it is rich in design and art components featured in its architecture that are still surviving until today. This building has an interesting mix of architectural and cultural inspirations adapted from the Chinese origin, with the local Malay ethnicity and the European influence that has colonised the region. The introduction of new non related architectural components into the Southern Chinese (Eclectic Style) style in shophouses in George Town has resulted in the disappearance of this unique style of architecture. This investigation employs a qualitative research approach by documenting evidence and understanding the architectural and cultural influences of the southern Chinese Eclectic Sty by studying the Sun Yat Sen Museum as a case study. The findings of the research point towards an understanding of the architectural and cultural influences that govern the design of the shophouse and its architectural character.

**Key words:** Layout, architectural and cultural influences, shophouse, eclectic style

### INTRODUCTION

The main purpose of this paper is to examine the architectural value of eclectic style. The Straits eclectic is the architectural manifestation of east meeting west. Elements of European architecture are incorporated into properties that usually belong to Asia and very likely Chinese owners. In fact, it is rich in design and art components featured in its architecture that are still surviving until these days. The Straits eclectic style came about during a prosperous era in the history of George Town in between 1840s to 1910s. It was also during the period when George Town experienced an influx of Chinese immigrants. Most of the ornate clan shophouses in George Town were built during this period of time. Furthermore, this city was successfully added to the UNESCO's world heritage list in 2008 to acknowledge its rich cultural heritage that constitutes of unique architectural and cultural Townscape along the Straits of Malacca.



## HISTORICAL BACKGROUND OF PENANG ISLAND

Briefly, in 1786, the first British Trading company was established by Captain Francis Light in Penang Island. This was to ease their trade between India and China. Pearl of the Orient is just another name given to Penang Island which is located in the north-west coast of Peninsular Malaysia with the total area of 285 square kilometer for the island whereas 760 square kilometer is the size for its mainland which is known as Seberang Perai (Figure 1). UNESCO has recognized Penang Island as one of its heritage area on 7<sup>th</sup> July 2008. This status was awarded to Penang due to its uniqueness in architectural as well as cultural landscape within the town itself. This makes them so unique and special as compared to any other places in the world (<http://whc.unesco.org>).



Figure 1: Map of Penang Island, Core and Buffer Zone of UNESCO World

However, it is observed that the architecture of Penang is an eclectic mixture of the European classical style, Islamic, Malay, Indian and Chinese. Interestingly, the well blend of different religions, cultures and architecture from the various groups co-exist in harmony. As a result, one could see the present of mosques, churches, Buddhist and Hindu temples standing side by side on the same street in George Town, Penang. Many of the well-preserved and restored straits eclectic style of shophouses and Townhouses in George Town stand as a liveable architectural values and culture which is part of Penang heritage when the city experienced abundant growth and prosperity. The opulence is reflected in the rich ornamentation. The pilasters, spandrels, every possible blank space would be embellished with stucco decorations.

## ECLECTIC STYLE

The Chinese community settled in the area along the Straits of Malacca during the western occupation. The predominant architectural characteristics were most likely originated from Chinese settlement. The architecture and art patterns with adoption of Chinese elements appeared on shophouses especially in façade design structure. The shophouses built during this period of time is known as eclectic style or Baba-Nyonya's Shophouse (Chansen, 2014). Ahmad emphasized that the development of architecture with straits eclectic style commenced sometimes in between 18<sup>th</sup> until early 20<sup>th</sup> century. The combination of Eastern and Western elements style in the early 20<sup>th</sup> century has introduced ceramic artwork and elaborated plaster renderings. Those architectural covers types of shophouses, George Town, Penang, (Ahmad, 1994)

## DEFINITION OF SHOPHOUSES IN GEORGE TOWN, PENANG

The shophouse (Malay: rumah kedai) which was built in between 17<sup>th</sup> to early 20<sup>th</sup> century is one of the unique architecture found in South East Asia particularly in George Town, Penang and Malacca (Chen, 2007; Wan Ismail, 2005). The shophouse is usually used for commercial activities and it possesses a private structure. It is also known as row house which in general would have two or more storey. Most of the time, the commercial activities would take place on the first floor whereas the upper floors would be places for residential. The continuous rows of 19<sup>th</sup> century shophouses are part of the remarkable identity of Penang. This is available along the old streets. However, the term shophouses in most of the countries in Southeast Asia refers to multiple storeys building with the ground floor reserved for commercial activities whereas the remaining floors as residential place. But this is not an ideal case in Penang whereby a shophouse could purely be residential place and sometimes might be termed as a terrace house too (Knapp, Ong, & Wang, 2010). Thus, as in the case of 120 Armenian Street, it was designed mainly for residential purpose. The unique Chinese form of shophouses resulted from local influences and colonial's modification in an attempt to adapt to tropical climates

## SHOPHOUSE STYLE IN GEORGE TOWN, PENANG

Penang Heritage Trust (heritage of Malaysia trust, 1990) has classified shophouse buildings in George Town into 6 main historical styles. Those are, Early "Penang" Style (1790s - 1850s), Southern Chinese" Eclectic Style (1840s - 1900s), Early "Straits" Eclectic Style (1890s - 1910s), Late "Straits" Eclectic Style (1910s -1940s), Art Deco Style (1930s -1960s), Early Modernism Style (1950s - 1970s). The unique architectural and decorative features in each style represent the history of George Town in a different period of time. One could say their building might have 'heritage value' only if the shophouses still retain the distinct historical features or at least restore the features that might have been lost. We can find the original features and decorative elements of our shophouse in this. Thus, shophouses ought to revamp the presents of conventional structure in order to enhance the building performance toward greener design in parallel to support the sustainable development.



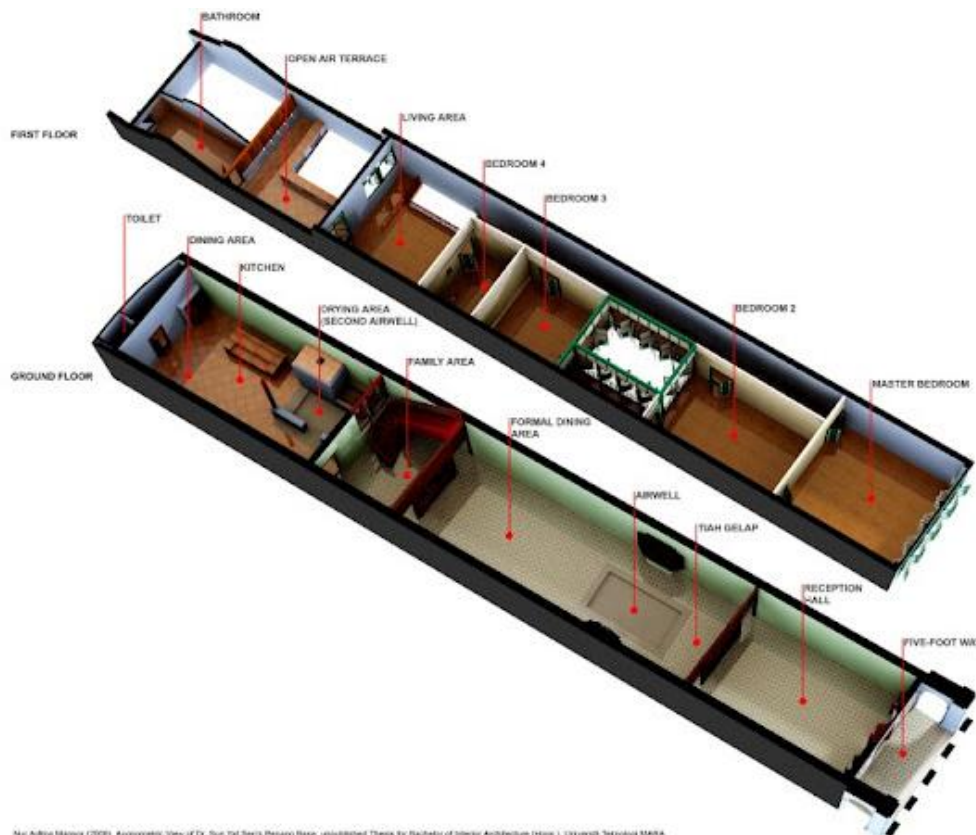
Figure 1: The period of shophouses were classified by Penang Heritage Trust  
<http://penangshophouse.blogspot.com/2010/03/introduction-to-shophouse.html>

## SUN YAT SEN MUSEUM

It is observed that most of the shophouses in Armenian Street, George Town, Penang would either become as residential or just for business purpose. Along this 300 meter street which is significant with its street diversity also is where the Sun Yat Sen Museum situated along with the



George Town Heritage Office With length of approximately 300 meters, it is the base of many residential shophouses , museums like Sun Yat Sen building, markets as well as George Town heritage office. Principally, the Armenian Street in George Town has a history of interest to those who occupied them. Occasionally there was a significant activities being structured in there led by Dr Sun Yat Sen. Those activities took place in the shophouse found at 120 Armenian street which was associated with Dr Sun Yat Sen that was known as father of the nation. Moreover, the shophouse itself served as a significant base for Sun Yat Sen’s activities in George Town, Penang. It has become as one of the good example from the late 19<sup>th</sup> century association style whose significance has been enhanced by his personal association with it. Sun Yet Sen Shophouse was built around 1880 as a residential Townhouse. The narrow double storey building structure is a very good example of merchant’s house in the Straits Settlements. The building comes with a covered walkway or at least complimented with five-footway which would be linked to the neighbor shophouse. This is to ease the pedestrian move and secure their safety. Some of the original features that are still available on this 130 feet (40 meters) height building are like a courtyard garden, timber made staircase, geometric tiling floor as well as its large beams spanning lime plaster walls (Figure 3).



Yvonner & Alvin (2013). Architectural Plan of Dr. Sun Yat Sen's Penang Base, unpublished Thesis for Bachelor of Interior Architecture (Hons.), Universiti Teknologi MARA.

Figure 2: Internal shophouse layout of Sun Yat Sen Museum (Yvonner & Alvin, 2013)

The interior is fully decorated with the original black wood made of Straits Chinese furniture and ornately carved wooden screens (Figure 4).



Figure 3: Black wood Straits Chinese furniture and carved wooden.

However, the old-fashioned Nyonya kitchen does still maintain the original firewood stove as well as its kitchen utensils (Figure 5).



Figure 4: Kitchen with antiques (a) kitchen, (Barbara A.) (b) firewood stove and kitchen utensils (Reese, 2011).

It is part of the Municipal commissioners of Penang mandates for the new shophouse to be built with bricks, plaster coat and roofed with fire proof tiles instead of wood or attap thatch which was commonly used before. This was officially executed right after a fire happened in 1814. As could be seen from Figure 7, the air ventilation and light would be sheathed from a series of wooden louvered shutters which is placed at the upper storey of full faced. However, nowadays the shophouses are equipped with two layers of glass windows but the wooden made shutters is said yet to be installed. A series of ornamental ventilation ports too could be seen from the bottom of the shutters. It is made of ceramic tiles along with some carved openings as well as painted in light blue hue colour (Yvonner & Alvin, 2013). In general, the second storey of shophouse building would have over-hanged veranda that acts as a protection to the underneath walkway from the sunshine or even heavy downpours. Usually, square and rectangular glazed tiles with floral and colourful geometric patterns will cover the surface of five-foot way as well as the walls under the paired windows of veranda. This was commonly found during the dwelling time of Peranakan Chinese (Baba-Nyonya). A symmetrical ventilation port which is a lobed opening with butterfly or bat shape with lateral stretch would always be seen at the top of ground floor windows. It always complimented with a series of protective iron bars. A painted wooden made inserts is equipped in each of these lobed openings to serve as ornamental as well functional purpose. A stylized *shou* means “longevity” character surrounded by four bats could be seen from the insert molded feature.



Figure 5: Shou featured by four bats and Wu

*Wu* which is represented by five essential elements of good fortune marks the traceability of 5<sup>th</sup> century which were written in *Shujing* or “Book of History”. It is very famous especially in the Ming and Qing dynasties. Those five elements are longevity, wealth, health, love of virtue and lastly to die in a natural way at the old age. Zhuang Rong Yu is the three characters which could be seen on top of the entrance door placed on a horizontal signboard refer to Ch’ng Eng Joo which is the name of a firearms company that is Ch’ng Teong Swee. The characters of Guorui Jiaxiang means “Prosperity” for the country and “Auspiciousness” for the family is available on the surface of red doors (Fatland, 2013). An elongated building with the width of about 5.50 meters and 40 meters in height would have a shady and dark internally. It comes without a spatial component known as skywell. Sometimes, airwell or lightwell also refers to skywell. In the south of China, skywell is called “*tianjing*” commonly found in urban shophouses or even in country homes. It provides a passive mechanism for internal ventilation as well as light through an attenuated structure.



Figure 6: Skywell

One room could be found after passing through the front entry. This room is backlit by the skywell that radiates through the two doorways as well as a carved wooden wall screen which separates the living hall for public from the more privacy behind area meant for family members. A rectangular altar table with a square table down under serves for family members to worship deities. Meanwhile, a space further inside or upstairs would be a preferred place for ancestral tables.





Figure 7: A room after the entrance backlit by skywell

A welcoming space for visitors which is not invited to go in beyond the screen is located along the sides of the room. This area will be furnished with a table, stools, heavy wooden chairs as well as side tables are arranged symmetrically (TourismPenang.Net, 2015) in the courtyard of Sun Yat Sen building (Figure 6).



Figure 8: Courtyard of Sun Yat Sen Interior Decoration

The lithographed portrait of Sun Yat Sen could be seen on a carved wooden frame with is full of low relief carvings and lattice panel's decoration. The portrait of Sun Yat Sen is a common portrait to be seen in any Chinese schools in the past. Besides the two flags with each one of them for the Nationalist party (Kuomintang) as well as Republic of China, there carved with his famous motto "The revolution is not yet over, comrades must continue their efforts." A bright and windy place furnished with a set of table and chairs is reserved for guests to drink tea while having conversation is located next to a rectangular skywell. The skywell provides a cozy place till the second floor allows a myriad type of greenery available in the shophouse. Huge vats used to be a reservoir tank to store the falling rainwater for domestic use. If we looked further inside, an antique wooden made curio cabinet is attached to the wall with an iron safe imported from Birmingham around 1900 used to keep account books as well as cash.



Figure 9: A lithographed portrait of Sun Yat Sen

One could find a corner with an atrium-like indoor outdoor room with some kind of grand spiral staircase leads to the family's rooms in upstairs level. Access of the light and wind to the bedrooms and storerooms on second floor would be coming through the wooden louvered panels which surround the skywell. Generally, the master bedroom will be at the front of the house which is full of shuttered walls and louvered windows (Yvonner & Alvin, 2013). <http://sunyatsenpenang.com/architecture restoration/>

## CONCLUSION

This paper has presented about the Sun Yat Sen Museum in Penang. It is a converted shophouse in the heritage area of George Town. The building is a living example of the architectural heritage of George Town which is a superb example of Straits Settlements merchant's shophouse. The research findings of this study has brought the author towards a significant understanding of the architectural and cultural influences that govern the design of the shophouse which characterizes the Baba-Nyonya architecture. The truly extraordinary culture expresses the beauty, grace and passion of lifestyles synthesized by two major groups of people, the Chinese and the Malay. It can be seen from the discussions that each style has distinctive architectural and decorative features which represents the history of George Town's at different period of time. These shophouses are perfect example of architecture that used materials which are locally available such as lime, clay stone and timber. Likewise, the Sun Yat Sen Museum also possessing architectural features such as air vents and air well that help with natural ventilation and cooling within a building. Due to the concerns arose on the architectural liveable values and also the implication of dwindling number of shophouses, it is important for the architectural values as well as the cultural impact of these shophouse buildings to be discussed further so as to sustain the presence of shophouse and its distinct architecture in future. This could also be secured with the protection of World Heritage Site, UNESCO.

