Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 170 (2015) 680 – 689

Procedia
Social and Behavioral Sciences

AcE-Bs2014Seoul
Asian Conference on Environment-Behaviour Studies
Chung-Ang University, Seoul, S. Korea, 25-27 August 2014
"Environmental Settings in the Era of Urban Regeneration"

Regenerating Ipoh City Mobility through High Level of Service (LOS) of Public Bus Service

Syahriah Bachok[a,*], Mariana Mohamed Osman[a], Mansor Ibrahim[a], Zakiah Ponrahono[b]

[a]*Kulliyah of Architecture and Environmental Design, International Islamic University Malaysia*
[b]*Dept. Environmental Management, Faculty Environmental Studies, Universiti Putra Malaysia*

Abstract

Environmental setting in regeneration of Ipoh city mobility relates much in how the public transport enhancement undertaken. The history behind Ipoh city existence from mining-activities accessibility pattern creates a unique environment within the city. New technology, initiative and strategies on creating a sustainable transport system will increase the level of service (LOS) of public transport service. This research aims to evaluate the services of bus as a mode of accessing the destination such as residential, commercial and workplaces in Ipoh city. The data collected through a series of on-board survey.

© 2015 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
Peer-review under responsibility of Centre for Environment-Behaviour Studies (cE-Bs), Faculty of Architecture, Planning & Surveying, Universiti Teknologi MARA, Malaysia.

Keywords: Urban regeneratio; sustainable transportation; level of service (LOS); environmental setting

1. Literature

This research intertwines the elements of urban regeneration with the increasing accessibility levels provided by the constant improvement in bus services. Urban regeneration refers to a comprehensive planning of socio-economic and physical development into declining city growth and activities. Its propagated urban regeneration as a tool of rehabilitation, revitalisation, redevelopment and regrowing of derelict run down old city centres in improving the social and economic stability as well as the

* Corresponding author. Tel.: +603-6196-3148; fax: +603-6196 4864.
E-mail address: syahriah@iium.edu.my

1877-0428 © 2015 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
Peer-review under responsibility of Centre for Environment-Behaviour Studies (cE-Bs), Faculty of Architecture, Planning & Surveying, Universiti Teknologi MARA, Malaysia.
doi:10.1016/j.sbspro.2015.01.070

infrastructure of a geographical location (Roberts, 2000, pp. 16-19). This term is often associates with developed nations' inner city whose manufacturing and industrialising economic activities have halted, or tally ceased due to the new growth cycle of tertiary economies taking over these roles of dying secondary and primary industries (Dahlia R. and Azmizam A.R. (2013).

Meanwhile, accessibility is defined within the context of this research as the supporting elements of urban regeneration that provides the effective mobilization of goods and services for economic and social growth. Dahlia R. and Azmizam A.R. (2013) and Lucas, K., et al., (2008), argued that accessibility is further divided into distance of accessibility to a facility or service centre and mobility to reach these amenities and facilities by choices of various mode of transportation.

Taking cognisance of some of the regenerations strategies from the more developed countries and increasing awareness of the need to advocate modal switch from private vehicle trips to those of environmentally friendlier such as public buses, heavy and light rails and other collective modes of transportation; the city governments in many Malaysian urban centres (The Economic Planning Unit (EPU), 2010) have taken various initiatives including improving the buses services levels.

In this research a case study of Ipoh, is selected for the following justifications:

- The population density reflecting and representing the majority of urban centres in Malaysia
- The structural changes experienced since late 1980s due to the ceased operation and industrialisation activities centred around tin mining and manufacturing
- The increasing net migration and the alteration socio-demographic composition of inner city population
- The rise and fall of the capital of the Perak State during the hay-days of industrialisation during the British rules and the spearheading of other States in Peninsula Malaysia such as Selangor, Pulau Pinang and Johor, posing high competition to the inner Ipoh to reclaim its role and function as the centre of the once glorious Silver State.
- The dwindling number of patronage of public buses of some privately owned and operated buses services, and the taking over of these dying services by state-owned bus services which had initially only attempted to complement the existing services.
- The initiation of modernised and advancing vehicle fleets and technologies suiting better the needs and requirements of new generation of public buses passengers, especially those patronising the newly inotrduced Perak Transit services.

