



An Assessment of Public Transport Facility in Johor Bahru: a case study in Taman Ungku Tun Aminah Area, Majlis Perbandaran Johor Bahru Tengah, Malaysia

Musarrat Zaman*, Zahid Sultan, Maryam Fard, Abdulrahman Siyaka, Pung Jia Chyi

Department of Urban and Regional Planning, Faculty of Built Environment, Universiti Teknologi Malaysia, Johor Bahru

*Email: aurony1990@gmail.com

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ABSTRACT

Provision of public transport infrastructure is important to increase the ridership and at the same time decrease the use of private transport. Like the other Malaysian cities, Johor Bahru is mostly dependent on private vehicles such as motor cars and motor cycles. The ridership on public transport especially public bus is getting lower over the years. In this situation the sustainability in transportation and land use cannot be ensured. This paper aims to assess the public transport facility in Taman Ungku Tun Aminah in Johor Bahru which is very old and traditional residential area with some major extent of commercial and educational land uses. The actual scenario of public transport service and underlying problems that impeded the residents to use public bus service is observed in this paper. The possible options for the improvement of the bus service and turning it into an effective short and medium length inter town travel media are also discussed as well. Both the primary and secondary information are collected for the purpose of study. Various descriptive statistical data analysis are done in order to get the expected outcome from the collected data. According to this study only 26.7% of the respondents use public bus for their daily travel. The opinion of the respondents is taken for the underlying causes of their reluctance on using public bus service and also the effective measures for the enhancement of this service to the users like them. Finally some recommendations and strategic actions and policy frameworks are also suggested in this paper.

1. Introduction

Johor Bahru, located in the southern state of Peninsular Malaysia, is the capital city and one of the districts of Johor State. It is the third largest district of Malaysia covering 1758.596 square kilometer of area with population numbering 1.4 million (Department of Statistics Malaysia, 2013). The city of Johor Bahru serves the important role as the southern gateway of Peninsular Malaysia and it is one of the significant business hubs under the special economic zone of 'Iskandar Malaysia' (IRDA, 2011). As a result, a huge amount of long and short commuter trips are being generated everyday on the roads for various purposes. Though, at present there are about 600 buses in Johor Bahru operating on 117 routes which owned and managed by 6 bus companies in order to serve its citizens intercity mobility needs (Alavi and Mohammad, 2013), the bus service across the residential town's feeder streets is not sufficient enough to fulfill daily inter-town medium and short trips. Therefore, people prefer private vehicles to public transport for their daily travels. As a consequence, the number of motor vehicles is increasing in an alarming rate on the roads. According to the estimation of 'Low Carbon Society Blueprint for Iskandar Malaysia, 2025' the auto ownership is expected to grow from 500 cars per 1000 people to more than 800 cars per 1000 people by 2025. Consequently the public transport modal split is predicted to decline from 15% to 10% by 2030 (Low Carbon Society Blueprint for Iskandar Malaysia 2025, 2013).

The lack of effective public transport system is recognized by the Malaysian government and several researchers and organizations. Much emphasize has been given on the development of a comprehensive and efficient public transportation in the 10th Malaysia Plan (2011-2015) also in the 11th Malaysia Plan (2016-2020). There are also two individual plans prepared for the transportation- 'National Land Public Transport Master Plan 2012' and 'Transportation Blue Print 2010'. Other researchers have also studied on the context and suggested that the investments in public transport infrastructure, particularly bus rapid transit and railways can help reduce any types of externalities like congestion, emissions, and accidents. They also recommended allocating more fund for the development of public transportation systems (both buses and rail).

Considering the most of the governmental plans and previous researches that have recommended the promotion of public transportation, the current public transportation mode share is very low in Johor Bahru city. In this situation, the sustainability of transportation and environment cannot be ensured. Therefore, there is a need to identify proper solutions for this situation to ensure sustainability of traffic growth in the study area. This paper is an assessment, based on the context of public transport deficiency specifically bus service in the local areas of Johor Bahru. It seeks to find out actual scenario of the public bus service condition in the selected town and also to give possible solutions for the improvement of this