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## THE INFLUENCE OF INTERIOR DESIGN FACTORS ON TOPOLOGY OF THE GENERATIONS OF TRADITIONAL SHOPHOUSE IN GEORGETOWN - PENANG

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### ABSTRACT

Shophouse in Penang, Malacca, and Singapore is one of the unique type buildings in the global. Shophouse shaped through different generations affected by the physical environment and cultural factors. Georgetown- Penang is one of the well known heritage area in the world. Therefore, it's listed in UNESCO World Heritage as a heritage area. Georgetown has a unique eclectic architecture and interior design style, which mixed with the multi-culture and architectural style, like Malay, Chinese, Indian, and European touches. Shophouse in Georgetown is one of the architectural identity buildings in Penang. The present era is effecting shophouse topology by using new and unusual material and shapes to re-design and reuse for business, entertainments, or any commercial purposes. Originality of the place was effected, micro edits today will lead to lose giant cities. The changing has started from the nearest area to the users, which is an interior design area. The strategies of design, using new material, and themes of design that used in designing interior spaces like, café, coffee shop, restaurant, and retails in Georgetown going to use the simplicity element. Simplicity in design should follow a clear way to be effective positively on the identity and aesthetic value of the design. In this paper, design factors that effected the topology of shophouse generations will be found by using interviews and geometrical analysis as a technique of the methodology. Selected case from three different periods of shophouse generations. Geometrical and topological analysis for selected shophouse in Georgetown – Penang will be compared to find the effective element of design. The effective design elements in interior design are: shape, form, space, texture, colour, light volume. The primary results show the excessive simplicity in the metaphoric processes to design an interior shophouse as a livable place in the livable heritage city.

**Keywords:** shophouse, coffeeshop, interior design, heritage, physical factors.

## 1. INTRODUCTION

Interior design of heritage places influences by different kind of factors. Design factors have the effective influences in the topology of places. Little change could lead to lose the identity of that place after a while. The architectural style in Georgetown shaped by a unique mixture of harmonized architectural element and styles, which presents the mix-culture of Georgetown. Each community added and edit the interior space of shop house to be adaptable with the traditional live of that community. However, this editing process increased the value of space by creating new and unique styles, which is known as "Eclectic Architecture". While, the reusing of shophouse in Georgetown as an entertainment and other types of used like coffee shops, restaurant, and bars involved strange forms and themes in the heritage buildings (see figure 1). As a result, the exterior reflects the heritage of Georgetown, but interior space is totally reflected the idea and the concept of the designers. In concluding, the visitor to Georgetown will store the new image about the place, which is the strange architectural styles and themes that used in designing the interior space of heritage buildings.



Figure 1: Out of context, strange materials and element to design the coffee shops in Georgetown.  
 Source: Researchers

Year by year, new material and themes added to the interior spaces of heritage shophouses in Georgetown. Georgetown – Penang, Malaysia is one of the most significant heritage sites. Heritage buildings in George town have an exceptional conjunction of harmonic architecture style, variety of building types and functions (Hassan & Yahaya, 2012; Ahmad, 1997). Nowadays, Georgetown is the commercial, historical, tourism centre of Malaysia's northern region. The user can sense and smell the authenticity of the place, as well as, can recognize the real story of the Georgetown streets and how was shaped (Khoo, Streets of George Town, Penang, 2007). Georgetown is famous in the coffee shop places, many types of coffee shop within different location and building types. Most three types of coffee shops in Georgetown are located in traditional shophouse, attached to the hotel, and street coffee shop. The current study conducted to discover the effective design factors on the originality of the shophouse as an architecture type in Georgetown. Interviews with users, owners, and old people who have an original image about the cases were done to collect the data, in addition to observation for 3 coffee shops from different shophouse generations, in order to observe the evolution stages of the topology of the traditional shophouse.

## 2. BACKGROUND

The interior design process of social space and heritage place is a critical issue, designers should deal with three types of design factors to reach the point of creating good place (Oldenburg, 1998). Design factors linked to the physical environment of the place, which consist of effective sub-factors. Layout, relation between out and in, furniture order, theme, architecture elements and free movement are effective factors on the topology of the places, which designers could play with these factors to change the image of space from heritage to modern or opposite (Ching & Binggeli, 2012; Abdulqader, Ibrahim, & Bahauddin, 2014; Atmodiwirjo, 2014; Grimley & Love, 2013). The function of the space is playing a necessary role with design factors to adjust the interior space to cover the needs of the users. In the current era, users' needs are updating following to contemporary age. Therefore, the physiological, psychological, and emotional human needs are changed according to the modern age. The characterized features of design in the current age are going to be simple by abstract the use of details and form. Therefore, it dispensed with everything are not related to the utilitarian function of the design, focus on the functional identity of places. The value of simplicity in design affects the value of space and quality of life (Maeda, 2006).

Simplicity, as a strategy, is unintentionally used by designer to formulate the coffee shops in Georgetown with high level of simplicity (Ahmad, British Colonial Architecture in Malaysia, 1800-1930, 1997). Some design going to be more complex than complexity design. Simple space is a general required by users to spend time within space understood by them and familiar (Moore, 1979; Maeda, 2006; Abdulqader, Ibrahim, & Bahauddin, 2014). Shophouses as an architectural style affected by the design factors in term of originality and identity of space, which included strange architectural styles and the changing reach the topology of shophouses (Penang, George Town, historic cities of the straits of Malacca, Special Area plan, 2013; The Straits Times, 2014). Nowadays, coffee shops within shophouses are using the first part of the place as, no more to use as a type.

### 2.1 SHOPHOUSE

Georgetown is the commercial, heritage, and tourism centre of Penang state and northern region of Malaysia. Georgetown contains different types of building and amenities, which became a target point for millions of local and international tourists (Khoo, Streets of George Town, Penang, 2007). The architecture style of Georgetown is a unique style, it formed from variety architecture elements and the impacts of mix-culture create the architectural framework for Georgetown. During the 19th Century, the Malayan bungalow emerges, which is a mixture of European and local characteristics. Timber posts and thatched roofs, the shophouses and temples built by the Chinese immigrants. The Indian temples built by the Indians. This mix of cultural influences has created an architecture that is unique in its eclecticism and adaptation to local climate and values. Consequently, the building types in Georgetown are as follows: (Traditional Malay houses; The Malayan bungalows; Shophouses and townhouses; Mosques; Churches; Chinese temples; Hindu temples; Administrative buildings from the periods of Portuguese, Dutch and British; Commerce buildings; God owns; Water villages or clan jetty. All these types located in two main heritage zone, core zone and buffer zone (figure 2) (Penang, George Town, historic cities of the straits of Malacca, Special Area plan, 2013).

Shophouse is a unique architecture type in Georgetown, built two hundred years before were constructed as an original type with special form and traditional architectural elements. Therefore, shophouse have been formulated by the affects of multicultural and styles, including the Malay, Chinese, Indian, British, and European. The shophouses documented the relations and the stories of



the heritage and history of Georgetown, which is making it a valuable legacy and Carving on the walls the story of the settlers of this city as " Pearl of the Orient"(Hassan & Yahaya, 2012; UNESCO, 2015; Khoo, 2007; Yap, 1990). The shophouse is the common urban element is the Southeast of Asia, and especially in Georgetown, Malacca, and Singapore. The Shophouse is a building included two functions, residential and commercial. The term came from Hokkien language 'tiam-chhu', which means shop and house. The normal one shaped from two to three stories, five-foot width in front, which provides a walkway gallery. The type and style of shophouse related to the location, period, and which community (Khoo & Berbar, 2009; Chai, 2011).

Shophouses mostly built with brick and timber. The walls are the remarkable elements in constructing it. As well as, it has two sequence area with fixed width. The width is very narrow, around 13 to 20 feet, the depth is around four times the width of shophouse between 100 and 120 feet. The walls divided the shophouse to square rooms. Coffee shops within shophouse are a unique functional and architectural type were built in rows of blocks and the design produced a very compact housing type. Walls are an important element in the design of the shophouses, it has a flexibility term to adapt with the new used and function(Hassan & Yahaya, 2012)..

The interior design of shophouse has a special open space element, which is designed based on the Chinese traditional courtyard, but the size of this open space is smaller than the original one, because the small size of the shophouse width (Ahmad, 1994; Penang, 2013). The air-well or the courtyard is very important element in the interior space of the shophouse, which is usually located in the middle part and used as a relaxation space. The interior space contains normally the same area size and the same width. A privet zone is located in the depth at the back, which consist of bedrooms, kitchen, dining, and toilet (figure 3) (Ahmad, 1997; Hassan & Yahaya, 2012; Chai, 2011).



Figure 2. The Core and Buffer zones of Georgetown heritage city.

Source: George Town, historic cities of the straits of Malacca, Special Area plan (Penang, 2013)



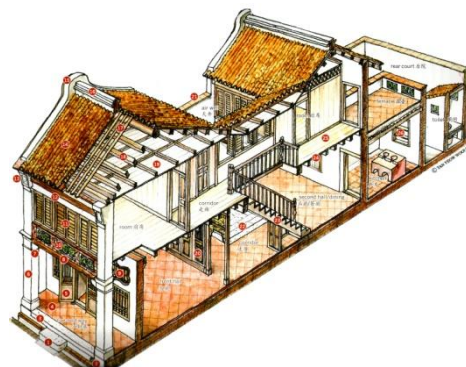


Figure 3. The typical shophouse in Penang.

Source: Penang Shophouses, A Handbook of Features and Materials.(Wooi, 2015)

There are six main types of shophouse according to the architectural styles . Figure 4 shows the physical characteristics and the period of each style. There are six generations of the shophouse in Georgetown, which represents the stages of the development of the shophouse. These stages are interacting with each other and modified to create the styles. The six styles are: (Ahmad, 1994; Hassan & Yahaya, 2012; Bristow & Lee, 1994; Khoo & Berbar, 2009; Penang, 2013; Wooi, 2015) :

- Early Penang Style.
- Southern Chinese Eclectic Style.
- Early Straits Eclectic Style.
- Late Straits Eclectic Style.
- Art Deco Style.
- Early Modern Style.



Figure 4. The six architectural styles of Shophouse in Georgetown.

Source: re-edited and adapted from (Ahmad, 1994; Hassan & Yahaya, 2012; Penang, 2013)

Most of these buildings, especially the shophouses are adapted to new used like restaurant, coffee shop, gallery, museum, and workshop. Coffee shops in Georgetown have variety styles and themes, Baba-Nyonya (see figure 5), Indian, traditional Malay, eastern and western styles(Khoo, Streets of George Town, Penang, 2007). The coffee shop style is affected by the surrounding area styles in Georgetown, it is a mixture of European, Malay and Chinese style with adaptation to the tropical ambience. Moreover, this special character of coffee shops and shophouses in Georgetown provide a fundamental platform for heritage tourism. According to Sustainable Tourism Research

Cluster(2014), report there is 54.6% of the visitors were international and 45.5 were domestic, as the same time 48.7% were attracted to heritage sites.



Figure 5. Me.n.u coffee shop, Baba-Nyonya style  
Source: Researchers

## 2.2 INTERIOR DESIGN FACTOR

Nowadays, Interior design process in the heritage area go after the conservation rules of the Governments and heritage organizations in the world. The limitation of the creativity in heritage places is the ignition point to another type of creativity of design by using simplicity to create great and good places (Oldenburg, 1998). Simplicity and complexity are a measurement tool of aesthetic value and originality value. Create a simple interior design is a tricky challenge, especially in the heritage area. The results of simplicity as a design factor could be a disaster if the designing process reflects opposite concepts (Maeda, 2006; Abdulqader, Ibrahim, & Bahauddin, 2014).

Metaphoric strategy widely used in designing coffee shops, abstract the architectural element and changing material, texture, and colour lead to losing the originality of the architectural elements, as a result, the interior space will be a strange space (Ching & Binggeli, 2012). As well as, the function of interior space affects the originality of the place by the re-use and adaptation process of heritage buildings. Layout, furniture styles and arrangement, the relation between outside and inside are a design factor for any interior projects (Merrell, Schkufza, Li, Agrawala, & Koltun, 2011). The free movement and circulation create flexible space and free to move through it, which reduce the negative area in the interior space.

## 3. METHODOLOGY AND APPLICATION STUDY

The current study conducts to find the effective design factors on the order of the generations of shophouses in Georgetown. Reviewing the scholars lead to identify the main variables that related to the design factors (see figure 6). As well as, the relation between these variables and the order of interior space are evaluating by the real users of the coffee shop third space. The unstructured interview question was asked to the two kinds of users, the visitors and owners. The interviews were documented and recorded by Stereo IC- Recorder (Sony ICD-UXX523fF). While, notes were written during the interviews. Additionally, observation of space and user were done to understand the effects of physical environment on user behaviour. Behaviour map also draws out to provide data of the relation between human needs and interior space.

The main variables connected each with design factors and quality of space, which quality of space in this paper reflects the originality of interior order of heritage shophouses. As well as, the

effective variable will deal with the quality of space and interior design factor as action and re-action of design.

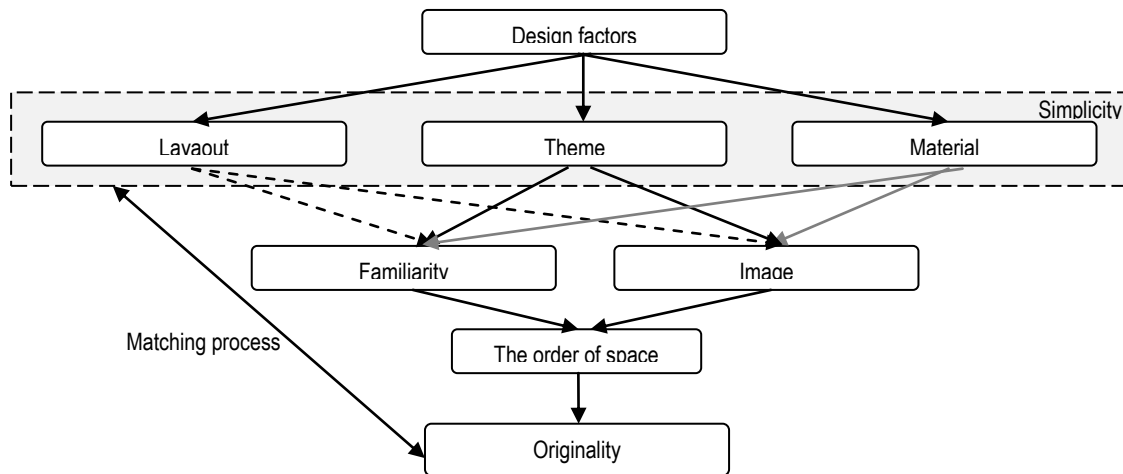


Figure 6: The sequence relations among interior design factors, users, and places.  
Source: Researchers

Total samples of the current paper were 13 visitors and 3 owners. The data collected from three coffee shops within heritage shophouse ( ME.N.U, JAWI HOUSE, TEA OR ME). The observation for the cafes were 4 hours each within 3days during business hour (5pm-9pm). The coffee shops are located in the core zone of Georgetown, where visitors are mostly tourists.

#### 4. RESULTS AND ANALYSIS

The harmonized mixture of culture in Georgetown made from collecting data absolutely difficult, because of the verity community and communication with the interviewers. Therefore, the samples selected randomly included locals, local tourists, and international tourists. The results form observation of the three coffee shops are mainly present the effective functional of coffee shop, as well as, 40% from the shophouse are used for the real function and the rest is closed or used as a stores. The coffee shops that have a strange architecture elements and themes are totally different from the original shophouse. It used the just the first part of the shophouse, which made users confused about the space or the building. This mismatching between the mental image of the user and the existing image could create new generations of shophouse, which is out of the heritage building. The editing in the original coffee shop is mainly for floor and some other material, which is not effected on the originality of the type. Users are involved in the interior space of the coffee shop from the outside and mostly chose the seat near a traditional thing, and traditional seating and tables more than middle area (see figure 7).

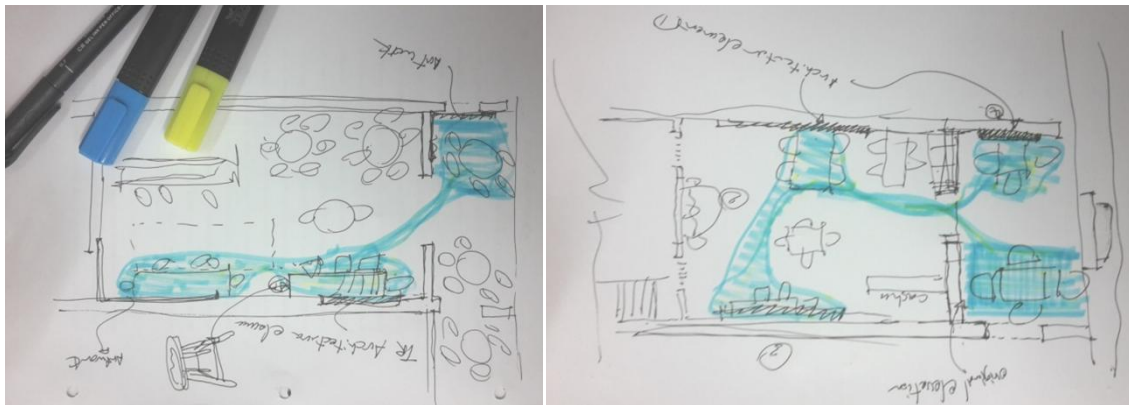


Figure 7: observation notes of users behaviour and characteristics of space.

