ISLAMIC ENVIRONMENTAL ETHICS AND GREEN TECHNOLOGY PRACTICES FOR PARK DESIGN: POTENTIAL OF THE ADAPTATION IN TAMAN TASIK TITIWANGSA

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ABSTRACT

Current global environmental problems such as global warming, urban heat island impact, water contamination and deforestation lead towards a great challenge to present and future generation in providing its solution. The role of design intervention in minimizing and mitigating such problems seems to be vital. Therefore, developing an environmental friendly park in an urban setting is highly needed to mitigate the environmental degradation, improve quality of life and connect man and the environment through the patches of green space. Park as the public space may provide a vital outdoor space which brings comfort to the people. Hence, the demand for good and practical park design has been increasing. As a Muslim, our life is should be based on the Islamic principles as referred to the Al-Quran and Sunnah Hence, good design guidelines should also be derived from the Islamic principles as Islam provides a comprehensive way of life. In studying the Islamic ethics, these three prior relationships are explored; man and God, man and the environment and man and man, followed by special focus on sustainability in Islam in an attempt of a holistic approach. Therefore, green technology practices in park design are important in sustaining the environment. This research is an attempt in deriving a park design guideline which is based from the Islamic principles and ethics, with further observation on the application and potential application of green technology at a case study site which is Taman Tasik Titiwangsa. The main techniques adopted are content analysis and observation. The content analysis is applied on several surah in Al-Quran and the al-hadith that mentioned on the environment, as well as the park design guideline from Jabatan Landskap Negara (JLN) and Jabatan Perancangan Bandar dan Desa (JPBD). The output from the content analysis is translated as a guide to observe design elements such as; spaces, forms and activities at the site. The results suggested that the Islamic environmental principles and ethics could be integrated and applied into the park design guideline and associated with the arrangement of spaces and the interaction of people. This paper also suggested that the green technology application is in-line with the Islamic principles and ethics on the environment and could be instilled together with the design elements such as at the gathering points and pathway, on the land as well as in the water bodies. Therefore, the design recommended for the adaptation of green technology that addresses Islamic environmental principles and ethics are suggested at one location only at the case study site because the overall site is quite large to be covered by researchers.

Keywords: *Islamic environmental ethics, green technology, park design guidelines*

INTRODUCTION

The history of public park development in Malaysia started by the British administration by introducing Kuala Lumpur Lake Garden in 1890's, the Penang Botanical Garden in 1844 and Taiping Lake Garden in 1897. The idea of Public Park continues after the country's independence where

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several public parks being introduced which are Taman Tasik Titiwangsa, Taman Tasik Permaisuri, Taman Tasik Shah Alam and many more. This was in conjunction with the Malaysian Government movement towards an urban renewal where several policies were made to upgrade the living environment (Abu Bakar 2002). Normally people will go to an open space or public park, to do various recreational activities (Bilgili and Gökyer, 2012 - online). This suggests that people started to seek for quality lifestyles. Thus park design guideline is important as the initial step leading towards good quality park. This research is to study on the existing park design guideline and to study whether it is in line with the Quran and *Sunnah*. These is deemed as crucial because a good quality design guideline would reflect the Islamic principles and ethics as the Quran and *Sunnah* are the ultimate and perfect references for us. This has been mentioned in the Quran;

"*This day I have perfected for you your religion and completed My favor upon you and have approved for you Islam as religion*" (*Al-Maidah*: *5*)

From the literature review conducted, there might not seems to be any park design guidelines that is derived straight from the Quran and *Sunnah*. The understanding of human relationship in life which are the relationship between man and God, man and the environment and between man and man were studied and being translated into the practices of sustainability in Islam. The practice of *'adl* (justice), *mizan* (balance), *wasat* (moderate) and *taharah* (cleanliness) are emphasized in an attempt to relate the Islamic principles and ethics with park design guidelines. Green technology practices are seen as the translation of techniques towards achieving sustainability which is seen as in-line with the Islamic environmental ethics. One site has been chosen to be further studied which is Taman Tasik Titiwangsa in Kuala Lumpur.

Interpretation of Islamic Environmental Ethics in Park Design Guidelines

Islam identified human interaction into three categories; the interaction with the Creator, the interaction with human being and the interaction with the environment (Mamat and Mahamood 2010). The understanding of these three relationships is important in environmental studies because it is related to the creation of the Earth as mentioned in the Quran;

"And the heaven He raised and imposed the balance, That you not transgress within the balance, And establish weight in justice and do not make deficient the balance." (Ar-Rahman: 7-9)

The first verse above mentioned about the relationship of man and Allah as man should realize that Allah is the Creator of the earth and He created it with balance. The second verse continues to remind man that they should not cause anything that will lead to the disturbance of the

environment and this is how the relationship of man and nature being explained in the Quran. The verse also highlighted on the relationship between man and man where they should practice justice in interacting with each other without causes harm to the environment. These aspects can be translated physically in park design guidelines as the implementation of the practices of sustainability in Islam which are *'adl* (justice), *mizan* (balance), *wasat* (moderate) and *taharah* (cleanliness).