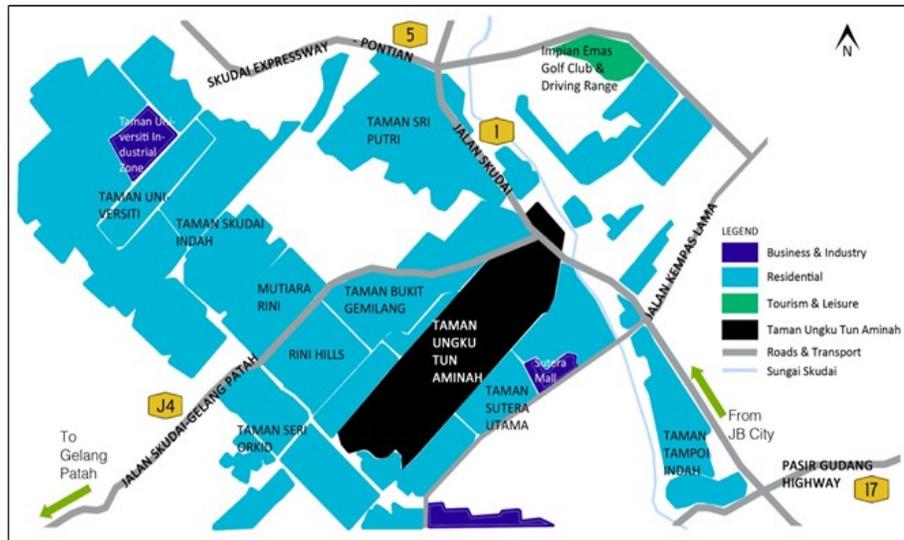


Figure 1: Location and Surrounding of Taman Ungku Tun Aminah
(Source: Geoportal, 2015)

service in order to ensure sustainability in the transportation system of the study area. Therefore, the aim of this paper is to Find out possible ways for the effective public transport service in the residential towns of Johor Bahru to reduce car dependency and ensure sustainability. The selected objectives are-to assess the existing situation of the public bus service facility in Taman Ungku Tun Aminah, Johor Bahru and to find out possible ways for an effective public bus service in the study area.

2. Description of the study area

The selected study area, Taman Ungku Tun Aminah encompasses 723 acres is a neighborhood in Skudai, which falls under control of Johor Bahru Tengah Municipal Council (MPJBT). It is mainly occupied by residential land uses with an estimated population of 25,000 people (Answers.com, 2016). This residential project was launched during 1980s by Tasek Maju. It is a high motorized-vehicle dependent neighborhood and lacks of infrastructure dedicated for non-motorized vehicle in terms of mode of transport (Tasek Maju, 2011). Within Johor Bahru District, Taman Ungku Tun Aminah Bus Terminal is one of the

important bus terminals located in the neighborhood serves intercity bus services by numerous bus companies i.e. Causewaylink 1B, 666, City Bus 15 and Bas Muafakat P-202 which the buses stop along the main road, Jalan Tun Aminah. Other than that, CW4S operated by Causeway link serves bus service to Jurong East, Singapore for easy connection of commuter and working class people (Malaysia Public Transport Directory, 2016). Table 1 shows the bus routes across the Taman Ungku Tun Aminah. Figure 1 shows the land use map of the study area. Similar to bus services in Johor Bahru context, bus operator City Bus provide bus services in Taman Ungku Tun Aminah with waiting time around 10 to 20 minutes between each trip of bus services. According to Causewaylink (2016), bus route CW3S provide bus service every 30 minutes and the bus service starts from 5:30am until 9:00pm daily (Causewaylink, 2016).

Existing bus stops are all located along Jalan Tun Aminah, which is the arterial street of the neighbourhood. In Fig. 2, the location and distance between each bus stop is indicated. The distances between each bus stop vary from 380 meters to 700 meters, which is within 8 minutes by