Source: Researchers

The results show that the familiarity value was high level in the new generations of coffee shop. On the contrary, original interior design of shophouses designed to be fit for the group of people of family, the users feel little of fear and strangeness, especially if it's the first time for the user to involve in traditional shophouse. The strangeness creates the attraction to the place, even using the simplicity in designing or arranging the furniture. The layout of shop house was changed within the modern cafe, it became one place for the different types of users and purposes. Shophouse has special zones, arranged in sequence from the entrance until back area and connected with the residential area vertically by decorating stairs. The user feels more exciting and freely to move and capturing images in the heritage shophouses, especially in the Baba-Nyonya shophouse. From the answers of question, even the tourists like to keep the original interior design of the shophouses with some edit to adapt to the function.

## 5. CONCLUSION

The identity of places depends on the stages of evolution of the first original forms. Each little change following by changes in another stage will create an adaptive generation for special environment and purposes. Our current age going to be simple to deal with complex things, while this simplicity is difficult to reach in the heritage area because of the limitation of design and rules. Simplicity is needed by the human to understand the space perfectly and feel free inside it. But human also need for strangeness as a type of exciting and challenging within coffee shops created inside heritage shophouse. Layout of the coffee shop, theme, and metaphoric architectural elements linked to the originality of the place. Simplicity in some coffee shops in Georgetown crosses the value of simple and again dropped to complexity, which changes the topology of shophouse and become used 40% of the whole building. Heritage city should have heritage interior space, not just heritage façade. Heritage is not just a building, it is an essence of architectural and interior characteristics. To conserve our heritage cities active and sustainable in our generations mental image, fake skin of the heritage building should removed and consider the second skin of interior space, which is located between the user bodily skin and interior space.

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## INVESTIGATION OF DAYLIGHTING PERFORMANCE FOR HIGH-RISE APARTMENTS IN KUALA LUMPUR, MALAYSIA

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### ABSTRACT

In Malaysia, residential buildings are currently constructed in the new style high-rise buildings. Architects and engineers face a major challenge to provide a comfortable living environment in residential buildings. The functional arrangement of space, occupants visual and thermal comfort is highly affected by proper design for daylighting. Daylight is considered as the best source of light and it is the light source that most closely matches the human visual response. Furthermore, energy used for lighting is significantly reduced when natural lighting is properly utilized. This paper addresses the daylighting performance of selected high-rise apartments in Kuala Lumpur. Energy Plus software is utilized in measuring the daylighting performance as it has been validated for accuracy and offer great capability for simulating a wide range of design features and daylighting implications. Daylighting performance is addressed in terms of illumination level and daylight factor. The impact of window area, glazing type room depth and building orientation on daylighting performance is investigated.

**Keywords:** Apartments; Daylighting; Daylight Factor; Illumination Level

### INTRODUCTION

Malaysia experienced economical rapid development in the late 1980s. This provided the opportunities for new types of professions and attracted migration by the rural population to the urban areas. Consequently, the housing construction sector has been significantly developed and the development of urban areas, mainly in Kula Lumpur, has been considerably increased. The number of residential units in urban areas has increased from 827,100 units in 1980 to 2,071,100 units in 1991 Due to government effort. New building construction materials and methods have been introduced to build affordable and mass housing units. Terraced housing and lately high-rise apartment buildings are the most typical of the modern housing industry built based on modern construction techniques (Hassan, 2002)

Residential buildings are currently constructed in the new style high-rise buildings totally different from the traditional ones. They are built with highly glazed façade and thermally lightweight

buildings which are unsuitable to the local hot and humid climate. This is chiefly obvious in urban areas where land is limited while population is high.

Daylighting is an important factor in interior design affecting the functional arrangement of spaces, occupant comfort (visual and thermal), structure, and energy use in buildings. It gives a sense of cheeriness and brightness that can have a significant positive impact on the people. Daylight is considered as the best source of light for good colour rendering and its quality is the one light source that most closely matches human visual response. The amount of daylight entering a building is mainly through window openings which provide the dual function not only of admitting light for indoor environment with a more attractive and pleasant atmosphere, but also allowing people to maintain visual contact with the outside world (Li and Tasang, 2008).

According to Illuminating Engineering Society of North America (IESNA), daylighting is a technique to bring natural light into a room by manipulating this free resources to achieve required illumination level in that room. By having a good daylighting strategy, it helps to create a visually stimulating and productive environment for building occupants. It is reported that the performance of daylight entering into the area depends on some of internal environment (size and position of the windows, the depth and shape of the rooms and the colours of the internal surface) and external factors (light reflected from the ground and opposite obstruction) (Li et al, 2006). The performance of natural light that penetrates through various size and position of fenestration need to be investigated, in order to make sure that enough amount of daylight is received without creating any undesirable effects to occupied space.

In recent years, greater recognition has been given to the contribution that daylight to energy conservation in buildings. The utilization of daylight can remarkably reduce energy consumption in buildings. Energy consumption can be reduced by 40% for lighting and 11% for total energy consumption if daylighting is properly integrated with artificial lighting (Alashwal et al, 2011) In terms of luminous efficacy (i.e. the amount of light provided per unit heat gain), daylight (100 - 200 lm/W) is much better than the (16 - 40 lm/W) for incandescent and 50-80 (lm/W) for fluorescent lamps that are commonly installed at homes (Lam and Li, 1998), because less heat is introduced to achieve the same lighting level and less cooling will be required. This is particularly beneficial tropical climates such as Malaysia, where air-conditioning accounts for a large portion of the total electricity consumption in the residential sector. The more daylight is made available in a building, the less artificial lighting is required.

In Malaysia, windows are the most common fenestration used in residential buildings. This is to allow natural daylight transmits into the interior of the building and allows occupants to maintain visual contact with the outside view. Size and position of the window can have a major impact of the efficient use of daylighting and therefore reduce the electric consumption for artificial lighting.

The main objective of this paper is to investigate the daylighting performance of selected high-rise apartments in Kuala Lumpur. Daylight performance is addressed in terms of daylight factor and illumination level. The impact of window area and glazing type on daylighting performance is investigated.

The daylighting performance of a building is always evaluated in terms of the daylight factor, which by definition is the ratio of the internal illumination to the outdoor available illumination (Egan and

Olgay, 2002). In the early days, daylighting design was based on the point-by-point calculation method. Later, the concept of average daylight factor is proposed, which indicated the visual adequacy of the daylighting in space as a whole rather than any particular point, for daylighting calculations. In principle, average daylight factor can be predicted using considerably less input data than the point-by-point.

### **Availability of Daylighting in Malaysia**

(Zain-Ahmad et al) 2002 conducted a research to study the hourly daylight availability for the Malaysian sky using daylight modelling techniques based on empirical and measured solar irradiation and cloud cover data. This research presents the techniques involved in producing exterior illuminance data. These data were then compared with measured illuminance at Shah Alam and Bangi, Malaysia. It was found that the global illuminance levels are generally high, with values exceeding 80,000 lux at noon during the months when solar irradiation is highest. Even during the months when the ground receives less solar irradiation, the peak illuminance can reach 60,000 lux.

### **AFFECT OF WINDOW DESIGN VARIABLES**

#### **Building Orientation**

A proper orientation of the building is the major factor which affects daylight penetration. Due to the movement of the sun in Malaysia, it is recommended that layout of the building to be on east-west axis with the major windows facing either north or south in order to maximize penetration of daylight. Direct sunlight easily transmits and result to the increasing building energy consumption by 20% or more when windows facing to the east or west (Husin & Harith, 2012).

#### **Glazing Type**

The glass used for windows in building has different energy-performance characteristic. That is the ability to resist heat transfer (U-value;UV), ability to control solar heat gain through the glazing (Solar Heat Gain Coefficient;SHGC) and the amount of light passes through a glazing material (visible transmittance;VT). By knowing the amount of UV, SHGC and VT of the window, it helps user to select the right window in order maximize daylight effectiveness and occupant comfort. In Malaysia, the most common glazing type used is 6mm thick glass with U-value of 5.6 W/m<sup>2</sup>K, shading coefficient between 0.4 – 0.96 and visible transmittance from 20 – 80% (Tang et al, 2006).

#### **Window areas**

For a given glazing type, the critical factor determining the daylight entering a building is the window area. Window area is commonly represented by the window-to-wall ratio (WWR) which is defined as the ratio of the total area of windows to the overall gross external wall area (including windows). Most WWRs are between 25 and 30%. Buildings with low WWRs are mainly located in older and densely populated zones where buildings are built close to each other with windows on the shorter facades. Recent residential units tend to have high WWRs of more than 35% (Ibrahim & Zain-Ahmad, 2007).

## RESEARCH METHODOLOGY

A theoretical modeling approach is used to achieve the main objectives of this paper. Three recent high-rise apartment buildings were selected in Kuala Lumpur for this research. Energy plus program is used for hourly model simulation under the selected weather conditions using a weather data of a typical meteorological year (TMY). Selection of the suitable program depends on many factors related to program capabilities to simulate the problem at hand as well as other factors, including program reliability, ease to use, etc. Several available simulation programs were reviewed and Energy Plus program was selected because of its reliability as it has been widely validated for accuracy and consistency (Witte et al, 2001).

This software uses RADIANCE for daylighting simulation. RADIANCE is a backward ray-tracing program that accurately predicts light levels and rendering. For daylighting analysis, RADIANCE generates readings in illumination level and Daylight Factors (DF). After the three cases are modeled and simulation is performed, daylight factor and illumination level results are obtained. The impact of window area and glazing type on daylighting performance are investigated.

## CLIMATIC CONDITIONS OF KUALA LUMPUR

Kuala Lumpur is located at the latitude 3°7'N, and longitude 101°32'E, and the climate is classified tropical wet climate with no dry or cold season as it is constantly moist (year-round rainfall). The diurnal temperature range is of minimum 26–28°C and maximum 31–33°C. The average difference is 6.7°C – 8.3°C with annual RH value ranges from 58 - 66% (Liggit & Milne, 2008).

## MODELLING CASES DESCRIPTION AND CHARACTERISTICS

Three high-rise buildings apartments are selected for this study. These residential buildings are selected as they represent the trend of modern residential design which has mostly a glass façade. They are located in Kuala Lumpur, Malaysia. While the First case (Mirage Residence) is located at the Kuala Lumpur city center, the other cases (288 Residency and Maxim Residence) are located at Sentul and Setapak respectively as shown in Figure 2.

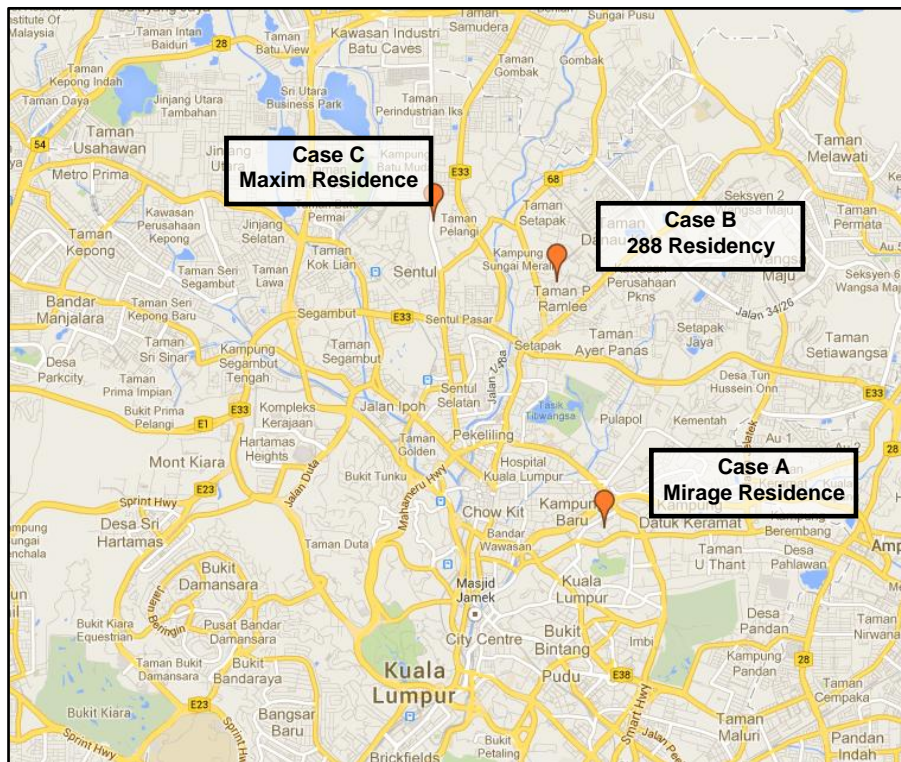


Figure 1 High-rise apartment building cases location

The selected high-rise apartment buildings consists of different type of apartments based on number of bedrooms in each apartment. This paper will address only apartments with three bedrooms and each apartment has different floor area. While the apartment case (A) has a gross area of 135 m<sup>2</sup>, case (B) is 126 m<sup>2</sup> and case (C) is 86 m<sup>2</sup>. Detailed floor plan for each apartment is shown in Figure 3. The main properties of each case are illustrated in Table 1.





Figure 2 Apartment cases floor plan

Table 1 Main properties of building cases

	Case A	Case B	Case C
Location	Kuala Lumpur city center	Sentul, Kuala Lumpur	Setapak, Kuala Lumpur
Floora area	135 m <sup>2</sup>	126 m <sup>2</sup>	86 m <sup>2</sup>
Construction:			
Walls	Masonary wall/ concrete wall	Brick wall / RC wall	Clay brick / RC wall
roofs	RC flat roof	RC flat roof	RC flat roof
Windows	Aluminium frame single galss	ditto	ditto
HVAC System	Residential Split unit system	ditto	ditto
Infiltration	0.5 ACH ( Average building tightness)	ditto	ditto
Occupancy	4-5 people	ditto	ditto

## RESULTS AND DISCUSSION

Following the formulation of cases and initial verification of input data, the case models are run through the EnergyPlus program. The results for daylighting performance were obtained, including daylight factor and illumination level. The simulation was done for the living area because it will be occupied during daytime comparing to other apartment areas. Figure 4 shows the daylight factor results for living area at different locations from the window starting from 0.5 m to 4 m deep. The working plane height is assumed at 0.75 m from the floor. The simulation results for daylight factor are comparable with results obtained from previous studies in similar climates and function (Li et al. 1999, Li et al. 2006, Ibrahim & Zain Ahmad 2007 and Husin & Harith 2012).

The measure of general illumination from diffuse daylight can be obtained using average Daylight Factor. It provides a basis for daylighting to be appropriately considered at all stages of the design process. The recommendations for the DFs in residential buildings are at least 1%, 1.5% and 2% for bedroom, living room and kitchen, respectively (CIBSE, 1987). The simulated daylight factor values under overcast skies were analyzed for the living/dining room, each room will be able to receive daylight from a large part of the sky, and thus receive a high DF. In general, the daylight levels obtained for all rooms appear to be adequate. The low daylight factor level for living/dining room may be due to the fact that the depth of the room from window to back wall is too long, resulting very low DF at the rear part of the room.