On the other hand, accessibility and effectiveness of buses service can be measured by both tangible outcomes of services performances as well as intangible indicators including passengers' comfort and convenience (Suwardo, M. Napiah, and I. Kamaruddin, 2008). From these categorisations, various measurements of level of services can be derived. These are:

- the fleet and vehicle types.
- the services types
- the stations and waiting facilities
- the route and schedule systems
- fare and zoning systems
- travel, waiting and delay Time
- information systems
- passengers' comfort and convenience

1.1. Research objectives

- To identify the existing of public transportation system and services provided in Ipoh City
- To study the public buses services and infrastructure regeneration in the study area.

- To analyze the Level of Services of public buses services in the study area.

1.2. Research methodology

Field study visits and observation methods have been employed to measure the supply side of the services provision, while on-board intercept face to face questionnaire survey has been utilised to capture the latent variables of comfort and convenience of passengers riding the buses. The data capture took some 14 days to complete, ranging from buses and trips identification and familiarisation, routes, scheduling and travel, waiting and delay times assessment and evaluation as well as recording, cleaning and recapturing of data which deemed best suited for the levels of services kind of analyses. This process and procedures were undertaken during the months of January and February of 2014.

1.3. Case study

In this research a case study of Ipoh, a capital city of the State of Perak, in Malaysia, is selected for the following justifications:

- The population density reflecting and representing the majority of urban centers in Malaysia
- The structural changes experienced since late 1980s due to the ceased operation and industrialisation activities centred around tin mining and manufacturing
- The increasing net migration and the alteration socio-demographic composition of inner city population
- The rise and fall of the capital of the Perak State during the hay-days of industrialisation during the British rules and the spearheading of other States in Peninsula Malaysia such as Selangor, Pulau Pinang and Johor, posing high competition to the inner Ipoh to reclaim its role and function as the centre of the once glorious Silver State.
- The dwindling number of patronage of public buses of some privately owned and operated buses services, and the taking over of these dying services by state-owned bus services which had initially only attempted to complement the existing services.
- The initiation of modernized and advancing vehicle fleets and technologies suiting better the needs and requirements of new generation of public buses passengers, especially those patronising the newly introduced Perak Transit services.

1.4. Research limitation

The data collection process has encountered several challenges including bus breakdowns, drivers' issues and changed/altered timetable schedules, frequency and route de-fixing, hence limiting the validity, reliability and overall representativeness of the outcomes and generalisations of the overall findings. Furthermore, bus conditions differ from one trip to another. Bus chassis, engines, comfort and convenience levels also differ from one passenger to another. Nevertheless, the followings are recorded and presented in this paper, having been qualified for a general representation of buses services typical of declining mining urban centres in Peninsular Malaysia. The standards for Level of Service (LOS) of public bus operation referred to analyse the data collected. Survey conducted during the first trip, peak-hour, shoulder-hour and last trip of public transport services.

1.5. Research highlights

This research highlights the initiatives such as improvements in public buses services, in the absence of rail services provision, in cities with corresponding density and population size like Ipoh, can assist in regenerating once a glorious and economically advanced State such as Perak. The initiatives undertaken by the public-private partnership types of development and construction collaboration, project management and regulatory functions have indeed revitalise some parts of the Ipoh city including the Medan Kidd bus terminal, Medan Kidd Bazaar, surrounding landuses around and along the routes traversed by the buses services. The following section elaborates on the introduction and improvement schemes of buses services as provided by the operators.