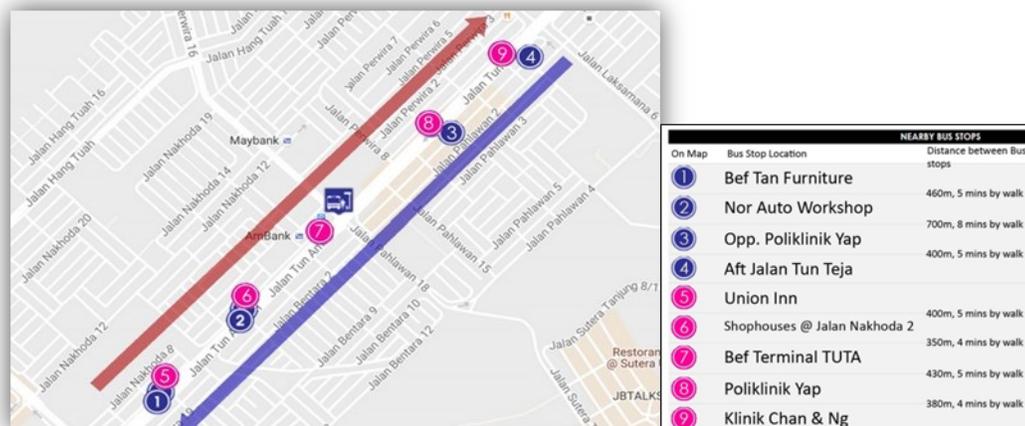


Figure 2: Taman Ungku Tun Aminah Bus Stops (Source: Land Transport Guru, 2015)

walking. The low accessibility of bus stops to housing area is one of the critical reasons why residents would rather travel with private vehicles.

According to pilot survey, 2016 the condition of existing central bus stand is quite good condition. Intercity buses are very frequent including the destination of Jurong East, Singapore. But this bus stand is not used for inter town local buses running across the surrounding neighborhoods. Again, the local bus stops along the road Jalan Tun Aminah are observed as under poor condition with a low maintenance. Most of the existing bus stops are not maintained with cleanliness and the handrail are mostly rusted. Moreover, it is noticed that some bus stops have no ceiling or sun shade. As a result Bus users have to be exposed under sunlight with a poor condition bus stop. Hence, people will not be comfortable with this kind of condition and therefore private vehicle is the only alternative for residents to travel around.

3. Methodology

The data collection method was mainly based on primary data and some extent of secondary data. The primary data collection was completed on two steps- Pilot Survey and Questionnaire Survey. The existing situation of the study was observed prior to the detail questionnaire survey. A field survey was conducted on the study area with the modified and brief questionnaire (with a sample size of 60). Demographic information of the respondents regarding age, sex, education level, income, job types, number of car users, number of public bus users were collected through the questionnaire survey. Again, information of the public transport service such as number of bus stops, condition of the bus stops, distance between the bus stops, schedule, frequency of the buses, trip generation and mode choice, destinations and purposes of the trips, frequency of the trips, mode choice per trips, cost per trips, preference of modes and opinions of the respondents regarding the improvement of the bus service were also collected from the survey. Besides the primary data, the secondary information was collected from the websites of bus transit of Johor Bahru in order to get the data on existing bus routes and schedules. Several statistical analytical tools were applied to get the expected result on data formulation.

4. Results and Discussions

The following sections describe the key results found from the data analysis and interpretation.

4.1 Socio-economic profile of the respondents

The socio-economic attributes of the respondents including the age, sex, educational qualification, occupations and monthly income of the respondents were collected through the primary survey. Among total 60 respondents, about 40% of the total respondents are aged from 27 years to 36 years old. Another 30% and 21.7% are aged between 37-46 years and 17-26 years respectively. Only 8.3% of the respondents are above 46 years. The number of male respondents is more than the female respondents.

Around 58% of the respondents are male and rest 42% of them is female. Again, the educational qualification of the respondents shows variety in types. Among the total number of respondents there are 45% of Degree, 22% of Masters, 18% of Secondary, 10% of Primary and rest of the others have PhD or degree on religious line. There is much variation in occupations of the respondents on the field survey. There are both formal and informal job holders among the respondents. As, the targeted persons should be the residents of the study area, questionnaires are served mostly on the permanent shops and restaurants of the study areas. Thus about 23% of the respondents are businessmen (mostly shopkeepers and owners of restaurants and workshops). Among the others 14% of the respondents are private job holders and 13% of them are students. There are also some limited numbers of govt. employees, housewives, freelancers among the respondents. According to the survey- around 35% of the respondent's income is under the range of RM 3000-6000. That means the respondents are above the median income line of the Malaysian. As among the respondents almost 13% are students and 7% are housewives, the income range of them is limited within RM 1000-3000. The other two groups of income range RM 0-1000 and RM 6000 and above fall under 18% and 16% of the total respondents respectively (Figure 3).