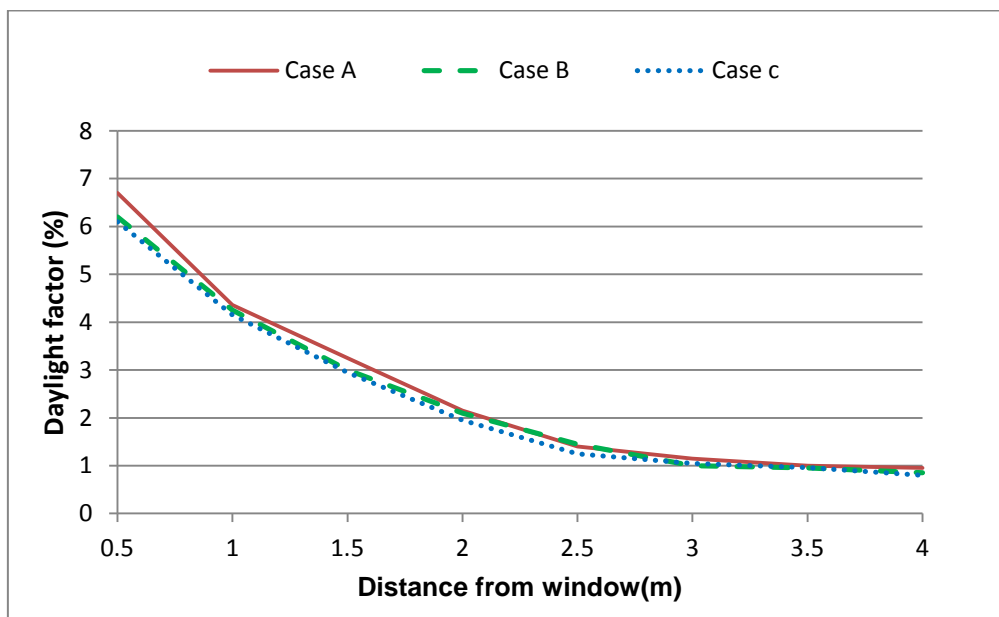


Figure 4 Daylight factor results for living area

For daylighting design and calculation, the indoor daylight illuminance can assist for determining the necessary use of artificial lighting, and the probable energy savings from on-off controls. Figure 5 presents the interior daylight illuminance for living/dining room. It can be seen that relatively high illumination level values are obtained in the areas close to the window. Then the illuminance level decreases significantly as the distance from the window increases. With the

recommended indoor design illuminance levels for living/dining room of 150 lx (IESNA,2000), it can be observed that the daylight illuminance can provide the required indoor illuminance for living/dining room. However, large illuminance level also means that the daylight is accompanied by certain amount of direct sunlight causing problems of glare, excessive brightness ratios and thermal discomfort.

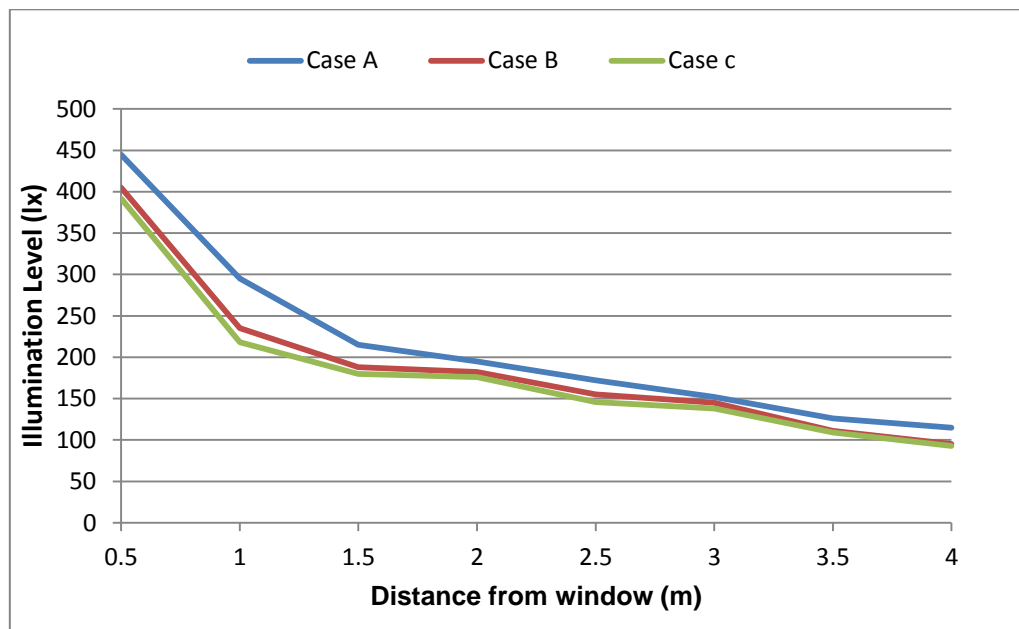


Figure 4 Illumination level results for living area

### Effect of glazing type

The glazing type and the number of glazing layers are among the critical parameters the designer must consider when designing windows. They can affect both the amount of light transmitted into the built space and the magnitude of solar heat gain, which in turn results in an increase in the cooling load. Many types of glazing with different thermal and physical characteristics are available for designers to choose from. Four different glazing types have been investigated in this study. Table 3 shows thermal and lighting characteristics of the four glazing types including the number of panes, the visible transmittance, and the shading coefficient (SC).

Table 2 Properties of glazing types used

Glazing Type	No: of panes	U-Value W/m <sup>2</sup> .K	Shading Coefficient (SC)	Solar Heat Gain Coefficient (SHGC)	Visible Transmittance
Single clear 6 mm	1	6.4	0.95	0.81	0.88
Single tinted 6 mm	1	6.0	0.73	0.62	0.65
Double clear 6/12/6 mm	2	2.74	0.81	0.70	0.78

Double clear low-e 6/12/6 mm      2      1.78      0.65      0.56      0.74

The glazing type used in all apartment cases is single clear glass 6 mm with aluminium frame. This paper investigates the impact of using various glazing types on daylighting performance. The simulation results, for all apartment cases, show that a various results for illumination level would be achieved when glazing type is replaced.

The simulation results demonstrated that the visible transmittance value for a glazing type is the main factor affecting resulted illumination in the space. The higher the visible transmittance value the higher the illumination level. Figure 7 shows that the replacement of single clear glass with single tinted glass reduce illumination level. However, tinted glass helps in energy efficiency and conservation and also reduce glare solar radiation transmitted to the interior space. In addition, using double glass clear would result in a similar results comparing with single clear glass in term of illumination level. The replacement of single clear glass with double clear glass low-e combined the advantages of clear glass to allow more daylight penetration to the interior space better thermal performance which reduce heat gain or loss.

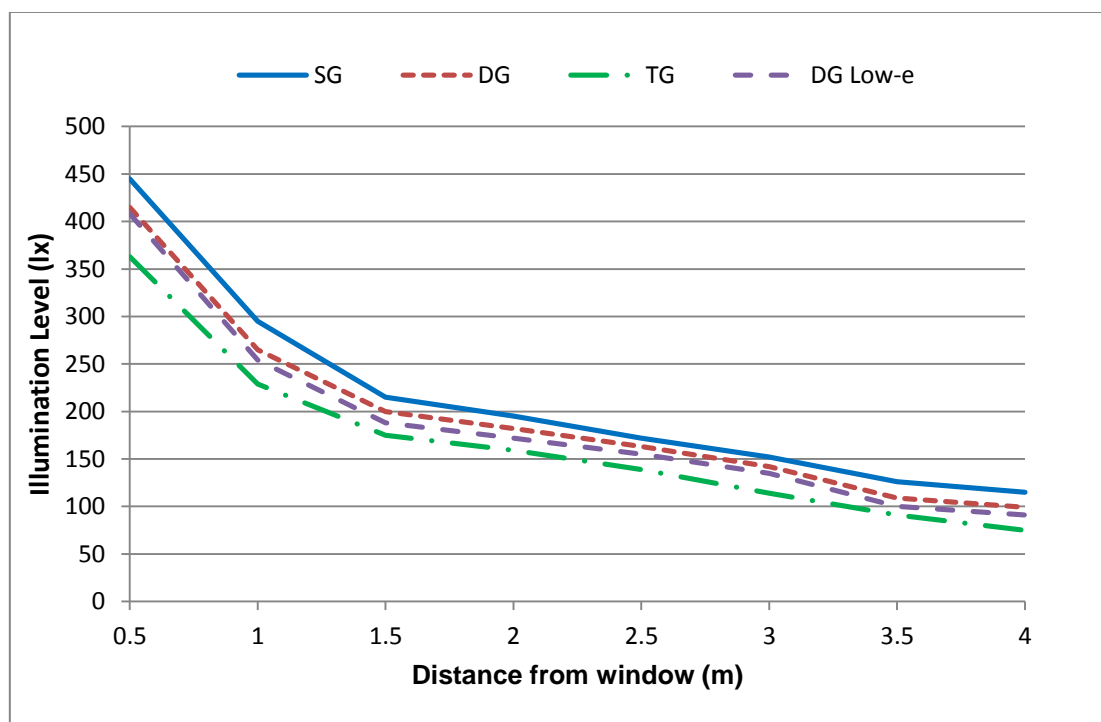


Figure 7 Effect of glazing type on interior illumination level

### Effect of window area

For a given glazing type, the critical factor determining the transmitted daylight availability is the window area. The window area is commonly represented by window-to-wall ratio (WWR) which is defined as the ratio of the total area of windows to the overall gross external wall area (including windows). Most WWRs are between 25% and 30%. Buildings with low WWRs are mainly located in older and densely populated zones where buildings are constructed close to each other with windows

on the shorter facades. Large luxury units located in more up-market and low density residential areas tend to have bigger windows with WWR of more than 35% (Li et al, 2006).

This paper investigates the effect of window area on daylighting performance. The selected WWRs for this study are between 20% to 80 %. Figure 8 presents the resulted illumination level for different window areas for single glass 6mm. The results show that the illumination level increases with larger window area. This can be attributed to the fact that large window area allow more natural lighting to the interior space.

However, it is noticed that when WWR is larger than 60%, a slight increase in illumination level is achieved. Large windows allow more daylight into a space, and therefore the use of artificial lighting can be reduced. But large glazed areas may also allow excessive heat gains or losses into the building which increase the air-conditioning or heating load and, consequently, the energy consumption. Therefore the optimum scenario is to select window area in which there is a balance between daylight provision and the energy consumed by the artificial lighting and air-conditioning.

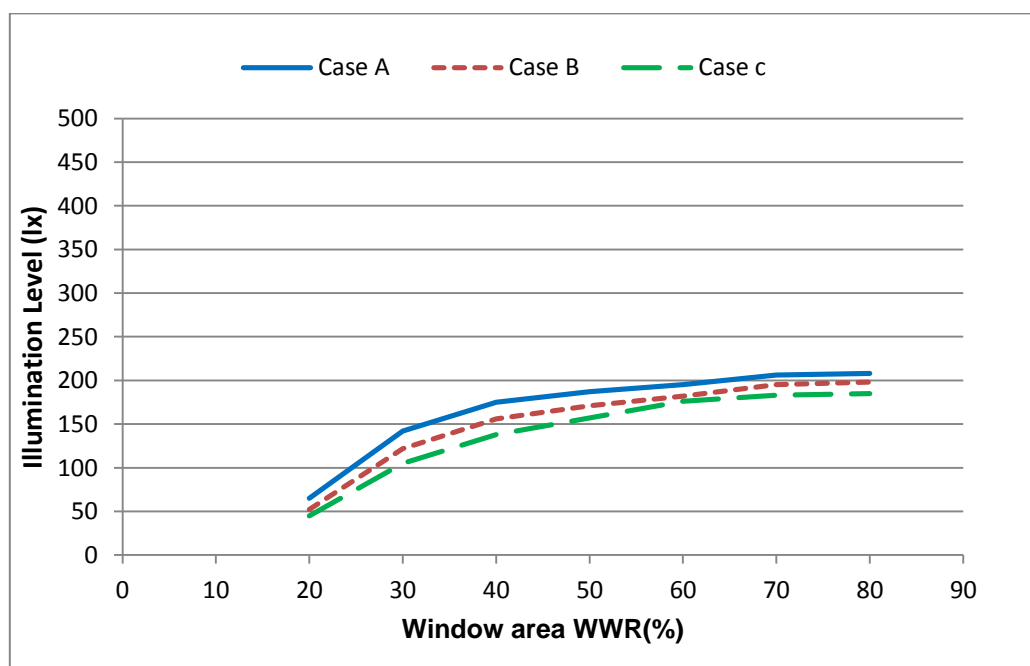


Figure 8 Effect of window area (WWR) on interior illumination level

## CONCLUSIONS

It is important to consider daylighting at early stage design. Design with daylighting has great influence on the functional arrangement of spaces, occupant comfort (visual and thermal), structure and energy use in building. Daylight is considered as the best source of light for good colour rendering and its quality is the one light source that most closely matches the human visual response. The main source of daylight penetrating a building is window openings which provide the dual function not only by admitting light for indoor environment with a more attractive and pleasant atmosphere, but also allowing people to maintain visual contact with the outside world. People desire good natural lighting in their living environments.



This paper presented a study on the daylighting performance of selected high-rise apartments in Kuala Lumpur. Performance is addressed in terms of daylight factor and illumination level. The results showed great potential for daylighting as most of the living spaces meet daylight factor and illumination level recommended values for residential buildings. This provides the opportunity to utilize natural lighting and reduce the use of artificial lighting by proper window design and suitable lighting control system.

Glass type controls the amount of daylight penetrating into an interior in terms of light transmittance. In daylight calculation, light transmittance is directly proportion to the daylight factor. Four types of glass have been selected for this study, namely single clear, single tinted, double clear and double clear low-e with 6mm thickness. Clear glass provides a high transmission of daylight, but it also allows a large amount of solar heat into a building. Tinted glass reduces the amount natural lighting entering the space with the absorption of the considerable amount of infrared radiation. The use of Low-e glass contains a thin coating of metal oxide substantially cutting down heat gain without proportionally reducing daylight transmittance.

For a given glazing type, the critical factor determining the daylight entering a building is the window area. The results showed that large window area provides more natural lighting, but large glazed area may allow excessive heat gain or loss particularly if single glass is used. Therefore, single clear glass windows are likely to be used with small window area and large WWRs are mainly recommended for Low-e glass.

It is concluded that type of glazing used and window area gives major significant on the performance of daylight and thermal performance in residential buildings.

## ACKNOWLEDGEMENTS

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## A REVIEW ON INDOOR ENVIRONMENTAL QUALITY (IEQ) STUDY IN NON-RESIDENTIAL BUILDINGS

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### ABSTRACT:

Green building is known the sustainable building in the construction industry worldwide. It usually incorporates from the planning stage throughout the ultimate end of building's life recycling. The green buildings also mean improving our design, construction, and landscaping practices so that it will last longer, cost less and contributes to the better healthy living of the present and future generations. It likewise means protecting natural resources and improving the built environment so that people, communities, and ecosystems can thrive and life in prospering. Over the past decade, rating tools for green buildings have been developed worldwide to promote the construction of green buildings and encourage green practice in the construction industry. Among the numerous efforts in the emerging green building, movement is the establishment of green building certification systems worldwide as one of the most prominent and systematic approach to continuing effort toward promoting outdoor and indoor environmental sustainability. Benefits of these tools are they can guide the development of construction industry towards best practice and improving the quality of building for tenants and occupants. Therefore, the main objective of this paper is to review the aspects of indoor environmental quality (IEQ) study previously done by researcher around the world. The paper will focus on the characteristic of indoor environmental quality (IEQ) parameters and methodology conducted in previous studies. It will also an emphasis on the relationship between indoor environmental quality (IEQ) and post-occupancy evaluation (POE) in determining post occupant's satisfaction. It is hope that more future research gap can be identified through these reviews.

**Keywords:** Green Building, Indoor Environmental Quality (IEQ), Post Occupancy Evaluation (POE), Non- Residential Buildings

## INTRODUCTION AND LITERATURE REVIEW

“Sustainability” is one of the world’s most talked issues nowadays. Its had various meaning and different interpretations of its implementation in many fields and treated the subject. Sustainability concept often relates to countless field such as the social, economy growth, eradication of poverty and most commonly related to the construction industry as the sustainable construction of notably known as the green construction. The most famous definition of sustainable development the development that "meet present needs without compromising the ability of future generations to meet their needs" by the 1987 U.N. World Commission on Environment and Development (WCED). Other definitions of sustainable includes, Berke & Conroy (2000) define sustainable development as “a dynamic process in which communities anticipate and accommodate the needs of current and future generations in ways the reproduce and balance local social, economic and ecological systems and link local actions to global concern” while earlier research by Rosenbaum (1993) describe sustainable as " using methods, systems and materials that won't deplete resources or harm natural cycles". Hence in the world of construction, buildings have the capacity to make a significant contribution to a more sustainable future for our planet. This sustainable building is widely known like the green building worldwide.

Green buildings mean to improve our design, construction, and landscaping practices so that it will last longer, cost less and contribute to healthy living. It also means guarding natural resources and refining the built environment for the people, communities and ecosystems to grow and live together in prospering (John & Michael, 2007). The US Green Building Council believed that green building can minimize and eliminate the negative impact of buildings on the environment and occupants (LEED, 2004) as cited in Yiing, Yaacob, & Hussein (2013). This can be done by encouraging the use of more environmentally friendly materials, implementing techniques that can save resources and reduce waste consumption, and the improvement of indoor environmental quality for the end user (Wang et. al, 2005) and (Thormark, 2006).