2. Data Findings

2.1. Ipoh public bus service regeneration

An efficient public transportation provision will reduce the commuting time, transport cost and environmental impact (Rohana, K. et. al; 2012). While, inefficient public transport will limit choices to access destination such as housing/ residential and commercial/industrial /workplaces. The history of Ipoh City transportation system start early 1980's with Kinta River become the main liaison Ipoh and surrounded areas. The transport system development become essential when the Growth of Kinta start to slowed because of the limitation of access onroad and dependable of river as main connector. Year by year started after 1874, the expand of road network, and the urban regeneration take place in Ipoh City until the development of Ipoh new town between 1905-1914. In year of 1910 and 1911 the bus services began in Ipoh city (Table 1: The History of Ipoh City Transportation System Regeneration).

Table 1. The History of Ipoh City Transportation System Regeneration

Year	Development / Regeneration Process
1980s	Kinta River to be the main liaison between Ipoh and surrounded areas
After 1874	The growth of Kinta district start to slowed, especially its communication via the Kinta River. Vehicles such as boats, elephants and bullock carts take a long time of trip
In 1884	The development of road to link the villages around Gopeng and port in Kota Bharu. The network then is expand to connect the Papan mining area with Batu Gajah.
1893	Redevelopment of residential/houses along Kinta Valley with brick structure. Reorganization of street design and street landscape.
1895	Road connection between Ipoh with other places in the Kinta Valley improved
1900	Wooden bridge across the river Kinta replaced with steel bridge
Between 1905-1914	New town (Ipoh New Town) growth with development of railway stations, hotels, city hall (town hall), and a post office. Motor vehicles have started to take place in Ipoh
1910 and 1911	The bus service began. Motor vehicle registry office was established in Ipoh

Source: Retrieved at http://www.mbi.gov.my/web/guest/latar-belakang-ipoh1

Medan Kidd is the main terminal for Ipoh City's public buses users for over 20 years. Medan Kidd Station consisted of 2-storey blocks where the ground floors became ticketing counter and bus operators office at first level (Figure 1).

Fig. 1. Photo of Medan Kidd Station in 1960's (left) (retrieved from http://www.ipohworld.org/) and in 2014 (right), show no changes of the building and architectural design. However, there is the installation a new fleets from Perak Transit.

2.2. Bus services improvements

This research highlights the initiatives such as improvements in public buses services, in the absence of rail services provision, in cities with corresponding density and population size like Ipoh, can assist in regenerating once a glorious and economically advanced State such as Perak. The initiatives undertaken by the public-private partnership types of development and construction collaboration, project management and regulatory functions have indeed revitalise some parts of the Ipoh city including the Medan Kidd bus terminal, Medan Kidd Bazaar, surrounding landuses around and along the routes traversed by the buses services.

The following section elaborates on the introduction and improvement schemes of buses services as provided by the operators.

2.2.1. Route and Schedule of Intra-City Bus Services

To analyze the data collected, standard LOS are referred as below:

Table 2. Fixed-route Hour of Service LOS

LOS	Hours of service	Remarks
A	19-24	Night 'owl' service provided
B	17-18	Late evening service provided
C	14-16	Early evening service provided
D	12-13	Daytime service provided
E	4-11	Peak hour service only or limited midday service
F	0-3	Very limited or no service

Source: Noorfakhriah and Madzlan, 2001, p.6

The bus route schedule, frequencis and service hours is summarized in Table 3 below. The LOS for hours of services for most of the route is C (early evening service provided) and D (daytime service provided).