Table 1: Bus routes and service providers operating at Taman Ungku Tun Aminah and Surroundings

Route Number	Terminal Destination	Routes	Service Provider
666	Taman Nusa Sentral	Larkin Terminal – Taman Tasek – Tampoi – Plaza Angsana – Kipmart Tampoi – Taman Ungku Tun Aminah – Taman Seri Orkid – Lima Kedai – Taman Nusa Sentral	Causewaylink
1B	Selesa Jaya	JB Sentral Terminal – Majlis Bandaraya Johor Bahru – Hospital Sultanah Aminah – Danga Bay – Tampoi – Plaza Angsana – Kipmart Tampoi – Taman Ungku Tun Aminah – Taman Damai Jaya – Selesa Jaya	Causewaylink
15	Selesa Jaya	JB Sentral Terminal – Majlis Bandaraya Johor Bahru – Hospital Sultanah Aminah – Danga Bay – Tampoi – Plaza Angsana – Kipmart Tampoi – Taman Ungku Tun Aminah – Taman Damai Jaya – Selesa Jaya	City Bus
CW4S	Jurong East, Singapore	Sutera Mall Terminal – Jalan Sutera Danga – Jalan Skudai – Taman Ungku Tun Aminah – Jalan Seri Orkid – Jalan Gelang Patah – Second Link Expressway – Second Link CIQ Complex – Tuas CIQ Complex – Jurong East Interchange	Causewaylink
P-202	Hub MPBJT	Terminal Taman Universiti – SMK Taman Mutiara Rini – Hutan Bandar MPJBT – Taman Sri Orkid – Pangsar Puri Jaya – Taman Ungku Tun Aminah – Hub MPBJT	Bas Muafakat

Source: Malaysia Public Transport Directory, 2016

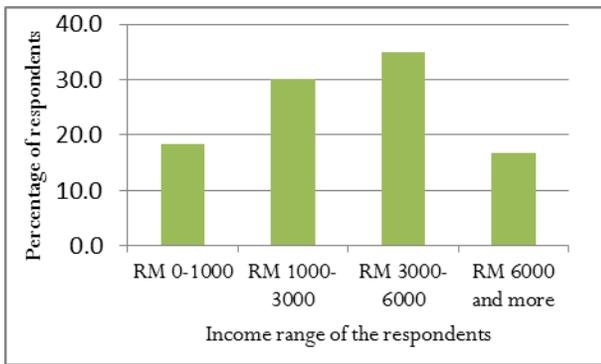


Figure 3: Income distributions of the respondents

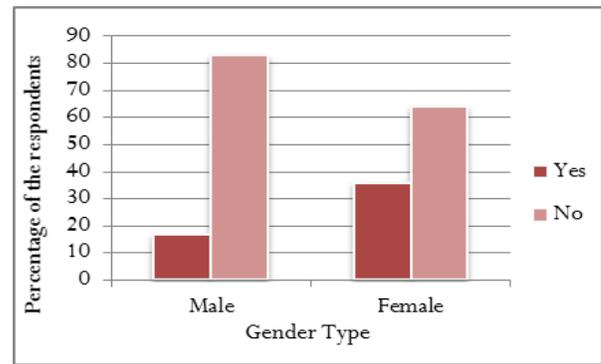


Figure 6: Public bus users according to gender type

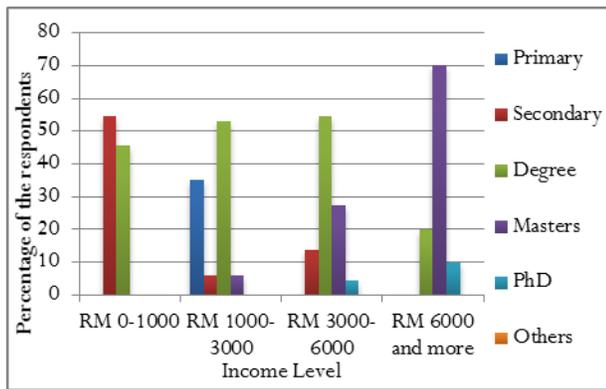


Figure 4: Income distributions of the respondents according to educational qualifications