There are numerous potential benefits of green building including the environmental, economic and social benefit. The environmental benefits include protecting, conserve and restore the biodiversity and the natural resources. While the economic benefits comprise of reducing the life-cycle cost of the building and enhance profit and rental value. Whereas, in social benefits, the implementation of green building can improve the occupants comfort and health thus improving the overall quality of life. Other benefits of green building includes the improvement of indoor environmental quality ,reduction on health costs ,increase on employees' productivity as well as increased occupant's satisfaction on the aspects indoor comfort conditions (Edwards, 2003), (Kats, 2003), (Ross et al., 2006) and significantly Improved on an indoor air quality with access of lighting and windows that serve to promote physical and mental well-being (Heerwagen, 2001). Previous study done by USGBC had proven that the green building does increases performance by 6–26%; decreases absenteeism by 15% (compared to conventional buildings; and improves health conditions (LEED, 2002). Thus, study by Gabay et al., (2014) indicate numerous benefits of the green building includes: minimal energy use; minimum requirement for water, material, and energy resources throughout its life cycle; conducive to occupant health productivity; and minimal waste, pollution, or environmental degradation. With the blooming of the green building concept, the sustainable building standard or tools for green buildings has been developed worldwide to promote the construction of green buildings in the industry. According to (Liang et al, 2014), among the numerous efforts in the emerging green building is the establishment of green building certification systems as one of the most prominent and systematic approach toward promoting sustainability in

construction. This sustainable building standard believed to provides an efficient framework for assessing building environmental performance and integrating sustainable development into building and construction processes while assist in determining performance measures to guide the sustainable design and decision-making processes (World Energy Report ,2004) and (DEWA, 2003).

## METHODOLOGY

This study adopts a subjective methodology by a critical review on the aspects of indoor environmental quality (IEQ) in non-residential building conducted previously by researcher around the world. The paper is divided into three parts. First, background definition of green building and sustainable rating tools available in relation with indoor environmental quality (IEQ) aspects were identified. Secondly, the paper will review on studies that previously done on the aspects of indoor environmental quality (IEQ) in rated or unrated non-residential building. The similarity and contracts in the features of indoor environmental quality (IEQ) parameters and methodologies are discussed under in this step. It will also the review on the relationship between indoor environmental quality (IEQ) with post-occupancy evaluation (POE) in determining the satisfaction level of building occupants. Lastly, the paper will provide a glimpse of satisfaction study conducted previously in Malaysia.

## ANALYSIS

Nowadays, there are many excellent building certification tools globally to assess the environmental performance of building and its sustainability (Todd et al, 2001) such as BREEAM in United Kingdom, the Leadership in Energy and Environmental Design Standard (LEED) in the United State of America and Green Star in Australia are an assessments made by awarding credits, points or marks according to the building performance in order to determine the green-rated given at the end of the building's evaluation process. Benefits of these tools are they can guide the development of construction industry towards best practice and improving the quality of building for tenants and occupants. In Malaysia, the development of own sustainable rating standard begun in May 2009 where the Malaysian Green Building Index (GBI) was launched as design guides and tools of green building in Malaysia. The Green Building Index (GBI) is always dynamic, being adapt and adopt from other rating systems. Green Building Index (GBI) closely adopted the Leadership in Energy and Environmental Design Standard (LEED) rating award and its criteria, although both are used in a different geographical zone and under different climatic conditions. The Malaysian (GBI) tools is based on the six criteria, which are "Energy Efficiency", "Indoor Environment Quality", "Sustainable Site Planning & Management", "Materials and Resources", "Water Efficiency" and "Innovation" with four categories of rating given which are the "Platinum", "Gold", "Silver" and "Certified" that based on marks obtained by the assessed building.



Table 1.0 identify on the evaluation criteria of above mentioned sustainable building standard including the Malaysian Green Building Index (GBI).

Table 1.0: Sustainable Rating Tools Evaluation Criteria

Sustainable Rating Tools	Evaluation Criteria														
	EE	WSE	IEQ	INN	SSPM	MS	RP	IP	LT	WaE	ECO	MP	P	EP	
1.GBI	X	x	x	x	X	x									
2.LEED	X		x	x	X	x	x	X	x	x					
3.BREEAM	X	x	x			x			x	x	x	X	x		
4.HK BEAM	X		x	x	x	x				x					
5.GREEN STAR	X		x	x	x	x			x	x	x		x		
6.GREEN MARK	X		x	x						x				x	

Indicator: E-Energy Efficiency; WSE-Waste Efficiency; IEQ-Indoor Environmental Quality; INN-Innovation; SSPM-Sustainable Site Planning and Management; MS-Material and Resources; RP-Regional Priority; IP-Integrative Process; LT-Location and Transportation; WaE-Water Efficiency; ECO-Ecology; MP-Management Process; P-Pollution/Emission; EP-Environmental Protection

As earlier research by (Lebowitz et al., 1985), found that people in developed world spend almost 75-90 percent of their time inside a building. The similar finding was obtained by (Singh, 1996) and (Klepeis et al., 2001) who believed that research suggests people tend to spend 80-90 percent of their time indoors. These facts highlighted the importance of building indoor environment quality improvements and the need for validating the related well-being and productivity benefits available in rated green buildings (Singh, Syal, Korkmaz, & Grady, 2011).

Table 2.0: Sustainable Rating Tools Indoor Environmental Quality Criteria

GBI Malaysia	LEED US	BREEAM UK	HK BEAM Hong Kong	GREEN STAR Australia	GREEN MARK Singapore
<b>Indoor Air Quality</b>	<b>Indoor air quality</b>	Visual Comfort	Safety	<b>Indoor Air Quality</b>	<b>Thermal Comfort</b>
Environmental Tobacco Smoke	Environmental Tobacco Smoke Control	<b>Indoor Air Quality</b>	Hygiene	Acoustic Comfort	Noise Level
Indoor Air Pollutants	Low-Emitting Materials	<b>Thermal Comfort</b>	<b>Indoor Air Quality</b>	Lighting Comfort	Indoor Air Pollutants
<b>Thermal Comfort</b>	<b>Thermal Comfort</b>		Ventilation	Visual Comfort	<b>Indoor Air Quality</b>
Daylighting	Interior Lighting		<b>Thermal Comfort</b>	Indoor Pollutants	<b>Thermal Comfort</b>
Daylight Glare Control	Daylight Quality Views		<b>Comfort</b>	<b>Thermal Comfort</b>	<b>Comfort</b>
Electric Lighting Levels	Acoustic Performance		Lighting Quality		High Frequency Ballasts
High Frequency Ballasts			Acoustics and Noise		
External Views			Building Amenities		
Internal Noise Levels					
IAQ Before & During Occupancy					
Post Occupancy Comfort Survey: Verification					

Table 1, Table 2 and Table 3 (Sources: 1. <http://www.greenbuildingindex.org/> 2. <http://www.usgbc.org/> 3. <http://www.breeam.org/index.jsp> 4. <http://www.hkgbc.org.hk/eng/BEAM> 5. <https://www.gbca.org.au/green-star/> 6. <http://www.bca.gov.sg/greenmark/>

Although, there are resemblances on the category among the selected sustainable building standard, yet there are variances in the weighting of each category where some parameters were added or omitted to suit the local context and climate of different countries that were ranked according to their importance and represented through their weights. Table 1.0 indicate that indoor environmental quality (IEQ) is one of the most important evaluation criteria among the sustainable building standard. While Table 2.0 emphasis on the indoor environmental quality (IEQ) in various sustainable building standard with indicator on the most significant parameters of the indoor environmental quality (IEQ) namely the indoor air quality (IAQ) and thermal comfort that evaluated by all selected sustainable building standards.

### Review Analysis 1: Indoor Environmental Quality (IEQ) Studies in Non-Residential Buildings

It has been claimed worldwide that “green” buildings have a better occupants perception and satisfaction on the aspect of indoor environmental quality (IEQ) than conventional buildings thus providing a satisfying workplace for the building’s occupants. However according to the study conducted by Paul & Taylor (2008), there is no significant difference perceived in the indoor environmental quality between a green and a conventional office building. They also found that there is no evidence to believe that green buildings are more comfortable whit the only difference between the buildings was that occupants of the green building were more likely to perceive their work environment as warm . Hence the green building’s aim of reducing building impact on human health as well as producing occupants satisfaction on the aspect of indoor environmental quality (IEQ) criteria. According to Hodgson, (2008) as cited in Rao & Aminuddin (2012) the four major criteria highlighted in green building rating tools are: indoor air quality, acoustics, visual comfort (lighting) and thermal comfort. Even though the fact that acoustics is one of the main criteria under indoor environmental quality (IEQ), it is often overlooked and neglected. Chandratilake & Dias, (2015) stated that main indoor environmental quality (IEQ) parameter includes the occupant health and safety, thermal comfort, daylight, visual quality, acoustic and Indoor air quality.

Table 3.0: Indoor Environmental Quality (IEQ) Studies in Non-Residential Buildings

Author	Summary of Study	Type of Building	IEQ Parameters	Type of Measurement*
(Asmar et al., 2014)	Occupant Satisfaction with Indoor Environmental Quality: A Study of the LEED-Certified Buildings on the Arizona State University Campus using post-occupancy evaluation (POE)	Rated Academic Building	Workspace layout, workspace furniture, <b>thermal comfort</b> , indoor air quality, lighting levels, acoustic quality, water efficiency and cleanliness and maintenance	Subjective
(Hirning et. al, 2013)	Post-occupancy evaluations relating to discomfort glare: A study of green buildings in Brisbane using post-occupancy evaluation (POE)	Rated Office Building	Visual (Glare)	Subjective
(Gou & Lau, 2013)	Post-occupancy evaluation of the thermal environment in green building	Rated Office Building	<b>Thermal Comfort</b>	Subjective and Objective
(Kim et.al, 2013)	Gender differences in office occupant perception of indoor environmental quality (IEQ) using post-occupancy evaluation (POE)	Non Rated Office Building	Indoor air quality (IAQ), sick building syndrome (SBS), <b>thermal comfort</b> , lighting, and acoustics	Subjective

			was conducted	
(Huang et. al, 2012)	A study on the effects of thermal, luminous, and acoustic environments on indoor environmental comfort in office	Non Rated Office Building	<b>Thermal comfort</b> , luminous, and acoustic environments	Subjective and Objective
(Daioumaru et. al,2008)	Thermal performance evaluations of double skin facade with vertical blinds using monitoring evaluation	Non Rated Public Building	<b>Thermal Comfort</b>	Objective
(Paul & Taylor, 2008)	A comparison of occupant comfort and satisfaction between a green building and a conventional building	Rated and 2 Non Rated Academic Building	aesthetics, serenity, lighting, acoustics, ventilation, temperature, humidity( <b>thermal comfort</b> ), and overall satisfaction	Subjective
(Meir et. al, 2007)	Towards a comprehensive methodology for post-occupancy evaluation (POE): a hot dry climate case study using walk in the questionnaire	Non-Rated Dormitory	User satisfaction, <b>thermal comfort</b>	Subjective
(Abbaszadeh et. al,2006)	Occupant satisfaction with indoor quality in green building using web-based IEQ survey	Rated Green Office	Pathogens, Allergens (IAQ) Indoor environmental quality: <b>thermal comfort</b> , air quality, lighting, acoustics	Subjective
(Hydes et. al, 2004)	Understanding our green buildings: seven post-occupancy evaluations in British Columbia	Rated Academic Building	User satisfaction, use of space, <b>thermal comfort</b>	Subjective

*\*Indicators: Subjective Measurement (using Questionnaire Survey or Interview)/ Objective Measurement (Field Study)*

Table 3.0 summarized on the various study of the indoor environmental quality (IEQ) conducted in rated and non-rated on- residential building from the year 2004 to the year 2014 worldwide. Based on the table, it can be identified that the most frequent study conducted on the aspect of indoor environmental quality (IEQ) was the thermal comfort followed by indoor air quality (IQA), as well as the visual and acoustic parameter. The least favorite study of the indoor environmental quality (IEQ) were the space layout, cleanliness, and serenity. Table 3.0 also specify on the assessing measurement of the indoor environmental quality (IEQ) namely the subjective measurement (interview and questionnaire measures) and objective measurement (field study) of perceived comfort of indoor environments. Regression analyzes conducted by Fransson, Västfjäll, & Skoog (2007) indicate that the subjective sensory ratings were significantly better than objective indicators at predicting overall rated indoor comfort. Therefore, it is also noted that, most of the study conducted using the questionnaire as the subjective measurement or instruments in identifying the indoor environmental quality (IEQ) satisfaction level of building occupants. The most famous questionnaire survey employed by the majority of the reviewed study was the post-occupancy evaluation (POE) forms. Post-occupancy evaluation (POE) is the process of obtaining feedback on a building's performance in use. It is valuable in all construction sectors, especially education, healthcare, offices, housing and all the commercial building, where poor building performance will impact on running costs, occupant satisfaction, and business productivity.

## Review Analysis 2: Satisfaction Studies in Malaysian Non-Residential Buildings

Table 4.0: Satisfaction Studies in Malaysian Non-Residential Buildings

Author	Summary of Study	Type of Building	IEQ Parameters	Remarks
(El-nafaty et. al, 2014)	Correlating Visual Comfort with Green Building Index in an Open Plan Office Space in the Faculty of Built Environment (FAB) Universiti Teknologi Malaysia (UTM) by using a set of questionnaire based on the four criteria for Visual in Indoor Environmental Quality (IEQ) as rated by the Green Building Index (GBI) Malaysia.	Non-Certified Office Building	Visual	The data generated showed a high probability of visual discomfort as the recommended average illuminance level for lighting for working interiors (300lux-400lux) was not attained from the data generated.
(Syed Yahya et.al, 2014)	Factors Contributing to Occupants' Comfort: A Survey among Occupants of Academic Buildings in a Public University. This study investigates the relationship between comfort and its contributing factors by utilizing the Building Use Studies (BUS) questionnaire from the UK.	Non-Rated Academic Building: Public university in Malaysia	Thermal, air quality, acoustic, visual comfort and personal control	The analysis showed that there is a significant correlation between overall comfort of the building's occupants with two significant contributing factors that are; air condition (thermal comfort and air quality) and personal control. There is insufficient evidence that noise (acoustics) and lighting (visual) have significant correlation with a building occupants' overall comfort level.
(Khamidi et.al, 2013)	Post-occupancy evaluation (POE) and indoor environmental quality (IEQ) assessment: a case study of Universiti Teknologi Petronas New Academic Complex using post-occupancy evaluation (POE) and field measurement	Non-Rated Academic Building Intended to apply for GBI rating.	Temperature, relative air humidity, noise level, illumination level, CO2 level and air velocity	Study identify that the correlation of POE and IEQ reports that noise and illumination level are not meet the GBI and Malaysia Standard 1525 standard.
(Sulaiman, Wan Yusof, & Wan Kamarudin, 2013)	The study focused on identifying the framework in the evaluation of IEQ in the context of academic buildings at institutions of higher education using survey and field study.	Non-Rated Academic Building	Thermal (temperature and humidity) and noise comfort, indoor air quality (air movement CO2 concentration) and lighting.	The results showed that the element of temperature, air movement and the CO2 concentration are at accepted level. While the elements of relative humidity, sound and lighting are below prescribed standards.
(Musa et.al, 2012)	Study focuses on lighting in UKM architecture studio space to achieve better IEQ using field study	Non-Rated Academic Building	Lighting	Lighting setting is not within the range of Malaysian Code of Practice on Indoor Air Quality (POE not involve)
(Rao & Aminuddin, 2012)	Study on green building design strategies contribution to the degradation of the acoustical	Rated Office Building	Acoustic	The surveys indicated massive occupant dissatisfaction on acoustic

	environment in green office buildings using questionnaire survey.			quality in green buildings compared to conventional buildings, especially in working spaces that utilize the open plan office layout.
(Khalil et.al, 2011)	Performance Evaluation of Indoor Environment Towards Sustainability for Higher Educational Buildings using Post Occupancy Evaluation (POE) at Universiti Teknologi Mara (Perak)	Non-Rated Academic Building	Satisfaction Thermal Visual Air Movement	The analysis showed that if a higher educational building experiences poor environmental conditions, it will demotivate the students during the learning process, thus, reduce the quality of students' achievements.
(Khalil & Husin, 2009)	This study aims to provide a recommendation to improve the quality of the indoor environment in office building using post-occupancy evaluation (POE).	Non-Rated Office Building	Cooling System, Visual Comfort, Indoor Air Movement	POE provides a significant impact on creating change in terms of improving building environment. Results show that visual comfort, indoor air movement, and ventilation constitute the highest factor in terms of occupants' comfortability.