Table 3. Bus Routes, Frequencies and LOS of Service Hours

Bus No	Route	First Trip	Last Trip	Frequency	Hours of Service	LOS
91	Medan Kidd-Pasir Putih	5.40am	8.00pm	Every 30minutes	14 hours 20 minutes	C
94	Medan Kidd-Gunung Rapat	6.00am	6.30pm	Every 15minutes	12hours 30minutes	D
113	Medan Kidd-Ipoh Garden	5.45am	6.40pm	Every 10 to 20minutes, 30 to 40minutes	12hours 55minutes	D
114	Medan Kidd-Ampang	6.10am	7.00pm	Every 1hour 10minutes	12hours 50minutes	D
116	Medan Kidd-Terminal Aman Jaya	5.45am	8.40pm	Every 10 to 20minutes, 30 to 40minutes	14hours 55minutes	C
117	Medan Kidd-Bercham	5.40am	6.00pm	Every 15minutes	12hours 20minutes	D

2.2.2. Travel, Waiting and Delay Time

The summary of GPS tracking data for first trip of Perak Transit bus routes show the fastest travel time is 16 minutes for 7km distance with average speed 25.6kmh and the longest travel time is 1 hour and 25 minutes for 28.1km distance with average speed 19.7kmh.

Table 4. Data on GPS tracking for First Trip of Perak Transit Bus Routes

Bus No	Route	Average Speed	Max Speed	Departure Time	Arrival Time	Trip	Distance	Travel Time
91	Medan Kidd-Pasir Putih-Medan Kidd	14.7kmh	53.1kmh	6.02am	7.26am	(1st) peak	18.9km	1 hour 24 min
94	Medan Kidd-Gunung Rapat	25.7kmh	50.5kmh	6.05am	6.21am	(1st) peak	7.0km	16 min
113	Medan Kidd-Ipoh Garden	24.6kmh	52kmh	5.52am	6.35am	(1st) peak	19.3km	1 hour 3min
114	Medan Kidd-Ampang	25.6kmh	82.6kmh	5.55am	6.55am	(1st) peak	24.1km	1 hour
116	Medan Kidd-Terminal Aman Jaya	16.7kmh	70.2kmh	5.51am	6.47am	(1st) peak	15.8km	56 min
117	Medan Kidd-Bercham-Medan Kidd	19.7kmh	78.1kmh	6.05am	7.30am	(1st) peak	28.1km	1 hour 25 min

Passengers egress and alighting during first trip (5-8 February 2014) using Perak Transit service

From the on-board survey data recorded on 5th to 8th February, bus route number 117 (Medan Kidd-Bercham-Medan Kidd) shows the highest number of passengers load and bus route number 94 (Medan Kidd-Gunung Rapat) shows no passengers during the first trip of the service (Figure 2).