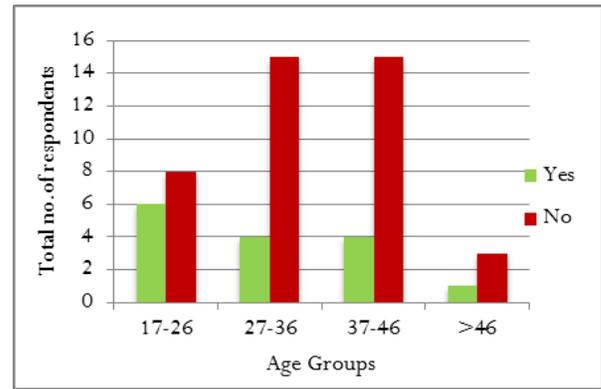


Figure 7: Public Bus users according to age groups

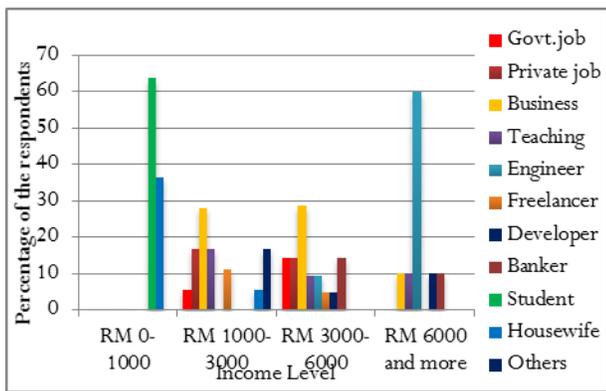


Figure 5: Income distributions of the respondents according to Occupations

In Figures 4 & 5 the percentage of respondents according to occupations and educational qualifications are shown with respect to income level. From the field survey it is found that people having normal degree have variety in income range. It depends on their occupation. People of masters and PhD degree have naturally higher income than the others. But the percentage of the respondents is very low (10%). On the other hand, people having Masters Degree have high income range (from RM 3000 to above RM 6000) (see Fig. 4). Again, in Fig. 5, it is shown that mostly students and housewives along with some petty shopkeepers and waitress have lowest amount of income comparing to other occupations. Most of the job holders have income range between RM 1000 to 6000,

whereas only a small amount of respondents who are engineers, have highest income per month.

4.2 Travel Pattern analysis

In order to assess the travel pattern of the inhabitants of the study area, survey was held on the respondents on public bus usage, car ownership, average no. of trips per day, major destinations, average travel distance from the workplace to home, average travel time per day and average cost of the trips per day.

From the field survey 2016, it is found that most of the respondents do not use public bus on their daily purpose. Only 26.7% of the respondents gave positive responses on public bus use and only 23.3% of the respondents have family members who use public bus on their daily travel. The major destinations of the users of public bus are- JB Central, Danga Bay, Larkin Bus Stand, Sutera Mall, Pasir Gudang to JB central, Jurong East (Singapore), MBJB, Tebrau and UTM. These destinations are easily accessible from the study area. Figures 6 and 7 show the usage of public bus according to gender variation and age groups. From those figure it can be seen that mostly the female respondents use public bus rather than the males (36%) and the young people use the public bus on their daily travel; whereas people aged above 36, do not use public bus that much.

Again in Fig.8, the usage of public bus according to various occupational groups is shown. According to the study, students, housewives, freelancers are mostly using the public bus service for their daily travel purpose (43% of the students and 40% of the housewives).

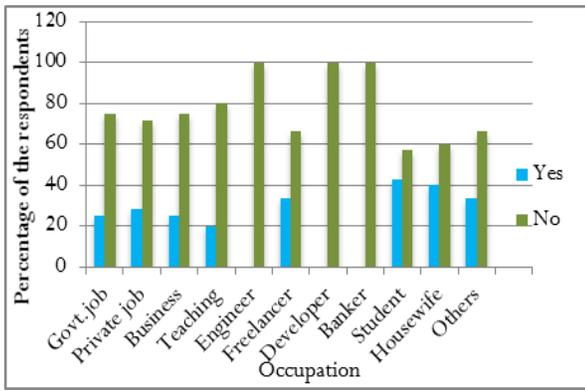


Figure 8: Public bus use according to respondents' Occupations

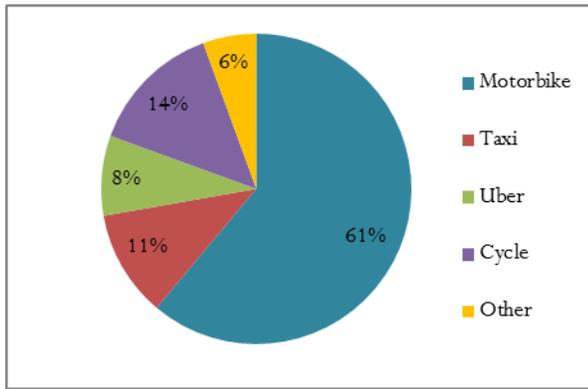


Figure 9: Transport Modes of non-private car owners

On the other hand the engineers, bankers or developers do not board on public bus at all. This is because of their high income and private car ownership.