\*Indicator: Indoor Environmental Quality (IEQ); Post Occupancy Evaluation (POE); Green Building Index (GBI)

Table 4.0 reviews on occupant's satisfaction study conducted in Malaysia by a various researcher from 2009 until 2014. Based on the table, it can be summarized that:

- The majority of the study carried out in a non-rated non-residential building in Malaysia.
- Study by Khalil & Husin (2009), Khalil et. al (2011) and Rao & Aminuddin (2012) cover only on the aspects of subjective measurement of occupants satisfaction thus reflecting only on the physiological needs of the building occupants without real data collection (objective analysis).
- Most of the study, focusing on the aspects of occupants satisfaction only with lacking the in the study of occupants performance and expectation.

## CONCLUSION

It is the claims that green buildings can achieve cost-effectiveness, improve occupant satisfaction and reduce the environmental impacts that driving the green building movement significantly throughout the world. However, well-documented study of green building benefits on the aspects of indoor environmental quality (IEQ) and occupant satisfaction will be necessary to encourage the potential of green building to the next level. Thus, persuasive evidence on the benefits of green building over the conventional building will also help in promoting green building in the construction industry despite its high cost. Therefore, to achieve a well-balanced and satisfied indoor environment, the focus on sustainability and greening aspects of the rated building should not stop after the design and construction phase. It is well believed that the best benchmark of a building is its performance regardless of its external aesthetic value. Hence, it is crucial for the researcher to conduct a more post-occupancy study on rated green building in Malaysia in various indoor environmental quality (IEQ) parameters by using both the measurement (subjective and objective). Finally, it can be stressed that the best prediction result of indoor environment and occupant's satisfaction was obtained using a combination of subjective measures and objective measure.



**Note:** This paper is part of the preliminary review of an ongoing PhD study conducted by the author on the scope of indoor environmental quality (IEQ) in rated Malaysian Green Building Index (GBI) office buildings by using the subjective and objective measurement with one moderating variable that acts as moderator between the outdoor and indoor condition of the selected green building.

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## TRADITIONAL CHINESE ARCHITECTURE: *FENG SHUI* AND PASSIVE DESIGN

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### ABSTRACT

*Feng shui* is one of the oldest traditional Chinese practices and has become one of the most popular life principles in the world. *Feng shui* is deeply embedded in the traditional Chinese architecture which has been applied in the planning, architecture, and interior design. This *feng shui* systematic approach aims to create harmony in the building between human and the environment. The goal is to maintain good principle and application of *feng shui* in a relationship between the two. Passive design is a part of sustainable design which dates back three decades ago. The concept of sustainability is the harmonious relationship between human and nature and closely related to the aspects of *feng shui*. However, there is a lack of understanding on the connection of *feng shui* knowledge and passive design in the architectural research. *Feng shui* is not only a unique knowledge but also a complex practice. The objectives of this paper is threefold: (1) to study the traditional architecture of Chinese house in Peninsular Malaysia, (2) to delineate the meaning of *feng shui* and passive design, and (3) to examine the relationship between *feng shui* and passive design. The qualitative research approach is used to investigate three case studies. The research techniques, such as document reviewing and observation are used to collect data based on the environment, architectural and interior designs. These are then discussed in the findings that clearly indicate the relationship between *feng shui* components and passive design in traditional Chinese architecture. These are featured in the orientation, openings, natural ventilation, and natural lighting of the house.

**Keywords:** Traditional Chinese Architecture, *Feng Shui*, Passive Design

### INTRODUCTION

This paper is an interpretation the relationship between passive design and *feng shui* in the traditional Chinese architecture. This study also examines the characteristics of traditional Chinese architecture in Malaysia by based on selected case studies of Hulu Langat Hokkien Association (HLHA) building. Researcher explores new case study of HLHA to fill gap. This paper investigates to

understanding on term of passive design and *feng shui* used in traditional Chinese architecture. This information is crucial not only for designer but this information can be as a source to maintain cultural heritage in the future and also useful for inter-cultural communication. In addition, this information help designer to understand on the application of passive design and *feng shui* in building for a better quality life human. It may support to minimize the problem gap on connection of passive design and *feng shui*.

The characteristics of traditional Chinese architecture had intrigued several authors especially Kohl, Vlatseas, Yeang, and Chen who outlined it very briefly in “*Chinese Architecture in Settlements and Western Malaya: Temples, Kongsis, and Houses*”, (1984), “*A History of Malaysian Architecture*”, (1990), “*The Architecture of Malaysia*”, (1992), and “*The Encyclopedia of Malaysia: Architecture*”, (2007) respectively. Lillian Too (1997), Joey Yap (2007), and Evelyn Lip (2010) were also briefly about application of *feng shui* including the features of exterior and interior. Sian Moxon (2013) had explained the part of passive design in sustainability in interiors. Other researchers particularly Tetsu Kubota, Doris Hooi Chyee Toe, and Dilshan Remaz Ossen (2014) had investigated the indoor thermal environments in traditional Chinese shophouses with courtyard in Malacca. Interestingly, Tan Yeow Wooi (2015), a researcher in culture, had examined the characteristics of features and materials used in shophouses.

## PROBLEM STATEMENT

Malaysia is located in the tropical climate region and the total of population had increased throughout years. Most of buildings consumed almost half of the total global energy used daily. In Malaysia, buildings consume a total of forty-eight percent of the electricity generated in the country (Hassan et al., 2014) because the growth of population is increasing. The energy consumption in Malaysia has shown tremendous increase over the last few decades (Kubota et al., 2011) that will cause bad impact issues formed. Kubota *et al.* (2011) noticed that the total number of households with air-conditioning in Malaysia has dramatically increased. The energy used rise significantly due to the homogeneous environment created by designers and the standardized engineering solutions (Mohd., 2011). The issues had happen in worldwide were climate change, diminishing resources and biodiversity, waste, allergies and stress, and water scarcity. These have come to light in recent times and increasingly affect our lives (Moxon, 2012). As a result, it will diminish the health and wellbeing of occupants in daily life.

Traditional Chinese architecture can be found especially Chinese temples, shophouses, and mansions. Typical Chinese shophouse was popular among various towns because of its architectural style such as façade, layout plan, and airwell. Chinese shophouse was believed start to built in Malaysia especially Penang in 1790s (Tan, 2015). However, not all people know that mansions or bungalows were mixture of Chinese and European architecture style. Indeed, some of mansions have incorporated traditional Chinese way to build that. Some old buildings such as shophouse were undergoing demolished for development purpose. This will disappear slowly as some researchers fail to collect information on traditional Chinese architecture in Malaysia. Thus, there have a big gap in understanding on traditional Chinese architecture in term of passive design and *feng shui* on heritage buildings. There have no many researchers investigate these mansions in term of passive design and *feng shui* analysis. Most of designers and architects nowadays have no aware on important of passive design and basic *feng shui* principles.



## LITERATURE REVIEW

### Traditional Chinese architecture

Traditional or ancient Chinese architecture in China was a rich architecture and outstanding spanned over five thousand years history in cultural heritage (Lip, 1993). On the other hand, traditional Chinese architecture in Malaysia only dated back as early as 1645 where Cheng Hoon Teng Temple was built in Malacca. There have various traditional Chinese architecture can be found in Malaysia, especially shophouses and mansions, known as traditional architecture of the immigrant communities (Chen, 2007). Traditional Chinese architecture in Malaysia had confluence between traditional Chinese, Malay, and European architectural style (Kohl, 1984 & Chen, 2007).

The components are can be found in traditional Chinese architecture such as structure system, courtyard, orientation, symmetry, axial planning, hierarchy, and enclosure (Kohl, 1984, Knapp, 2013 & Armani & Arbi, 2014). This was not only very strong influence among Chinese in Malaya but Chinese immigrants had brought their own architectural style from Southern China. For example, shophouses built by Chinese in Kuala Lumpur, Malacca and Penang, as well as Kuala Terengganu. Combination of Chinese and European architectural style can be found on mansions. Cheong Fatt Tze Mansion or known as Blue Mansion is a good example of traditional Chinese architecture in Penang.

### Passive design

Sustainable design is an inherent part of good design (Moxon, 2012). Sustainability is important because it meet the needs of today without compromising the ability of future generations to meet their needs (Moxon, 2012). The objectives of sustainable design were help to maintain comfortable and healthy environment, to maximise use of natural energy instead of mechanical energy, and reduce energy waste in building (Mohd., 2011). Passive design is a sustainable design approach (Mohd., 2011). Traditional Malay house is one outstanding in passive design because it has some strategies to attain optimal climatic control; there are, allowing adequate ventilation, using low thermal capacity building materials, controlling direct solar radiation and glare, protecting against heavy rain, and assuring adequate natural vegetation in the surrounding (Mohd., 2011 & Izudinshah & Lokman, 2012).

Application of passive design is simple and effective way in designing building among designers and architects. Passive design means manipulating the building's orientation, shape, layout and envelope to take advantage of natural energy from the sun, wind, outside temperature and building occupants where it requires no technology, and is therefore free energy (Moxon, 2012).

### Orientation

Orientation is important to avoid solar heat gain in tropical area (Mohd., 2011) and create a significant improvement in indoor thermal comfort (Wan et al., 2012). The façade of the building should face towards south in the northern hemisphere while the façade of the building should face towards the north in the southern hemisphere. By facing the longer axis of the building in the east or west direction, the longer dimension of the home faces will be more likely to gain the maximum solar radiation.

## Natural ventilation

Good ventilation can help to provide an acceptable indoor air quality and supplying fresh air through interiors (Izudinshah & Lokman, 2012). This is also removing heat and air pollution. Natural ventilation involves using the position of openings to encourage air flow through interior space (Moxon, 2012). Natural ventilation has two main principles which are cross and stack ventilation. Cross ventilation uses openings on opposite sides of a room to let natural breezes in and out while stack ventilation uses openings at low level to admit cooler air and at high level to extract warmer air (Moxon, 2012).

## Shading

Shadings are important devices in a passive house because it is necessary to reduce the direct solar radiation or heat gain (Zakaria & Kubota, 2014), and reducing overheating during the hot season (Moxon, 2012). However, the shading devices need properly sized to prevent overheating and glare.

## What is *Feng shui*?

*Feng shui*, pronounced as “*foong schway*”, or known as Chinese geomancy, was popular practice in designing and orientating the site. Terminologically, *feng shui* in particular were extremely difficult to translate precisely (Mak & So, 2015:30). There had different authors who define *feng shui* differently but the basic meaning remained the same. So and Lu (2011) said *feng shui* was the art of living in harmony with the land, and deriving the greatest benefit, peace and prosperity from being in the right place at the right time. *Feng shui* was the art of placing a building on a site so that it was in harmony with other man-made structures and in balance with nature (Lip, 2010). *Feng shui* represented a traditional Chinese worldview regarding the relationship between human being and nature (Chen, 2007). Yap (2007) urged *feng shui* was a skill of studying the *qi* flow in the environment, planetary influences, and contours of the land, and river and mountain formations in relation to a property. The term of *feng shui* is much more than simple divination or geomancy (Mak & So, 2015).

Indeed, *feng shui* was an important tool in architectural theory. *Feng shui* was also so deeply rooted in Chinese architecture that since historic times it had been incorporated into architecture, environmental science, conceptual design, cultural heritage and interior decoration (Lip, 1993 & Lip, 2010). This aim was to create a harmony between human, building and environment, and also to maintain a picturesque between building and landscape.

## Unity of Heaven, Human, and Earth

Unity of heaven, human, and earth was the core of *feng shui* principles in which there is harmony between energy of heaven, human, and earth (Mak & So, 2015). The connection and combination between heaven, human, and earth were known as Cosmic Trinity where trinity of luck that governs individual's material well being (Too, 1997 & Yap, 2007). Cosmic Trinity can be established when the ample of good *qi* (vital energy) is produced and filtered out the bad *qi*.

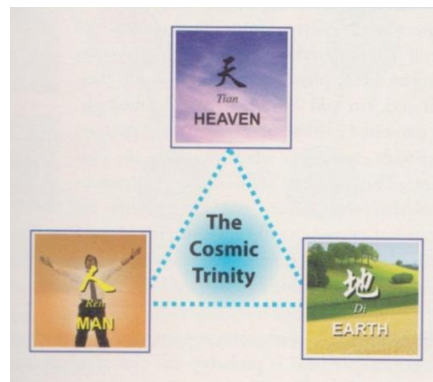


Figure 1. The Cosmic Trinity; Heaven, Human, Earth.  
Source: Yap, 2007.

## Theory of Qi

*Qi* or *chi* means a vital energy. There is no equivalent for term of *qi* in western terminology (Mak & So, 2015). *Qi* can be translated as the “breath of nature” or “breath of dragon”. *Qi* is a force that acquires form within an area and continuously in fluid form (Erdagon & Erdagon, 2014). *Qi* was the energy of the earth and comes in many forms (Lip, 2010). *Qi* has no form, shape, or dimension, but through it, all things in the universe manifest themselves in the realms of both the real (visible) and the unreal (invisible) (Lau, 1996). According to Guo Pu (276 AD – 324 AD) in *The Book of Burial*, translated by Field (2011), when *qi* rises to the sky, it will become cloud. This is called *yang* (active) *qi*, which moved by the wind. *Qi* can also fall again to the earth as rain called *yin* (passive) *qi*. The *yin* and *yang qi* produce all things on earth. *Qi* can be divided into *sheng qi* (growing *qi*), a positive energy that promotes to stabilise emotions, and *sha qi* (killing *qi*), a negative energy can harmful individual of psychological feelings (Erdogan & Erdogan, 2014).

## Yin and Yang Principle

*Yin* and *yang* principles were a symbolic reference system interrelated (Too, 2013) where *yang* represented masculinity, the realm of the living place, and the active principles in nature exhibited by light, heat and dryness whilst *yin* represented feminine, the realm of the dead place, and the passive principles in nature exhibited by darkness, cold and wetness. The principle of *yin* and *yang* was important fundamental that had incorporated into architectural design for make a criteria design to create harmony. The balance between *yin* and *yang* never is 50:50 but dynamic balance about 60:40 or 70:30 and vice versa.



Figure 2. Yin and yang principle in three pagodas of Chongsheng Monastery, Dali, Yunnan province; water and pagoda represented yang whilst flat land and mountain represented yin.

Source: Modified from Too, 1997.

### Five Elements

The Five Elements, called *wu xing* in Chinese, were considered the five fundamental groups of substances in the world. The theory of Five Elements represented the initiation, progress, development, fatigue, and cessation processes of events (Erdogan & Erdogan, 2014). The Five Elements that found in world was Wood, Fire, Earth, Metal, and Water. The theory of five elements had three cycles such as productive cycle, controlling cycle, and weakening cycle (Figure 1) (Yap, 2007). Productive cycle created positive energy that Wood made Fire, Fire produced ash to Earth, Earth create ores to Metal, Metal condensate Water, and Water nourished Wood. The controlling cycle created negative cycle which destroyed in opposite elements. The weakening cycle created natural cycle between elements. The combination of productive, controlling, and weakening cycle will create the movement of *qi* energy in nature accordancing the laws of nature and heaven (Lip, 2010).



Figure 3. Productive, Controlling, and Weakening cycle.

Source: Joey Yap, 2007.

### The Form School

There have two schools of Thought especially the Form School and the Compass School. The Form School had widely accepted by researcher in analysis of built environment (Mak & So, 2015). The Form School emphasised the study condition on the geographical arrangement of mountain or known as topographical whilst the Compass School focused on the cosmic pattern, magnetic field, and sensitive-direction based on Chinese compass (So & Lu, 2011).

The Form School approach took into consideration mountain ridges, surrounding hills, watercourses, locations, and orientation as the most important terrestrial and celestial elements for human dwellings because these elements represent both terrestrial and celestial *qi* (Mak & So, 2015).