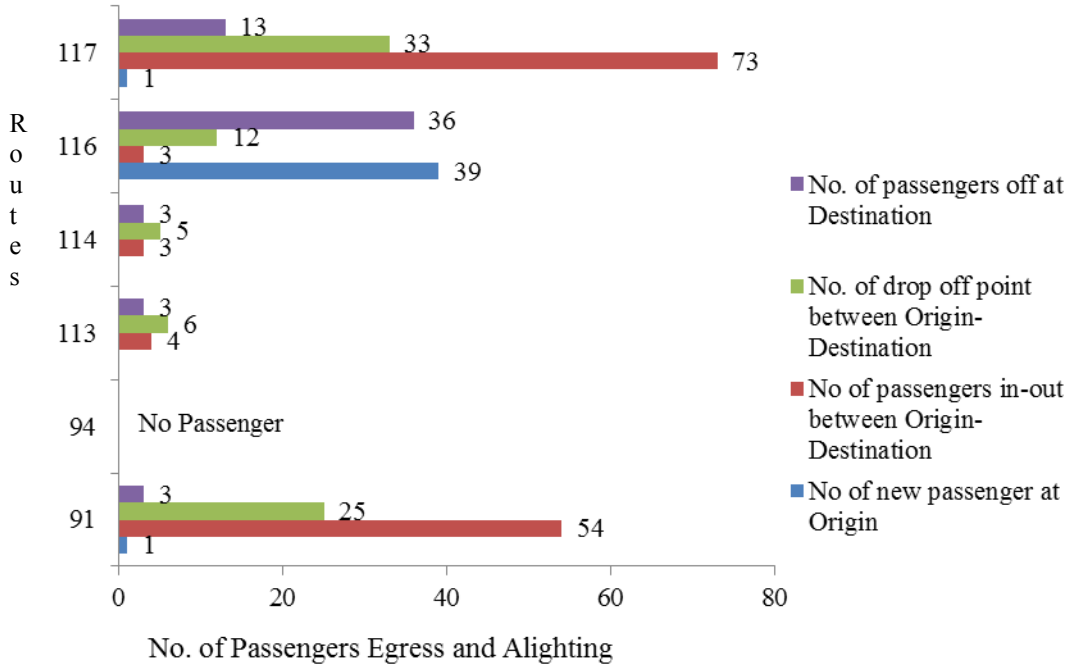

Fig. 2. Number of Passengers Egress and Alighting for Perak Transit Bus Routes during First Trip Service

2.2.3. Fleet and Vehicle Types

There exist two types of fleet and vehicles types in Ipoh's intracity buses services. They are namely:

- Mercedes Benz year of make 2008, model
- Fleet 44 passengers, standee 12, single door, conductor-less, machine operated ticket payment
- Ramp versus stairs – Low floor vehicles versus front engine designs
- Fuel – natural gas versus diesel

Fig.3. Perak Transit Buses

- Hino year of make 1990, model
- Fleet 44 passengers, standee 16, single door, conductor-based ticket payment.
- High floor – front versus rear engine design

Fig. 4. The Century Omnibus Co. Sdn. Bhd buses

2.2.4. Stations and Waiting Facilities

Observation on station furniture, facilities and bus stop is summarized as below (Figure 5, Figure 6 and Figure 7):

Fig. 5. Waiting area with benches at the ground floor of Medan Kidd Station is semi-open

Fig. 6. Bus laybys at Medan Kidd Station attached to the main building. No public toilet, prayer room, cafe or kiosk is provided

Fig. 7. Various types of shaded bus stop provided along the drop points of bus routes.

3. Discussions

The questionnaire is distributed randomly to the on-board passengers with specific minimum respond of 100 sample. Total number of respondents for this study is N 105.

Table 5. Socio Demographic Profile Distribution

	Variables	Frequency	Percentage (%)
1	Gender		
	Male	42	40
	Female	63	60
2	Age group		
	15-54 years old (schooling and working age)	81	77.1
	55 years old & above (retired age)	24	22.9
3	Race		
	Malay	59	56.2
	Chinese	19	18.1
	Indian	18	17.1
	Others	9	8.6

From total of 105 respondents (Table 5), 40% is male and 60% is female with 77.1% is between age 15 to 54 years old (schooling and working age) and 22.9% is above 56 years old (retired age). The highest number of respondents is Malay with 59%, followed by Chinese 19% and Indian and other races with 18% and 9% respectively.

In accessing the aspiration and perception towards public bus services among the respondents, the survey is constructed to identify respondents' satisfaction and aspiration with the level of services of public bus services in their daily bus rides. It covers on respondent perception and satisfaction on level of services for public buses; punctuality, efficiency and effectiveness and frequency provided. Analysis on crosstabulation analysis is run to assess the significant of level of services of public buses among different gender, age and race of respondents.

Table 6. Summary Of Chi-Square Analyses

Variables	Chi-Square Significant Level (P Value)		
	Punctuality	Efficiency and Effectiveness	Frequency
Age	0.828	0.334	0.418
Race	0.216	0.219	0.753
Gender	0.419	0.102	0.469

Note: Level of significance is at $p \leq .05$

In assumption, bus services levels in Ipoh to be relatively comfortable and convenient from the perspective of the respondents surveyed. Based on the results of chi-square analyses, all two factors such as age, gender, race, punctuality, efficiency and effectiveness and frequency of use have indeed influenced passengers' perception on the comfort and convenient of the bus services provided. In summary, for the crosstabulation analysis (Table 6), all of the result shows that there is no significant

difference within respondents in aspirations and perceptions towards level of services of buses. This result can generalize that public bus users in Ipoh are more matured and exposed to the good public bus services. The Ipoh public bus services users are categorized under urban group user with high expectation on level of service provided. It can be conclude Ipoh is truly urbanised in public transportation system.