As, most of the respondents do not use the public bus, they are mostly private car users. Around 67.8% of the respondents occupy their own car and rest of others, use different motor vehicles. Among the other private vehicle users the Motorcycle user is 61% and Bicycle user is almost 14%. The other users are for Taxi and Uber. None of the respondents travel on foot. Fig.9 shows the detail of the mode usage of the respondents except private car.

The average number of trips on public bus is only 2. That means respondents use the public bus twice a day including return trips from their destinations. On the other hand average no. of trips on private vehicle is nearby 3, excluding the return trips. Moreover, there is much variation in major destinations of the respondents on private vehicles. For the respondents, the daily workplace is the common destination. Almost 41 persons among 60 selected this as a major destination. Among the other places, shopping malls, schools, university (UTM), gas stations, banks etc. are some major destinations. Six of the respondents travel to Singapore as their workplace is there.

The respondents of the survey travelled both long and short distances from their home to workplaces. As, there are many destinations for their daily journey, for simplicity only the approximate distance between their residences and workplaces is taken as a factor. According to the field survey, the average distance between the home

Table 2: Daily travel distance of the respondents

Statistical Properties	Distance (km)
Mean	13.12
Median	12.00
Mode	10.00
Standard Deviation	9.365
Minimum	0.00
Maximum	45.00

Table 3: Daily travel time of the respondents

Statistical Properties	Travel Time (min)
Mean	23.6
Median	20.0
Mode	20.0
Standard Deviation	14.8
Minimum	0.0
Maximum	60.0

Table 4: Daily travel cost of the respondents according to travel modes

Daily Travel Cost	Public Bus (RM)	Private Car (RM)	Motor Cycle (RM)	Taxi/Uber (RM)
Mean	6.5	8.6	5.35	24.0
Median	6.0	8.0	4.0	
Mode	6.0	10.0	4.0	
Std. Deviation		5.1	2.4	
Daily average cost per trip	3.3	3.1	1.9	

and workplace of the respondents is 13 km. The table 2 shows the other statistical properties.

Like the travel distance, travel time of the respondents also show large range of time difference (Table 3). The minimum travel time is zero for some respondents who own shops nearby their residents, on the other hand maximum travel time exceeds 1 hour for some respondents who travel to Singapore or come from Pasir Gudang in the study area. However, the average travel time is 23.6 minutes. This travel time includes the assumption of daily total travel time rather than only travel time to workplace.

The average cost of the daily trips varies according to the mode choice and travel distance. The average cost on public bus and private vehicle is quite different. Including the return trips, the average cost on bus fare is about RM 6.5 where as average fuel cost of the private vehicles is RM 8.6. These two costs cannot be compared together as the bus trips only cover two way travels, whereas private vehicle trips cover multiple trips. However, both of the costs are quite similar if they are measured on same scale. So, the daily travel cost on bus per trip is RM 3.3 on average and the daily travel cost on car per trip is RM 3.1 on

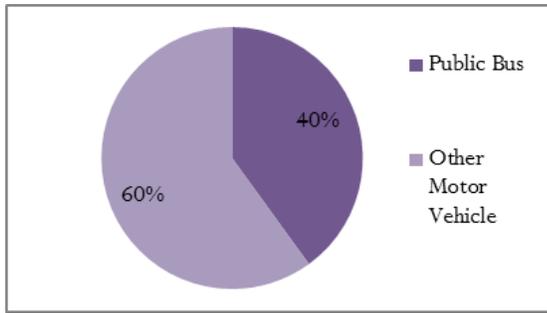


Figure 10: Mode choices of the respondents in absence of private vehicles

average. The fuel cost of motorcycle is quite less and on the contrary Taxi or Uber fare is relatively high. Table 4 shows the detail.