There are five *feng shui* geographical factors in *feng shui* model concept (Figure 5) especially dragon, sand, water, point (cave), and direction (orientation) (Lip, 1979, & Mak & So, 2015). The combination of these five *feng shui* geographical factors and the four emblems (the green dragon, white tiger, black tortoise, and red bird) symbolising the four cardinal directions produce a classic *feng shui* model (Mak & So, 2015). Every emblem have its own shape, there are, green dragon represents as rectangle, white tiger as circle, red bird as triangle, and black tortoise as wavy-shape.

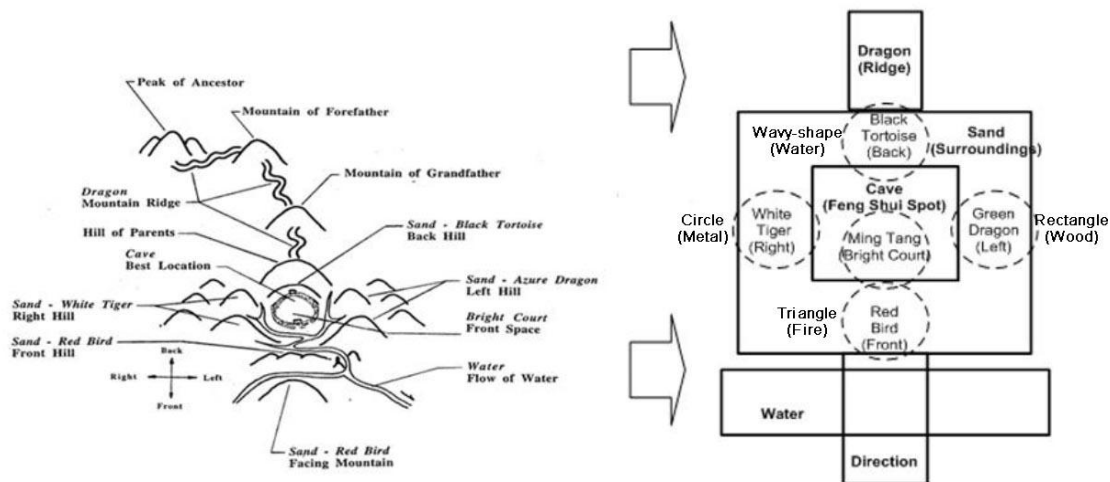


Figure 5. The concept of *feng shui* model.  
Source: Mak & So, 2015.

The reflection of *feng shui* concept model has depended greatly on the balance between external and internal space, which stem from the integrity with all the four design modules; there are, surrounding environment, external layout, internal layout and interior arrangement (Figure 7) (Mak & Ge, 2007 & Abbas, 2014). Outer Form represents exterior and Inner Form represents interior were classified several elements which known as *feng shui* design criteria concept (Table 1) for evaluating the exteriors and interiors.

Table 1.  
*Feng shui* criteria grouped in Four Design Modules. Source: Modified from Mak & Ng, 2007, Abbas, 2014 & Mak & So, 2015.

Form School			
Outer Form		Inner Form	
Surrounding environment	External Layout	Internal Layout	Interior Arrangement
Topography	Shape of site	Layout	Door opening
Front of site	Entrance	Doors	Bedroom
Rear of site	Shape of building	Windows	Kitchen
Sides of site	Orientation	Shape of rooms	Living room
Street location	Trees	Staircase	Bedroom
Water view	Pond	Ceiling	
Wind direction			



## METHODOLOGY

To examine the application of passive design and *feng shui* in traditional Chinese architecture in Peninsular Malaysia, this paper applied qualitative research approach to evaluate, examine, and interpret the case study selected. Information collections were collected through observation and documentation reviewing. In this process, all information is collected then some points should be clearly explained.

## CASE STUDY

Researcher chooses Hulu Langat Hokkien Association (HLHA) building where located in Kajang in Selangor. It was probably built in 1932. HLHA was formerly of Low Ti Kok (1877-1943) and believed as Low Ti Kok Mansion before World War II. The architecture of HLHA is mixture of colonial and Chinese architecture style. HLHA has its semi-closed courtyard and open space in front of.



Figure 5. HLHA building  
Source: Photo taken by author



Figure 5. Semi-closed courtyard  
Source: Photo taken by author

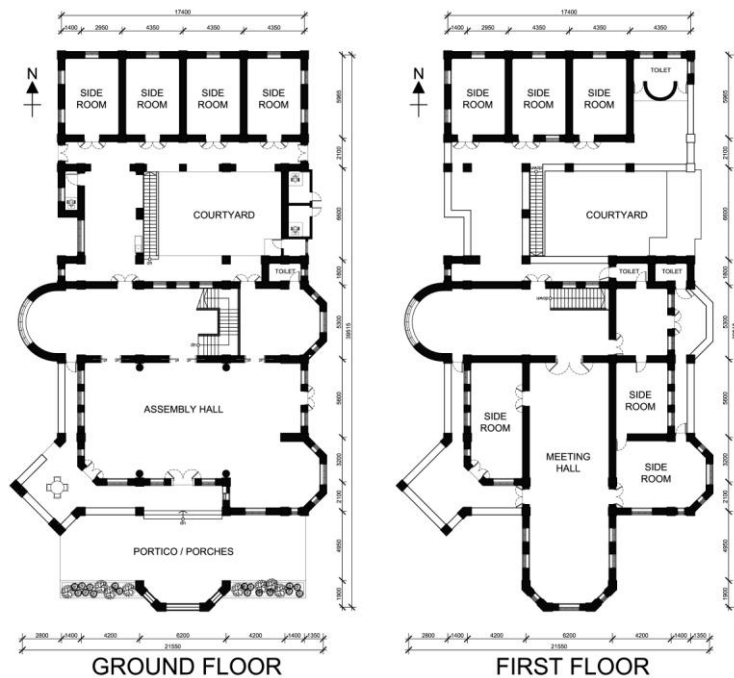


Figure 5. Ground floor and first floor plan of HLHA  
Source: Modified and surveyed by author.

## ANALYSIS AND FINDINGS

There are no contradiction between *feng shui* and passive design. Table 2 shows the relationship between *feng shui* and passive design in comparison analysis. It can be easily to comprehend and fill the gap between them.

Table 2.  
Comparison in relationship between *feng shui* and passive design.

Component	<i>Feng Shui</i>	Passive Design
Emphasis	Enhancing <i>qi</i> energy in interiors to make harmony between human and nature.	Observing, analysing the interiors to make comfort for human being.
Orientation	The façade of HLHA facing to south that considered auspicious in term of <i>feng shui</i> .	Facing to south to reduce over-radiating direct and solar gain into interior.
Opening	Main door represents as mouth of building where energy of <i>qi</i> flows into interiors.	Opening such as door and window are built on building to allow natural lighting and wind into interiors.
Ventilation	Courtyard affecting energy of <i>qi</i> flows into interiors to enhance harmony.	Courtyard functioned as stack ventilation to cool interiors, ventilation in space as cross ventilation.
Shading	Create <i>yin</i> and <i>yang</i> to avoid over-balance between shadow and natural lighting in interiors.	Porch, five-foot way, roof overhang, and verandahs are used to reduce the direct sunlight and heat.
Human position (Unity of heaven, human, and earth)	Courtyard functioned as a communication between human, and heaven to improve interaction between interior and exterior.	Inside, comfortable for interiors as human's shelter.

## CONCLUSION

Malaysian architecture plays a main crucial as a good example design for tropical climate. This architecture can be as an artifact and valuable heritage in Malaysia. Architecture is about human life and art that will have to be experienced by people for our next generations. This is because traditional Chinese architecture in Malaysia has its own context meaning which mixture of Chinese, Malay and Western architecture style that we never know.

This study explained the relationship between passive design and *feng shui* that gives us to understand by a case study. HLHA building was not only a good example as traditional architecture but this building can be analysed by researcher on passive design strategy for mansions. HLHA has a semi-closed courtyard that different with other mansions. This building has mixture with colonial architecture style where porch and five-foot way are built.

Passive design had incorporated by all architects to create a balance environment. Not all known about *feng shui* is crucial to create health impact on human in the interiors and improve prosperous among human. From this analysis, it is found that orientation, opening, ventilation, and

shading are related to *feng shui* principle in designing building. Researcher concludes some points between *feng shui* and passive design:

- Courtyard and airwell functioned as cooling passive for interior and interaction between human and nature.
- Openings should build in properly to enhance quality of air, light, and wind to improve *qi* energy.
- Porch, roof overhang, louvred window and verandahs are important elements to avoid too much solar radiation.

Courtyard is a major element in traditional Chinese architecture that created interaction between human and nature, and also help to cool down the interiors where ventilation come through. However, the application of *feng shui* need to have researching in the future for better understanding the application and concept of *feng shui* in modern architecture.

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## REDUCING UNCERTAINTIES IN URBAN POLICIES: THE URBAN PROJECT A KEY SOLUTION

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### ABSTRACTS

Economic uncertainty has been, since 1973, a recurring question that weighs on local urban policies. In a context of increasing globalization and scarcity of financial resources, competition is getting tough not only between companies but also among cities. In this competition, urban establishment, the territory and its development become factors of development (or of regression) through their ability to attract business, investment and people. The urban project appeared in France, as the remedy for the problems that are shaking cities in transformation.

If at first the urban project was considered as an alternative to functional town planning, it became, afterward, a mean for the modernization of public action. Governance, an integrated approach, partnership and participation become the key words of local government action. The performance of this action determines its legitimacy as much as the election. Thus, the ability to mobilize resources and build partnerships, become indicative of the ability of local government to take care of the needs of the territory for which it has the mandate.

The purpose of this paper is to put into perspective the evolution of the concept of "urban project". We will also discuss, through the example of Aix-en-Provence, how a flexible and heuristic model has allowed the realization of a large-scale project in spite of the economic uncertainties.

**Keywords:** urban project, governance, integrated approach, partnership, participation



## THE CONCEPTUAL PERCEPTION OF LIVABILITY WITHIN THE LEAST LIVABLE CONSIDERATIONS

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### ABSTRACT

Livability encompasses numerous indicators, factors, concepts and values that depend on locally prevailing life satisfaction in a living environment. Livability is not an attribute inherent in the environment but is behavior-related function of the interaction between environmental characteristics and personal characteristics practicing “livability” with “habitability” and “quality of life” in the living environment. Livability, thus, denotes the sum total of deliverables available to an individual or set of individuals in a particular location, leading to their contentment in day-to-day life. Doubtless, one to understand these concepts has to understand the factors of unlivability: Poverty, civil unrest, political unrest, insecure living, unemployment, poor education, lack of public facilities, inadequate shelter, poor public health, poor infrastructure, etc. The paper will discuss these factors as domains and determinants of unlivability, which lead to out migration. Such a perceptual approach of livability will be evaluated as concepts to share the terms like “quality of life”, “well-being” and “life satisfaction” all across. The paper will deal with the perceptual approach of livability to the degree to which its provisions and requirements fit with the needs and capacities of its citizens. Finally, the planning pragmatic implications of livability will be presented in relations to the living conditions of a place to reflect people’s perception of the place to be fit for living.

**Keywords:** Livability, Long Lasting City, Quality of life, Living Environment, Life Satisfaction.

### INTRODUCTION

Over the last five years, many cities in the world have become less livable. This may reflect renewed stability to recover from the global economic crisis of a few bygone years. It is not just some cities are seeing poor livable, but the world as a whole has livability decrease over the past five years (Falk, T. 2013). However, cities with major conflicts tended to score the lowest living conditions. Military and political conflicts weigh heavily on livability because they adversely affect many other factors as well: infrastructure is destroyed; hospitals are supersaturated with the wounded and dead; and economic productivity drops. But, what makes a city ‘livable’? The answer is embedded in the triple bottom concepts of Cemal Inceruh (2015) as key issues to livability: food, shelter and transportation (Inceruh, C. 2015). But at the very top to these key issues, the location of the city, water and food shortages are a frustrating frequent occurrence causing major problems for the city’s residents to inhabit their environment. Doubtless many other indicators, factors, concepts and values contribute to the answer as reasons that lead to unlivability, such as; poverty, civil unrest, political unrest, insecure living, unemployment, poor infrastructure, lack of public facilities, poor education, inadequate shelters, poor public health, traffic snarls and situations, and similar factors.

For the purpose of clarity it is important to begin with a discussion of the concept of 'livability'. Perhaps unsurprisingly, livability is an essentially contested concept, and any discussion must first begin by situating it in the wider context of the sustainable development agenda with which it is often conflated. Sustainable development itself was defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The question, then, does this definition of sustainable development relate to the concept of livability? Both are often wrongly presented as being synonymous.

First, both concepts seek to address the issue of needs. David Ley - one of the first to write academically on the concept - has noted its 'polyvocal' nature: "for the middle classes it [livability] implied a more healthy environment and attention to the culture and arts; for the inner city it carried a more rudimentary sense of social justice in such areas as jobs, housing, and public services" (Ley, 1996, pp. 33-34). Second, sustainable development has traditionally been concerned with the future, and dealt with the present only insofar as present-day development impacted on future generations. Sustainable development strategy is entitled 'Securing the Future' reflect the long-term connotations surrounding the concept.

In contrast, livability has traditionally placed a great emphasis on the present. Ruth and Franklin (2014, p. 19) noted that "livability...is about the 'now' or 'about to be'. It also tends to be about the 'here', with standards for livability varying not only from country to country, but also from city to city. Livability seems more immediate and tangible, and thus more achievable".

As a result, the concepts and strategies of sustainability and livability seem to be mainly developed to upgrade inhabited cities which by in another words to upgrade already existing living conditions. Both concepts are basically luxurious developments for living cities of almost middle classes. On the contrary, the principles and strategies of both sustainability and livability must be developed to upgrade the least livable or unlivable cities. Therefore, it must be related to revive unlivability in the least livable cities. Therefore, all factors and criteria of unlivability must be treated for the sake of humanitarian livability in the least livable cities. Thus, in these least livable cities there are so called 'basic needs' – such as food, water and shelter – and advanced needs and aspirations that arise only once basic needs have been met. Among the advanced needs are the environmental quality, personal characteristics, and biophysical environment (Figure 1).

## PERCEPTUAL APPROACH OF LIVABILITY AND UNLIVABILITY

Beyond the consensus that livability is a concern for people's perceived needs in the present, there is the concept of Kaal (2011, p. 534) that likened conceptualizing a livable urban environment to "sketching utopia", reflecting the fact that while a degree of consensus may exist as to what is 'good' in a place - security, decent infrastructure, and a high quality environment - there remains much debate about the relative importance of these elements and how to achieve them (Figure 1). At the most basic level, livability can be viewed through two alternatives objectives.

The first objective, sees livability as an attempt to conceptualize the needs and wants of urban dwellers, with a wide range of factors such as shelter, energy, food and water, waste management, public health and safety, education, entertainment, social engagement, economic wellbeing and creativity all being considered (Ruth and Franklin, 2014, p. 18).

The importance of subjective perceptions in assessing a given place's livability led social geographer Michael Pacione (2003, p. 20) to assert that “we must consider both the city on the ground and the city in the mind”, reflecting his belief that livability is a behavioral function of the interaction between the physical environment and the personal characteristics of its inhabitants (Pacione, 1990). Viewed in this way, the ambiguity surrounding livability that Ley observed becomes not just understandable, but expected. What matters is not that which objectively exists or does not exist in a place, but rather how people perceive their own needs, wants and objective surroundings.



Figure 1: Skeletal Concepts of Livability (Prepared by the Author)

The second objective through which livability can be viewed places a greater emphasis on the physical characteristics of the environment and its ability to support the livelihoods and wellbeing of its inhabitants. According to this objective approach, “the biophysical environment...establishes the boundary constraints that affect the ability of urban populations to thrive, yet those constraints themselves are shaped in complex ways by the pressures that urban populations exert on infrastructure and ecosystems” (Ruth and Franklin, 2014, p. 19).

It could be argued that the objective approach is more concerned with assessing livability in terms of the so-called ‘basic needs’, and affords less agency to individuals than those approaches which seek to portray livability as an entirely subjective construct. That is not to say that there is not an element of subjectivity to the approach - indeed, the very selection of supposedly objective criteria by which to assess a situation is likely to reflect the subjective perceptions of the researcher involved.

In practice, livability is best conceptualized as a synthesis of the perceptual and objective approaches; the ability of the biophysical environment to support an urban population is a prerequisite to the very existence of an urban population that can develop subjective perceptions of the livability of their surroundings. Therefore, livability is most valuable when seen as a skeletal concept that provides a focus for debates about what constitutes a 'good' urban environment within which to live (Figure 1).