A park can be considered as urban open space or green space that support various ecosystem components including water, plants, animals and many more (Chiesura, 2004). Thus designing a park with the application of sustainable ecology will help in achieving the main goal of the park which is providing peace and calmness to city dweller (*see* Chiesura 2004:130). Every creature has its own right and Allah (SWT) has commanded us to help and be fair towards each other's without exceeding the limit that has been set by Him. All humankind is required to practice justice in all kinds of situations as this is the law of Allah. He mentioned this in the Quran;

"Verily, Allāh commands that you should render back the trusts to those, to whom they are due; and that when you judge between men, you judge with justice. Verily, how excellent is the teaching which He (Allāh) gives you! Truly, Allāh is Ever All-Hearer, All Seer." (Surah Nisa: 58)

The term *Mizan* (balance) used in the principle of sustainability in Islam in discussing on how human should manage the environment to make sure it achieves the stability of natural ecosystem (Sustainability in Islam-online). Allah has set everything in balance (*mizan*) which is in proportion and integration. This has been proven in numerous verses of the Quran that explain the concept of *tawazzu*n (balance) for example in *Surah Al-A'la* verse 1-3;

"Glorify the name of thy Guardian-Lord Most High, Who has created and further given order and proportion: Who has ordained laws and granted guidance"

Matali reported that two things that can distract our role as steward on earth are wasting and over consuming (Sustainability in Islam-online). Therefore, in designing a park the practice of *wasat* is a must to ensure one did not use the resources excessively. The Quran says,

"…But waste not by excess, for God loves not the wasters" (Al-A'raf: 31)

Creating a harmonious community that practice cleanliness is really important in Islam as the Prophet saw said "*cleanliness is half of faith*" (narrated by Abu Malik al-Ash'ari). Furthermore, cleanliness (*taharah*) is one of the virtues that is included in the Islamic environmental ethics because it reflects how men should treats their environment (Shomali, 2008). The practices of *taharah* in life can ensure a good quality of life and will generate a well-being society.

After discussing and understanding how the practices of sustainability in Islam can help in improving and sustaining the environment in general, the existing park design guideline as well as the condition of park can be improved.

Green technology application in achieving environmental balance

Environmental degradation destroyed the balance of the environment. Green technology criteria which promote conservation of energy and natural resources and the use of renewable resources might be applicable to park design in mitigating the environmental degradation (KeTTHA website-online). Green technology is defined as "*the use of development and application of products, equipments and systems to conserve the natural environment and resources, which minimize and reduce the effect of human activities",* (from KeTTHA website-online). Therefore, existing green technology criteria by KeTTHA are focused on; energy efficiency which conserving the use of energy and natural resources, environment friendly by improving environment and design that should be safe for use and promoting health, promoting the usage of renewable resources, mitigate greenhouse gas which achieving zero or low greenhouse gas (GHG) emission and conserves environment by minimizing the degradation of the environment (from KeTTHA website – online). However, these green technology guidelines are rather general for all sectors to apply green technology in any development. Green technology guidelines for park design are not clearly outlined. Hence, it is deemed very crucial to have a park design guideline that clearly integrate the application of green technology in it.

Green Technology Application in Addressing Islamic Environmental Ethics

In brief, the application of green technology in park design can address the Islamic environmental ethics practices. This is because green technology application caters the criteria that have been outlined in the Quran and Sunnah such as purification and conservation of the environment. Thus, these show green technology is in line with Islamic environmental ethics in balancing the environment and improving the quality of human's life.

METHODOLOGY

This research study applied two main techniques which are content analysis and field observation. The content analysis is on the human relationships based on Islamic ethics and the application of green

technology. These will help in developing a checklist for observational purpose. Figure 1 outlined an overview of the stages involved in the data collection:

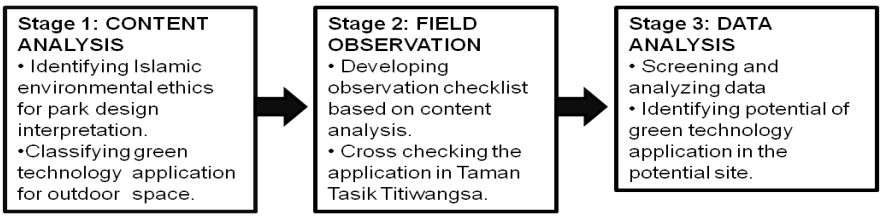


Figure 1: Stages of data collection

Content Analysis

The content analysis method is to get the understanding of Islamic environmental ethics and green technology application before conducting the field observation. The method used is to study on verses of Quran and Sunnah that reflect the Islamic environmental ethics for park design guidelines. In addition, a study on the green technology application was made to find how it can be integrated in park design. The selection of topics achieved by identifying and screening keywords that reflect the Islamic environmental ethics, green technology, its application, components, and benefit. The sources of the document were based on Quran and Sunnah, journals, books and articles. Figure 2 shows the aspects that are researched for content analysis:

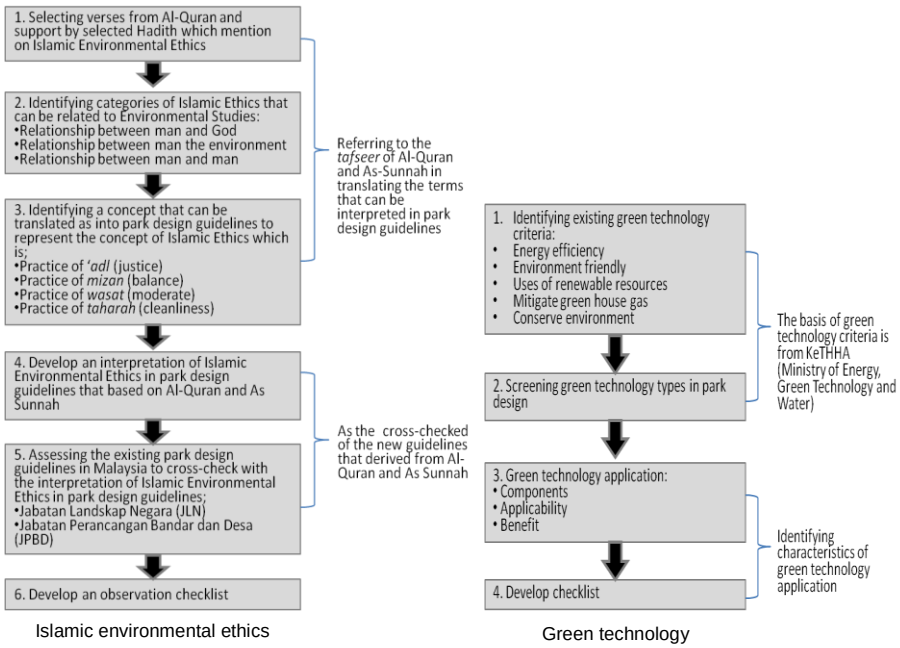


Figure 2: Framework of content analysis method for Islamic environmental ethics and green technology

The data derived from content analysis was analysed to produce the checklist for the observation form for field observation.

Field Observation

Field observation was done in Taman Tasik Titiwangsa. Taman Tasik Titiwangsa was chosen as site study because it was an ex-mining land which has been successfully developed as a recreational park in Kuala Lumpur City Center. The field observation was conducted on weekend from 11.00 am until 4.00 pm following the available time of the researcher. The main reason for this observation is to identify the translation of Islamic principles and environmental ethics, and green technology in the park and to identify further the potential of these applications on other areas within the site. A technique that was adopted is direct observation. First, the site is classified into five zones which determined by having the distance between two points of each trail approximately 300 meters which is within 15 minutes of walking distance. The process of observation is outlined in Figure 3.

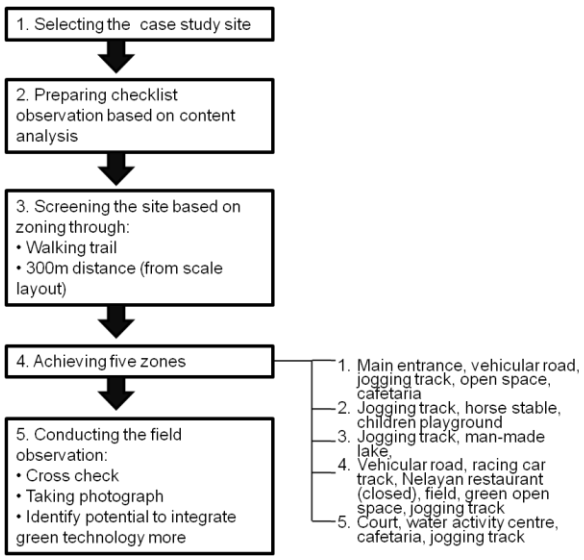


Figure 3: Framework of field observation

RESULTS AND ANALYSIS

The results of the content analysis for the park design guidelines that have been outlined from the Quran and Sunnah are as shown in the Table 1.0 below:

ISLAMIC ETHICS	**SUSTAINABLITY IN ISLAM**		**AL-QURAN**	**AS-SUNNAH**	**INTERPRETATION IN PARK DESIGN**	
The relationship between man and Allah	1	Practice of *'adl*	-(An-Nahl:90) -(Al-A'raf: 29-30) -(Al-A'raf: 56) -(Al-A'raf: 143) -(Al-Isra':70-72) -(Al-Fussilat :10-13)	(Sahih Bukhari,479) (Sahih Muslim, 2582)	Practice of *'adl*	**Function/Form-** that can be used by various group of people -provide a calm and peaceful area **Circulation-** well division of pedestrian and vehicular network, well connected,safe **Activity-** support all groups of people, encourage socializing activities to strengthen the *ukhuwwah* between one another
	2	Practice of *mizan*	-(Al-Qamar:49) -(Ar-Ra'd : 8) -(Ar-Rahman :7) -(An-Naml:61-64)		Practice of mizan	**Function/Form-** balance in providing space (for activities and natural area) to create balance ecosystem **Elements** -In designing a space, a proper balance between man-made and natural resource can give lots of benefits in term of aesthetic value such as beautiful scenery, tranquility etc
	3	Practice of wasat	-(Al-A'raf: 30-32) -(Al Baqarah :143)			
	4	Practice of taharah	-(Al Baqarah :222) -(An Nur :36) -(Ar-Ra'd :17) (Maryam :13) -(Al-Hajj: 26)	(Sahih Muslim, 521)		
The relationship between man and environment	1	Practice of 'adl	-(Al-A'raf:52) -(Al-A'raf, :157) -(Al-Baqarah :30) -(Ar-Rum :41) -(Al-Qasas: 77)		Practice of wasat	**Elements –** -provide functional facilities and structures **Function/Form-** -conserve natural resources
	2	Practice of mizan	-(Ar-Rahman : 8) -(Al-Fussilat :13) -(Al-Mu'minun :17-22)			
	3	Practice of wasat	-(Al-An'am :141-142)	(Sunan Ibn Majah,424)		