4.3 Modal Preference Analysis

In order to assess the preference of modes by the users, some questions were asked to the respondents in a multiple choice format. Those include preference of modes (based on stated preference) and respondent's opinion regarding the improvement of public bus service. The results follow the detail.

The respondents were asked if they prefer public bus instead of private vehicle in their daily travel. As most of them were private vehicle users, they gave negative response to this question. As a result, only 27% people stated the preference of public bus on the survey, the rest 73% people have no interest on boarding public bus. Again, when another question was asked about their stated preference on public bus choice in absence of their own private car, interestingly the positive response increased. About 40% of the respondents gave positive answer. They would prefer public transport rather using another automobile (like Taxi/uber/delivery car), as the cost is less. But this depends on the destinations and situations.

However, from this answer it can be assumed that the demand of public transport can be increased by imposing some restrictions on private vehicle using by the government. Fig. 10 shows the result.

4.4 Existing problems regarding public bus service

The schedule and routes of public bus service in Taman Ungku Tun Aminah were analyzed through secondary data. There are some selected destinations (e.g: Larking central, Selesajaya, JB Central, Majlis Bandaraya Johor Bahru, Hospital Sultanah Aminah, Danga Bay, Tampoi, Plaza Angsana, Kipmart Tampoi, Jurong East, Singapore etc.) for the bus service from the study areas, which cover most of the major destinations of the residents. Nevertheless, the usage rate and demand for bus is very low. Questions were asked to the respondents regarding the reasons for not using public bus in spite of having the services for medium and long distances. They were also asked to rank their reasons of not using public bus excluding the reason of having private vehicles. According to their response, the major reasons or issues that discourage people of using buses are listed below in the Table 5 according to their weightage and rankings.

From the table it is clearly visible that there are lots of underlying reasons that discourage people from using public bus in the locality of the study area. The first reason behind this low usage is that, the buses are not available and accessible from the origins or destinations of the residents. Again, the long distances between the bus stops discourages most of the people to avoid bus service as they need to walk great distance from the bus stops to their destinations. People prefer having uninterrupted journey by their own vehicle rather the interrupted journey on bus.

More to these, the 4th ranked reason is delayed journey time. As the buses do not always maintain the proper time schedule and operate on a longer travel routes, most of the users feel it inconvenient on their daily purpose. They prefer to move faster to their workplace and other destinations rather spending longer time on buses. Another mentionable reasons ranked in number 5 is poor condition of the buses, relating to the reasons ranked 8 and 9 (lack of comfort and safety). Though, Causeway and Bus Muafakat have good and comfortable buses, the other buses are old and obsolete to run in the road. People do not feel comfortable or safe in those buses. On the rank 6, respondents said that they do not know the exact schedules of the bus. Due to this unawareness, the bus services are not getting sufficient ridership and profit.

5. Recommendations for an effective public transport service in the study area

In order to get possible solutions for the effective public transport service in the study area some recommendations have been suggested. One of the major parts of these suggestions was collected from the respondents during the survey. Their opinions regarding the improvement of bus service have been presented as recommendations along with some policy suggestions.

5.1 Respondent's opinion regarding the improvement of public transport service

In order to suggest some recommendations for the effective

Table 5: Weightage and ranking of the reasons for not choosing the public bus service

Options	Reasons of not choosing public bus service	Total Weightage	Rank
1	Not available on the daily journey route	162	1
2	No accessible from the residence/workplace	120	2
3	Longer distance of bus stops from the residence/workplace	100	3
4	Delayed journey time	99	4
5	Poor condition	91	5
6	Do not know the bus schedule	81	6
7	Not Frequent on the daily journey route	78	7
8	Lack of comfort/too much crowd	73	8
9	Lack of safety	59	9
10	High cost	19	10
11	Other reasons	16	11

Table 6: Total weightage and ranking of the options for the effective solutions for the improvement of public bus service in the study area