## DOMAINS AND DETERMINANTS OF UNLIVABILITY

In the past five years, many countries' ability to feed their citizens has been at risk. Sadly and unexpectedly, such countries have lost their hard-earned status as an agricultural success story. While foreign wealthy countries aid is critical in feeding the hungry and reviving agriculture in poor countries, food security is too important to be left to the generosity of external partners. Food security requires the same seriousness and resources as national security, if not more. In fact, this results in high prices of food while population income is still very low. Therefore people look to leave their cities and migrate to the wealthy countries. Parallel to food security, water plays a central role in almost every aspect of our urban environment and quality of life in our cities. Alarming, the combined impacts of rapid population growth and climate change are now posing a severe threat to the livability and long lasting of our cities.

On the other hand, through adopting a 'societal needs' approach to livability, this paper draws connections between human needs and wants with the physical paradigm of livable environment. To a large extent the physical and material needs for survival are common to all communities – food, water, shelter etc., however, the needs and wants beyond mere survival, those that effectively enhance one's quality of life, are likely to reflect the particular values and ambitions of the communities.

We all know that many people have left their villages or small town looking for better education in other cities. Therefore, many places become unlivable once the environment lacks or has poor education. Therefore, livability is about tying the quality and location of transportation facilities to broader opportunities such as access to good jobs, affordable housing, quality schools, and safe streets (Newland, J. 2011). In this concern, Inceruh, C. (2015) considered transportation as one of the key issues to livability, in which people will basically need safe transportation to travel and to transfer their food goods to and from their living environment. Thus, providing transportation' alone, is not enough to provide livability, but rather it should be safe, affordable and well managed, and also, the accomplishment of all the needs shown in Figure 1, to proceed livability in urban areas.

Safety is another issue of concern in a living environment. It is important to make residents feel safe in a densely populated environment. Such a domain and determinant of livability is an indispensable factor to sustain livability; otherwise, the environment is determined as unlivable, and people may leave for safer environment. Moreover, Job is the source of income that makes a living for a family wherever they live. Therefore, job is that indispensable issue of living, and without it or lack of it in an environment; doubtless it becomes unlivable, thus, people migrate to other cities if not to other countries to provide a good living. Last but not the least, shelter comes at the top of the key issues, of Inceruh, to provide livability. It should be, also, affordable; and does not only concern the 'affordability' factor; but also the quality of shelter also impacts the home users. So, well-designed housing is important as it can allow people to live comfortably.

However, at the very top to these domains and implications, political conflicts, safety and security weigh heavily on livability because they adversely affect many other factors as well; such as, infrastructure, hospitals, and economic productivity drops. Doubtless, civil society flourishes under

conditions that include freedoms of speech and assembly. But what happens when those conditions are lacking? Freedom is limited, and political unrest regularly challenges the state. And political and civil unrests become a determinant of unlivability.

## CONCEPTUAL LIMITS AND THE PLANNING PRAGMATIC IMPLICATIONS OF LIVABILITY

The policymaking for planning implies not only the “here and now” is relevant to a city’s livability, but also the “there and later” The discussion above highlights the following five issues at the intersection of socioeconomic and environmental dynamics as critical in defining and shaping livability:

First, the plans of visionaries (of architects and planners) should fit to expectations and dialog with the people for whom the planning took place and the execution of plans should be provided for the forms of buildings, infrastructures and institutions; and also should consider personal preferences and future socioeconomic and environmental conditions.

Second, the concept of livability should be synthesized on the urban condition. However, theoretically grounded models can help planners and decision-makers scope out the potential “livability implications” of alternative investments in infrastructures and institutions. In addition, the distinction between required and desired aspects of livable places is murky. Thus, thoughtful integration of future research may complement modeling and community engagement to enrich a perspective that would otherwise be unduly skewed towards what is currently known and valued.

Third, infrastructures and institutions are usually long-lived and difficult to change. Yet urban systems characterized by rapid demographic, socioeconomic, and environmental changes must be increasingly flexible to adjust to unforeseen and often unforeseeable future conditions. Engineering solutions that facilitate re-use of materials become of increased relevance to a wider array of cities, especially as they attempt to cope with climate impacts. The design criteria and standards, choices for building materials, and other attributes may need to rapidly change, making it increasingly cost-effective to retrofit and adjust the existing capital stock. Similarly, institutions may need to be re-designed and re-tooled more rapidly. Using similar approaches to institutional design at the urban scale may bring with it new opportunities to redefine the mandates for those charged with maintaining and improving livability in an environment of rapid social and biophysical changes. Nevertheless, for adaptive management to be successful also requires better engagement of local communities in planning and policymaking. The traditional model of expert advice to decision makers; limit the development of use-inspired research that may be needed to enhance livability.

Fourth, growing national interconnections among cities gives them new market opportunities and a broader knowledge base for action. It also creates the danger that adverse impacts on a selected set of cities ripple through to affect others. Taking into considerations the national stage while strengthening their stance on the local provision of water, food, materials and energy may be essential to making the nation, and by extension livability, work. The diversity thus generated in the socioeconomic and environmental space that defines cities may well become a hallmark of their livability.

Fifth, and finally, diversity is both the scourge and banner of livability. It is the banner or hallmark of livability in the sense that diverse economies, populations, and responses to social and environmental challenges strengthen cities and make them more resilient and, arguably, more livable. Diversity should be considered in terms of age structure, class, race, or some other aspect of the



population—that undermines the premise of a uniform definition of livability for all. Moreover, by allowing for the possibility that what is considered “livable” and desirable will vary over space, we allow for the likelihood that individuals and households will migrate to the cities that offer the range of amenities, goods, and services they prefer. This migration, or sorting, is likely to have a detrimental effect on all aspects of diversity, as cities and neighborhoods become more homogenous over time.

In practice, numerous attempts have been made to put ‘meat on the bones’ of the concept of livability, principles must be developed to ensure the creation of livable cities are: the regeneration of existing urban areas; the prioritization of pedestrians and walking over car-based transport; the provision of high quality, easily accessible open space and community infrastructure, taking account of local history, architecture and ecology; and, above all, the creation of strong and diverse communities through citizen-based participatory planning. Nevertheless these principles are not in themselves enough to guarantee a high standard of livability, but we have to consider that ‘economic vitality, community stability and environmental health cannot be sustained without a coherent and supportive physical framework.

While New Urbanism might be seen as a development of traditional approaches, we have to focus on the importance of livability in determining socio-economic and health outcomes, and social and political resolutions. Such approaches tend to take a deductive approach, investigating the effect of certain environmental and societal characteristics on a given population to identify those factors (mentioned above) that are important determinants of a livable environment.

However, to create the ‘city in the mind’ or the ‘desirable city’ or the ‘city we want’, related values: durability, sustainability and livability must be considered all together to sustain and provide livability in urban areas (Figure 2). No doubt, our view of the kind and quality of cities we as societies want to build will continue to evolve and inspire a new descriptive goal. The city we want to create in the future is the city in which we want to live. Certainly that city is sustainable, since we want our cities to balance consumption and inputs to make a footprint that can last into the future. And yet: as we build this vision we know that cities must also be *livable*. Indeed, we must view livability as the third indispensable—and arguably most important—leg supporting the cities of our dreams: durable (long lasting) + sustainable + livable. Thus, we can imagine sustainable cities—ones that could persist in resource, energy, and ecological balance. We can, also, imagine long lasting cities—especially cities that are made so through extraordinary and expensive works of grey infrastructure—that are not sustainable from the point of view of energy consumption, food security, economy, or other resources. They perhaps are not even long lasting, but rather *durable*, in the sense that they repel the shock rather than absorb and bend it to.

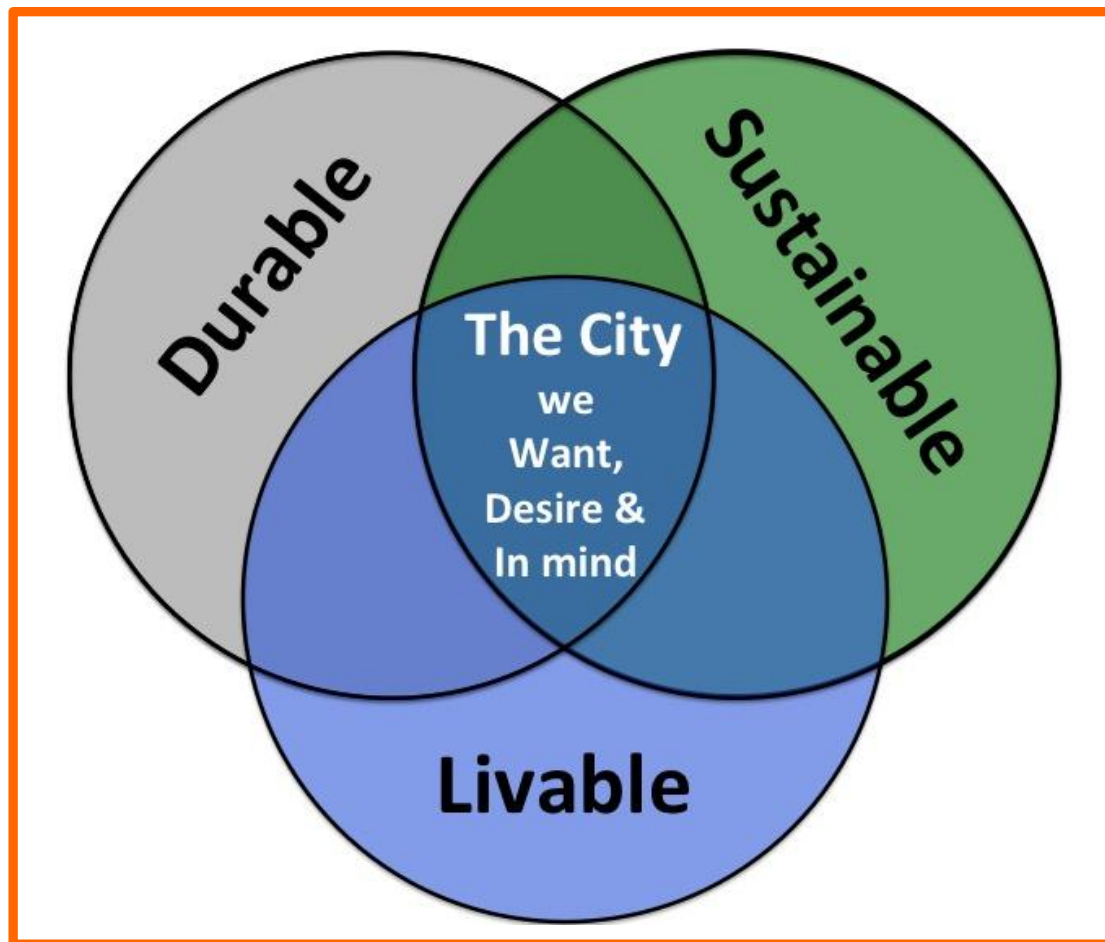


Figure 2: Values of the Design Elements for Future Livable City. (Developed by the author)

We can imagine livable cities that are neither durable nor sustainable. And, it is easy to imagine long lasting and sustainable cities that are not livable—and so are not truly sustainable. The point is that we must conceive and build our urban areas based on a vision of the future that creates cities that are durable (long lasting) + sustainable + livable. No one of these is sufficient for our dream cities of the future, unless related sources are available in the nearby. Of course, many cities around the world don't really have the resources to make progress in any of the three. In this manner, if we agree with the proposal of Madox, D. (2013), we can follow up five challenges to advance durability (long lasting) + sustainability + livability continuum.

1. To take the concept of durability (long lasting), sustainability and livability beyond the metaphorical status and to make them more operational by being specifics:

*Sustainability* is the long term, cultural, economic and environmental health. But in practice, the thought is long term but not long lasting, future but not durable, functional but practical; unless it provides linking of all of the aspects/values within the budget locally.

*Durability (long lasting)* of the city should be adaptable, elastic and should ability to rebound to previous state with redundancy of systems, and survival after soft failure.

*Livability* is the sum of quality of life, prosperity, opportunity, equity, safety, mobility and happiness including educational opportunity, and cultural, entertainment and recreation possibility.

2. Acknowledge and confront the differences between durability (long lasting), restoration and resistance: In long term we should focus on idea that our systems are elastic enough to deform and absorb the stress and then “bounce back” to the former state. At some level, though, high stress bumps the system to a new state, or new equilibrium. However, cycles of damage and rebuilding are not ecological or durable system. Thus, restoration is an act of the community and can require great resources.
3. Communities and social movements should include and engage people where they live: Engagement is key at every level. It is the community building they engender through stewardship activities as part of the program.
4. Mindfully to create mosaics of communities and design elements: the city will be designed as a community garden, where food is produced that otherwise would be imported from elsewhere. They are typically places of beauty where people gather and strengthen a community’s sense of identify and cohesion. This point circles back to challenge 1: durability for whom? If every zone or neighborhood is planned with a complete set of durability (long lasting) + sustainable + livable values, then perhaps we are likely to find that projects would create more flexibility for long lasting.
5. Interrelations of different types of cities: There are a few handfuls of cities around the world with the resources to create or buy the resources, structures, and experts they need to solve their challenges. It is the matter of how people in these cities can find the information and inspiration they need to effect positive urban outcomes. Cities often have more problems—and solutions—in common with each other, even across political boundaries, than they do with rural areas nearby. Therefore, first of all, solutions to urban problems ultimately must be adapted and implemented locally. This platform needs to be person to person so that thinkers and doers can share and learn, so knowledge can propagate and spread. Local solutions can thereby be shared globally and nation wise, and then re-localized, in new places.

Of importance to this study is the grouping of these indicators, concepts, factors and values into ‘domains of importance’ that are likely to be social determinants of health and wellbeing and therefore have a major impact on livability. These domains are: crime and safety; education; employment and income; health and social services; housing; leisure and culture; local food and other goods; natural environment; public open space; transport; and social cohesion and local democracy. Many of these domains are shared with more traditional conceptions of livability with symbiotic relationship between people’s attachment to their residential area and their experience of public spaces”, with ‘hard spaces’ such as streets, markets and shopping districts as important for social interaction as ‘soft’ spaces such as parks and gardens.

What becomes clear as one examines in detail the many factors that are associated with livability is that very few of them can be viewed in isolation. Some scholars put greater emphasis on some factors over others, but ultimately, they are not mutually exclusive and many are dependent to a degree on others. Rybczynski (1986, p. 230) has used the analogy of an onion to try to bring sense to this situation: “it appears simple on the outside, but it’s deceptive, for it has many layers. If it is cut apart there are just onionskins left and the original form has disappeared. If each layer is described separately, we lose sight of the whole. The layers are transparent so that when we look at the whole onion, we see not just the surface but also something of the interior”.

## CONCLUSION

Changes along the life course of people and their communities, as well as changes in the physical and biological environment within which they live, are therefore fundamental aspects of any principles of livability. Since livability is about the “now” or “about to be.” It also tends to be about the “here,” with standards for livability varying not only from country to country, but also from city to city. Livability seems more immediate and tangible, and thus more achievable. Creating livable communities, rather than sustainable ones, also lies within the purview of local agencies, planners, architects, and policy and investment makers, who shape the environment within which people’s needs and aspirations unfold. In many instances, laws and regulations exist that help ensure the promotion and maintenance of safe buildings, reliable provision of water and energy, a clean environment, education, jobs, public health, and other elements of a livable city. As a consequence of established mandates, institutions and individuals can, at least in principle, be made responsible and held accountable for their lack of attention to livability.

Once basic needs, such as food, shelter and security are fulfilled, higher-level wants and aspirations move into the forefront of planning and decision making both at the individual and community level. However, as one moves from basic needs to other determinants of livability, subjective judgments of what constitutes livability are introduced. Recent discussions, particularly in the context of developed countries, have framed the notion of a “livable city” akin to a “desirable city.” This shift in emphasis from minimum requirements for livability to lifestyle is also the conceptual crack that allows the bogey of varying preferences to enter ‘what minimum standards for livability might be’, but there will be confusion about what constitutes a desirable city.

The notion of a livable city has not yet outlived its usefulness. It is slowly maturing to embrace the dynamics that for so long plagued its various definitions and applications. Along the way, new approaches for data collection, analysis and visualization, modeling and stake-holder engagement, technology development and deployment, and institutional design and policy will help planners and decision-makers connect what is here and now with what is still lacking in order to meet people’s needs and wants, now and in the future.

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