	4	Practice of taharah	-(An-Naml :60) -(Al-Baqara: 25) -(At-Tur: 24)	(Sahih Muslim,432) (Al-Tirmidhi, 5239) (Al-Darimi, 560)		
The relationship between man and man	1	Practice of 'adl	-(An-Nisa': 58) -(Al-Isra' :26) -(Al-Baqarah :104) -(Al-Baqarah :233) -(Al-Qasas :83-84) -(Al-Hadid :25) -(Al-Mumtahinah:8-9) -(Al-Maidah :8)	(Hadith 32 : Imam Nawawi)	Practice of taharah	**Elements –** provide facilities that promotes cleanliness
	2	Practice of mizan	-(Ar-Rahman :9)			
	3	Practice of wasat	-(Al-Isra' : 27-28) -(As-Sajadah:24)	(Tirmidhi 5059)		
	4	Practice of taharah	-(Al-Maidah :6) -(Al-Muddaththir: 4-5) -(Al-A'raf :31)	(Al-Tirmidhi, 2799)		

Table 1.0: Content analysis for the park design guidelines that have been derived from Quran and Sunnah

The following table shows the translation of three relationships of human which are the relationship between man and Allah, man and environment and man and man into park design guidelines. The Quran mentions about these in some verses as shown in the table, the verses were selected based on its relationship with the environmental study and the practices of sustainability in Islam that reflected back those three relationships. There are some selected Hadith to support and to elaborate further the Quranic verses. From the analysis of some verses of the Quran and Sunnah, it can be said that the Islamic principles and ethics can be translated into certain design guidelines such as the form and function, circulation, activities and elements of the design. These translations reflect the three relationships of human in park design if it fulfills the criteria of *'adl* (justice), *mizan* (balance), *wasat* (moderate) and *taharah* (cleanliness).

From this analysis, an assessment of the existing park design guidelines in Malaysia is conducted to identify the adaptation of the Islamic Environmental Ethics criteria that exist in the guidelines. The two guidelines chosen are the guidelines from Jabatan Landskap Negara (JLN) and Jabatan Perancangan Bandar Dan Desa (JPBD). The following Table 2.0 illustrates the results from the assessment:

<table>
<tr><th rowspan="2">JLN (Jabatan Lanskap Negara)</th><th rowspan="2">JPBD (Jabatan Perancangan Bandar dan Desa)</th><th colspan="2">Islamic Environmental Ethics Practices that can be found in Park Design Guidelines by JLN & JPBD</th></tr>
<tr><th>JLN</th><th>JPBD</th></tr>
<tr><td>Taman Tasik Titiwangsa is considered as Taman Wilayah – minimum size 100 hectares</td><td>Taman Tasik Titiwangsa is considered as Urban Park - Size 40 hectares – 100 hectares (100 acres - 250 acres).</td><td rowspan="4">(Practice of ‘adl)

-The critical preparation of the planting design to make sure the vegetation selected is not going to harm the park user

(Practice of mizan)

- The guideline on the zoning classification is the approach to create a balanced ecosystem</td><td rowspan="4">(Practice of ‘adl)

- The guideline of activities provided is to ensure the park meet the needs of the users

(Practice of mizan)

-The guideline on the zoning classification is the approach to create a balanced ecosystem

(Practice of taharah)

- Provide facilities that promote cleanliness in the park</td></tr>
<tr><td>Zoning – 60% consists of soft landscape, 40% consists of plinth area (space that can be developed for activities/ facilities purposes)</td><td>Zoning for landscape – 50% of open space and recreation should be of soft landscape and less than 50% of the plinth area.</td></tr>
<tr><td>Types of trees;
- huge canopy for shades purposes
- height of trees (min 3m)
- flowery trees planted at the entrance
- trees that have no poison, thorn and frail branches
- fruit trees (can attract birds and others fauna)</td><td>Activities provided must;
-support various group of people
-Provide research and development facilities such as a research centre, library and information kiosk
-Provide playing fields for structured sports activities, games courts, sports building or hall, tennis, badminton complex, swimming pool and others</td></tr>
<tr><td>Planting organization – a distance that can be easily maintained</td><td>Public Facilities – vehicles parking space, public toilet, surau, and good pedestrian walkway network</td></tr>
</table>

Sources: http://www.townplan.gov.my/, http://www.kpkt.gov.my/jln/

Table 2.0: Comparing the park design guidelines with the four Islamic environmental principles

From the Table 2.0, it can be concluded that the practice of ‘*adl* is dominant compared to others practices. The practice of *wasat* in both

guidelines is invincible. From these result, it is strongly prove that park design guidelines in Malaysia recently does not derived directly from Quran and *Sunnah*.