4. Conclusions

This research has attempted to interpret regeneration of declining city centres in terms of improvement of the physical and socio-economic environment. From one perspective, physical improvements such as development, construction and upgrading of buses waiting facilities should be aimed at revitalising the derelict city centres, creating vibrant and robust economic activities and more frequent and higher quality social interactions between various walks of life. Higher accessibility can be achieved by carefully selecting programmes, schemes or initiatives that increase the buses catchment areas, introduce or sustain the routes plying through strategic landuses with the highest numbers of traffic generation and also encourage mode switching from private vehicles to buses for trips made especially during congested periods and through overcapacity road sections. On the other hand, regeneration to preserve the biological eco-system of run-down city centres should not neglecting the restoration of good public bus system to accommodate the accessibility for the city users. Bus services levels such as waiting amenities being improved and upgraded in derelict urban centres have indeed assisted in the regeneration of declining city centres. Urban regeneration through improvement of transportation terminal, integrated public transport interchange facilities and mixed use building components including commercial and waiting facilities have indeed occurred in Ipoh based on the findings of this research. This research has achieved the objectives set at the inception stage, by demonstrating the benefits reaped in regenerating city centres by increasing the levels of services of buses operations.

References

Dahlia, R. And Azmizam A.R. (2013), Revitalizing Urban Development In Malaysia Through The Implementation Of Urban Regeneration Programme, 43rd Annual Conference Of The Urban Affairs Association, 3-6 April 2013, San Francisco California,United States Of America.

Karen Lucas, Sophie Tyler and Georgina Christodoulou, 2008, The Value Of New Transport In Deprived Areas, Joseph Rowntree Foundation, ISBN: 978 1 85935 658 6

Mehta, P. (N.D). The Impact Of Urban Regeneration On Local Housing Markets – A Case Study Of Liverpool available at https://www.ljmu.ac.uk/BLT/BUE_Docs/mehta.pdf accessed on 2/5/2014

Madzlan Napiah, Amirah Suriati Ahmad Farid and Suwardo, 2010, Trip Productivity Evaluation Of Bus Service: Medan Kidd Bus Station, MUTRFC 2010.

Noorfakhriah Yaakub and Madzlan Napiah, 2001, Quality of Service and Passenger's Perception – A review on Bus Service in Kota Bharu, International Journal of Civil & Environmental Engineering IJCE-IJENS Vol: 11 No: 05, p. 1-9.

Roberts, P. (2000). Urban Regeneration A Handbook In Peter Roberts And Hugh Skyes (Eds.), The Evolution, Definition And Purpose Of Urban Regeneration, (Pp. 9-36). London*Thousand Oaks* New Delhi: SAGE Publications Inc.

Rohana, K., 'Ismah Osman and Che Anizaliana Che Pei, 2012, Customer Expectations and its Relationship Towards Public Transport in Klang Valley, Journal of asian Behavioural StudieS, volume 2, numBer 5, april 2012

Suwardo, M. Napiah and I. Kamaruddin 2008, Review on Motorization and Use of Public Transport in Perak Malaysia: Realities and Challenges, 2nd International Conference on Built Environment in Developing Countries (ICBEDC 2008).

The Economic Planning Unit (EPU), 2010. Tenth Malaysia Plan, 2011-2015. Prime Minister's Department, Putrajaya.

Retrieved on 23/03/2014 at http://www.ipohworld.org/2011/05/30/medan-kidd-back-in-the-1960s/

Retrieved on 27/05/2014 at http://www.peraktransit.com.my/