There are many types of green technology that can be applied in outdoor space. However, through the content analysis of green technology application, it can be suggested that there are about thirteen types of green technology that can be applied in park design- as shown in Table 3.0.

TYPES OF GREEN TECHNOLOGY	CRITERIA OF GREEN TECHNOLOGY	APPLICABILITY	BENEFIT
1. Photovoltaic system	• Energy efficiency • Environment friendly • Conserve environment • Uses of renewable resources • Mitigate green house gas	• Outdoor lighting • Provide electricity in landscape furniture.	• Preserve natural resources • Conserve energy • Financial savings
2. Green Screen/ Vertical Garden	• Environment friendly • Conserve environment • Mitigate green house gas	• Higher impervious surface areas • Outdoor facade or vertical surface	• Reducing the urban heat island effect (UHI) • Increase the effectiveness of building sound insulation • Decreased storm water runoff
3. Permeable paving	• Environment friendly • Conserve environment	• Paving roads, cycle-paths, parking lots and sidewalks	• Manage runoff, prevent serious erosion and siltation • Control pollutants. • Allow groundwater recharge
4. Stormwater planters	• Environment friendly • Conserve environment	• City streets, parking lots, and commercial and residential properties	• Reduce temperature in urban setting • Reduce storm water runoff • Reduce runoff volume.
5. Tree box filter	• Environment friendly • Conserve environment	• Along urban sidewalks	• Improve the quality of life in urban areas
6. Cistern/ rain barrel	• Energy efficiency • Environment friendly • Conserve environment	• Rainwater harvesting • Connected to green roof or underground reservoir	• Reduce the need for treating municipal water for uses • Reduce peak storm water volume • Reduce runoff volume
7. Phytoremediation	• Environment friendly • Conserve environment • Mitigate green house gas	• At contaminated areas • On land: less than twenty feet deep • Not more than three feet below the water-table surface	• Improve water quality for recreation • Wildlife conservation • Removing environmental toxicity

8. Green roof	• Environment friendly • Conserve environment • Mitigate green house gas	• On the building roof	• Reduce city "heat island" effect • Treat nitrogen pollution in rain • Negate acid rain effect • Help reduce the volume and peak rates of stormwater
9. Bio-retention cell	• Environment friendly • Conserve environment	• Parking lot islands, along streets and boulevards.	• Improve storm water quality • Maintain downstream stability • Preserve natural hydrology function • Reduce footprint
10. Infiltration trench	• Environment friendly • Conserve environment	• At small urban drainage areas (underground)	• Improve storm water quality • Maintain downstream stability • Preserve natural hydrology function
11. Curb cuts	• Environment friendly • Conserve environment	• Along road way , side walk, and planter box	• Maintain downstream stability • Preserve natural hydrology function
12. Sediment filter strip	• Environment friendly • Conserve environment	• Area between pollutant source areas and a downstream receiving water body.	• Improve storm water quality • Maintain downstream stability • Preserve natural hydrology function
13. Vegetated swale	• Environment friendly • Conserve environment	• Surface drainage along residential streets and highways	• Improve storm water quality • Maintain downstream stability • Preserve natural hydrology function • Reduce footprint

Table 3.0: Potential green technology types for outdoor spaces
(adapted from-*http://courses.be.washington.edu/LARCH/, http://www.kettha.gov.my/en/)*

The table shows the green technology types that were compared to green technology criteria stated by KeTTHA. The applicability of application also attained to indicate the potential location in the park. Hence, its benefit is outlined to explore potential areas for optimum advantages of the application. The result from this table is then used to develop the observation checklist form for the field observation.

Field Observation on Application of Islamic Environmental Ethics and Green Technology in Taman TasikTitiwangsa

The field observation was conducted in Taman TasikTitiwangsa with the aim to identify the application of Islamic environmental ethics and the green technology.The result of field observation is shown as follows:

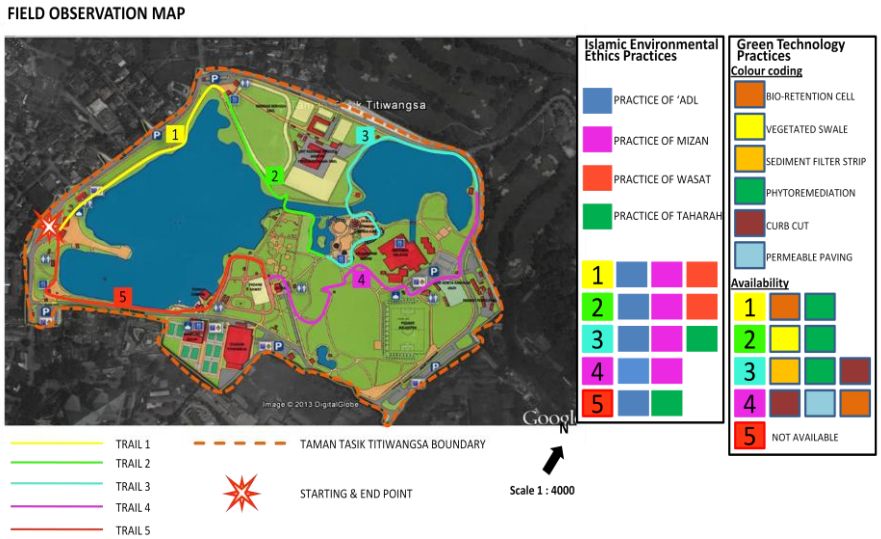


Figure 4: Field observation result in Taman Tasik Titiwangsa

Islamic Environmental Ethics Practices	Color Coding	Interpretation in Park Design
'Adl		• **Function/Form-** that can be used by various group of people • **Circulation-** well division of pedestrian and vehicular network • **Activity-** support all group of people, encourage socializing activities to strengthen the bond between one another
Mizan		• **Function/Form**- balance in providing space (for activities and natural area) • **Elements** -In designing a space, a proper balance between man-made and natural resource can give lots of benefits in term of aesthetic value such as beautiful scenery, tranquility etc
Wasat		• **Elements –** conserve natural resources , provide functional facilities and structures
Taharah		• **Elements –** provide facilities that promotes cleanliness

Table 4: Observation checklist on Islamic environmental ethics

The overall results on the application of Islamic Environmental Ethics are shown in the following diagram:

THE APPLICATION OF ISLAMIC ENVIRONMENTAL ETHICS AT TAMAN TASIK TITIWANGSA

Diagram 1: The Application of Islamic Environmental Ethics in Taman Tasik Titiwangsa

The diagram above explains on the overall result of the observation on the application of Islamic Environmental Ethics in Taman Tasik Titiwangsa. The most Islamic practices at the site is the practice of *'adl* (justice). While the practices of *wasat* (moderate) and *taharah* (cleanliness) are hardly found at Taman Tasik Titiwangsa. Therefore the discussion on these results was shown in the Table 5.0 below:

OBSERVATIONS (TRAIL 1 &2)	**DISCUSSIONS**	**ANALYSIS**
 Seating Area  Jogging Trek  Cafeteria  View of Kuala Lumpur skyline  Dirty drainage near to cafetaria	**Function/Form** -The area provide a sense of welcoming in terms of the shady walkway and peaceful seating area -It also designed in balance way where the man-made structure are not dominating the natural form -Wildlife friendlier environment because the natural elements being well-conserved - seating along lakeside allow users enjoying the view of Kuala Lumpur while they are resting (this also may invite the realization on the Greatness of Allah) **Circulation** -well division of pedestrian and vehicular network **Activity** -Promote various activities such as jogging, resting, gathering and cycling **Elements** - The weakness of this area was in term of facilities provided such as dustbin. In the cafeteria area there is no dustbin located, this has leads to the littering at the nearer drainage system	-From the observation and discussion, it can be concluded that area in Trail 1 and 2 area practices '*adl, mizan* and *wasat.* -Both of the areas have similarities in terms of form, function, activities and elements. This is the reason of the similar practices at the areas. Practice of *taharah* is still hardly been seen because the facilities provided did not reflect the awareness of cleanliness in the area. An area with an active zone such as cafeteria should provide more dustbins.

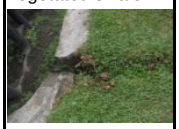
 Stable Horse		
OBSERVATIONS (TRAIL 3)	**DISCUSSIONS**	**ANALYSIS**
 Children playground  Man-made island  Impervious surfaces  Gazebo	Function/Form - The observation shows that the elements of man-made and natural form are well connected and balance each other. These can be seen along the walkway and the creation of man-made lake bring the harmony at the area Circulation -the walkway are well connected with each other's and create the sense of safety Activity -Promote various activities such as jogging, resting, playground, picnic, gathering and cycling Elements -The facilities provided catered the needs of the user by providing; -gazebo : normally being used by the parents that watch their children play - dustbin : promotes cleanliness awareness especially among youngster - But the weakness of the area is that the children playground is fully covered with impervious surfaces that slow the water run-off during rainy day. This might bring danger to the user because the area is slippery.	-From the observation and discussion, it can be concluded that this area practices '*adl, mizan* and *taharah.* - Although the area is functioning well, but from Islamic point of view, the area is not fulfilling the practice of *wasat.* -This is because there is an un-used space in the area, which is the man-made island. It may give an aesthetical value, but it is such a waste if a design cannot be functional. -The island can be more attractive if people can go and enjoy the view from it because the observation proves that from the island the users can enjoy the view of KLCC and KL Tower.
OBSERVATIONS (TRAIL 4)	**DISCUSSIONS**	**ANALYSIS**
 A well division of pedestrian and vehicular network  PWD signage  Porous pavement (parking area)	Function/Form -the area support the PWD user by providing a ramp - The area also provide peaceful environment that invite the user to have a picnic with family and friends near the lake Circulation -well division of pedestrian and vehicular network Activity -Promote various activities such as jogging, picnicking, resting, gathering and cycling Elements - The parking area for motorcycle was not being utilized at all. This might happened because of the location far from the entrance	-From the observation and discussion, it can be concluded that this area practices '*adl*, and *mizan* Practice of *taharah* is still hardly can be seen because the facilities provided did not reflect the promotion and awareness of cleanliness in the area. - While the parking area for motorcycle was not being utilized by the users because of the location is far from the entrance. This has caused wasting of space and this is not fulfill the concept of *wasat* in Islam

 Green area		
OBSERVATIONS (TRAIL 5)	**DISCUSSIONS**	**ANALYSIS**
 Shaded seating area  'Gelanggang Marble Pult'  Water-play centre  Public Toilet  Abandoned Structures	Function/Form - The space in this area bring peaceful environment as the seating area is well shaded and it also gives a beautiful view of Bukit Tabur and Titiwangsa Range Circulation -well division of pedestrian and vehicular network Activity - The area provides the activities that can be done by various group of people such as water play activity, jogging, resting, gathering and playing Elements - The area provides many facilities that can promote cleanliness awareness such as a clean public toilet, a clean cafeteria and most important thing is a dustbin.	-From the observation and discussion, it can be concluded that this area practices '*adl* and *taharah* -The practices of *wasat* cannot be fulfilled because there are some structures that being abandoned and did not being used anymore, for example the elements and structures at 'Gelanggang Marble Pult'. A good design is a sustainable design where it can be used by the present generation and also meets the needs of the future generation. This proves that the 'Gelanggang Marble Pult' is not meeting the needs of the future users. - Furthermore these problems also had caused an imbalance in terms of the function of the space so this is why *mizan* cannot be achieved.

Table 5.0: Findings and analysis of Islamic environmental ethics in Taman Tasik Titiwangsa.

Table 6.0 shows the distribution of green technology availability in Taman Tasik Titiwangsa in areas within 5 trails:

ZONE	GREEN TECHNOLOGY APPLIED	COMPONENTS	LOCATION	BENEFIT	ANALYSIS
1	Bio-retention cell 	-Surface mulch -Planting layer	Planter box	-surface mulch allow water filtrate into soil -manage storm water run off -avoid flood problems	• Many hard surface areas than green surface area which result to hot area and water puddles. • Should reduce the air temperature and manage water run off

	Phytoremediation 	-Submerged plant (*Elodea canadensis*, Pondweed)	Lake	- water purification through uptake in plant system -improve quality of water -provide habitat for aquatic life	• Green technology to be integrated: -Permeable paving -Vegetated swale -Infiltration trenches
2	Vegetated swale 	-Grass layer	Drainage	-filtrate water and allow it absorb into soil profile -manage storm water runoff -reduce footprint	• Poor water quality at certain area of water bodies • Should manage surface water runoff and remediate at polluted water improve water quality • Green technology to be integrated: -Sediment filter strip -Infiltration trenches -Tree box filter -Phytoremediation
	Phytoremediation 	-Submerged plant (*Elodea canadensis*, Pondweed)	Lake under bridge	-water purification through uptake in plant system -improve quality of water -provide habitat for aquatic life	
3	Sediment filter strip 	-Emergent plant (*Typha angustifolia*, Cattail)	Adjacent of lake	-improve soil stabilization -provide habitat for wildlife -filtrate pollutants which improve water quality	• Many hard surface than green surface which result to water puddles in the playground • The area receive a maximum sun exposure during day • Should manage storm water runoff, manipulate sun sources for renewable sources and improve water quality • Green technology to be integrated: -Photovoltaic system -Permeable pavement
	Phytoremediation 	-Floating plant (*Nymphaea odorata*, Water lily)	Lake	- water purification through uptake in plant system -improve quality of water -provide habitat for aquatic life	
	Curb cut 	-Curb	Parking area	-allow water flow into drainage and water bodies which avoid flood problems	
4	Curb cut 	-Curb	Sidewalk	-allow water flow into drainage and water bodies	• Existing drainage system use concrete material • Drainage can be improve using green material which can

	Permeable paving 	-Porous paving -Grass layer	Parking area	-filtrate water and allow it absorb into soil profile -reduce footprint -reduce temperature -manage stormwater runoff	reduce carbon footprint • The area which provide active activities and can be improved in terms of its aesthetic value • Existing building can be instil with green roof to reduce the temperature surrounding and lengthen roof life to reduce cost of roofing maintenance • Green technology to be integrated: -Green roof -Infiltration trenches -Vertical wall -Vegetated swale
	Bio-retention cell 	-Surface mulch -Planting layer	Sidewalk	-surface mulch allow water filtrate into soil -manage storm water run off -avoid flood problems	
5	None	None	None	None	• Having water puddles on hard surface area • Receive maximum sun exposure during day • Existing building provide potential for green roof integration • Should manage water runoff from precipitation, manipulate sun energy sources and building • Green technology to be integrated: -Permeable paving -Infiltration trenches -Green roof -Photovoltaic system

Table 6.0: Result of the observation on green technology applied in Taman Tasik Titiwangsa

Table 6.0 indicates the environmental problems occurred in each zone. The result was analyzed and potential of green technology to be applied is derived. There are no major problems occur in the area within trail 3 and 4. But areas within trail 1, 2, and 5 have major problems. However, from the analysis , the area within trail 2 and 3 which are located at the transition of natural and man-made lake have been chosen as a potential site for design recommendation on green technology integration. The area was chosen because the problems occurred relate to many aspects which are water quality, storm water management and temperature. Furthermore, within this area, there is also abandoned open space with poor in cleanliness and maintenance. Green technology can be integrated within the area to avoid waste which is not encouraged in Islamic practices. The integration of green technology is hoped could improves

the quality of area and provides more space for users in conducting activities.

CONCLUSION AND RECOMMENDATION

As the conclusion, the application of Islamic Environmental Ethics in park design guidelines can help in creating a better environment that will bring the users closer to the Creator. The study also suggests that green technology can be the solution to the environmental problems as well as in-line with the Quran and *Sunnah*. Following the results and analysis provided, below are some recommendations that can be applied to improve the site condition:

Recommendation of green technology at potential site

Throughout the study it has been decided that only one location is chosen for adaptation of green technology that address Islamic Environmental Ethics guidelines. This is because, the overall site is quite large and researchers may have to suggest one site only for the recommendation. Therefore, the existing site of area within trail 2 and trail 3 which located in between two lakes is chosen as potential area that can be improved. Below are the details of the recommendation;

POTENTIAL SITE

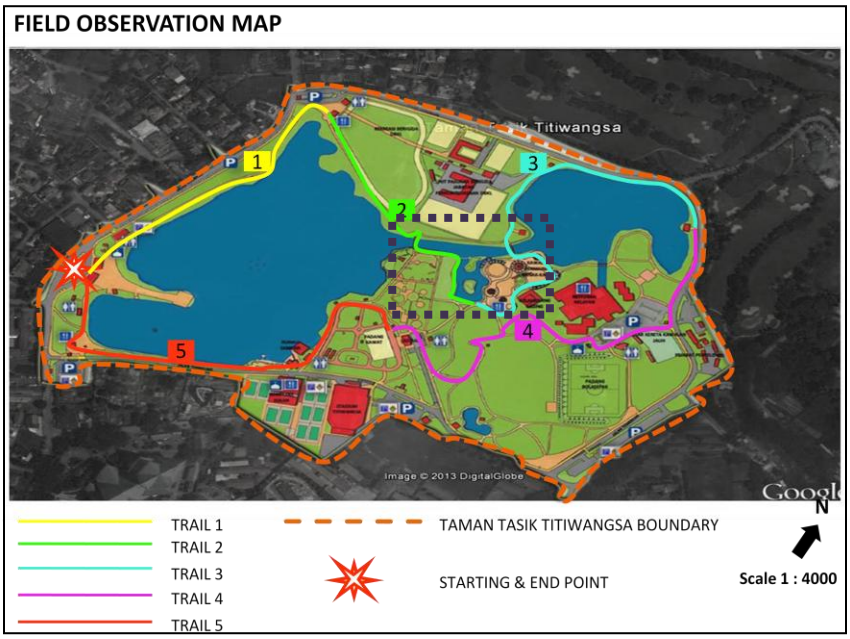


Figure 6: Potential site for recommendation

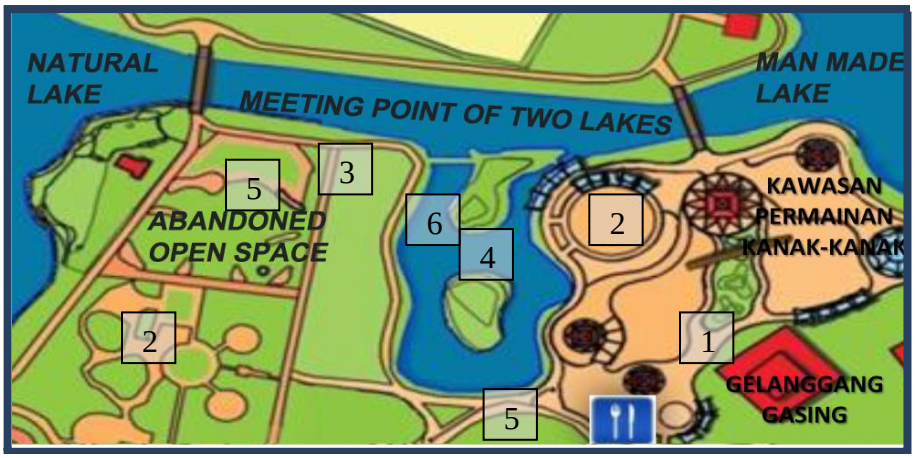


Figure 7: Recommendation on green technology application

1

Photovoltaic system
(sources:http://www.utilityfree.com/solar/)

- Proposed lighting with photovoltaic system at the playground area to save energy during night
– apply *wasat* (moderate)

2

Permeable pavements
(sources:http://www.lastormwater.org/green-la)

- Proposed at hard surface compound to allow water filtration and balance the area between hard and green surface
- apply *mizan* (balance)

3

Tree box filter
(sources:http://sql.ulma.nazwa.pl/24/tree-box-filter)

- Proposed along sidewalk to filtrate water and reduce water runoff which improve water quality
-apply *adl'* (justice)

4

Phytoremediation
(sources:http://www.trekearth.com/gallery/Asia)

- Proposed in the lake to remediate pollutants for water purification and encourage biodiversity
-apply *taharah* (cleanliness)

5

Infiltration trenches
(sources:http://www.cob.org/services/environment)

- Proposed along drainage to filtrate water and reduce water runoff which improve water quality
-apply *Adl'* (justice)

6

Sediment filter strip
(sources:http://www.madisonswcd.org/practices)

- Proposed at the adjacent of lake to reduce water runoff and remediate pollutants
-apply *taharah* (cleanliness)

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