Options regarding improvement of public bus service	Total Weightage	Rank
Providing more buses along the existing routes	162	1
Improving the condition of the existing buses	131	2
Make the buses more frequent	93	3
Providing new bus services along the new roads	91	4
Providing more bus stands within short distance	87	5
Improving the conditions of the bus stands	80	6
Using smart apps for the schedule and bus fare (using digitized map)	70	7
Reducing the bus fare	65	8
Shorten the bus routes	48	9
Introducing 'Bike Share' service for the access to the bus stand	42	10
Others	31	11

transportation service of the public bus in the selected study area, public opinion regarding the improvement of bus service is presented which was collected from the field survey. The respondents of the questionnaire survey were asked to give specific weightage to any five measures (1=very weak to 5=very strong) out of eleven according to their relative significance. According to their response, the eleven selected measures are arranged under particular ordinal ranking by calculating the total weightage. The relevant options are chosen based on the practical knowledge and study. Each option is multiplied by the respective weightage and summation of total weightage under each option is arranged according to highest to lowest values. Finally the ranking is given against each option. The following Table 6 shows the result of ranking of the solution options

According to the list of Table 6 it is seen that the highest value is given for the provision of more buses along the existing routes. From the previous studies it is also found that there is lack of buses in the local roads of Johor Bahru. So that, people are bound to use their own vehicle for their daily movement. Moreover, improvement of the condition of the buses is also necessary in order to attract the passengers. On the 3rd rank, it is suggested that the bus should be more frequent which is also related with the provision of more buses along the roads. The respondents also gave emphasis on new bus service along some other roads which have certain demand but do not have the bus route. In the next sections, some new routes are suggested for the introduction of bus service.

Again, improving the conditions of the existing bus stands and providing bus stands within short distances are also got good weightage and ranked on 5th and 6th. In fact, the condition of the bus stand is too poor to accommodate and attract the passengers. A recommendation for the improvement of the bus stand is given in the following sections. Finally, some innovative solutions like introducing smart apps for the bus service and Bike Share service are enlisted on the ranks besides some financial and technical solutions like reducing the bus fare and shortening the bus routes. However, these financial and technical measures are dependent on government interventions and policy decisions.

5.2 Key Findings and Recommendations

There are some major findings of this study which are mentioned below.

- The public bus ridership in the study area is very low comparing to the private vehicle ridership. Only 26.7% respondents use the public bus on their daily transport. The rest of others use private vehicles for their journey.
- Among the public bus users, the higher percentage groups are students (43%) and housewives (40%). Most of the job holders are unwilling to use the bus.
- The car ownership percentage is almost 68% among the respondents. Among the other vehicle users, motorcycle riders are the highest number.
- Both of the daily travel cost per trip on bus and private care are similar (around RM 3). But almost 73.3% people prefer to travel on their own vehicle rather public bus. The main reasons behind this unwillingness besides the low fuel cost are that, the buses are not always available and accessible on their daily journey route, the location and distance of the bus stops are not convenient, due to the delayed journey time and uncomfortable environment in the bus, unknown bus schedule, lack of frequency etc.
- Interestingly almost 40% of the respondents gave positive response on using public bus in absence of their own automobile and more than 80% respondents gave their opinion regarding the improvement of the bus service.
- They gave highest weightage on providing more buses along the existing bus routes, improving the condition of the buses and make them more frequent, providing new buses, improving the condition of the bus stands and setting them within short distances, reducing bus fare, introducing digital apps and bike share service etc.

5.2.1 Proposed new bus routes along the local roads of the study area

According to the pilot survey at the study area, it was observed that the existing bus stops are located only along the arterial street, Jalan Tun Aminah. As shown in Fig.2 there are 9 bus stops to serve the neighbourhood, and distance between each bus stop varies from 380 meters to 700 meters. Though, the houses close to Jalan Tun Aminah are highly accessible to numerous bus stops, the housing areas that are on the fringe of Taman Ungku Tun Aminah basically cannot access the bus stops within walking distance (400-500 meters). More importantly, these peripheral areas of Taman Ungku Tun Aminah have high demand on public transport revealed from the study and by the respondent's opinion. Therefore, new bus routes are proposed, aiming to solve the issue of lack of connection between bus stops along Jalan Tun Aminah and housing areas. The major points of the proposals are given below.

- The bus stops will be provided within every 400 meters of walking radius in housing area to serve the residents and to enhance connectivity of distribution road to arterial road.
- As shown in Fig.11 one of the new bus routes from direction of Johor Bahru/ Larkin is integrated with the existing bus stops along Jalan Tun Aminah. Proposed new bus stops are located at these two locations aiming to give convenience for people to travel to respective destinations. This proposed new bus route can be

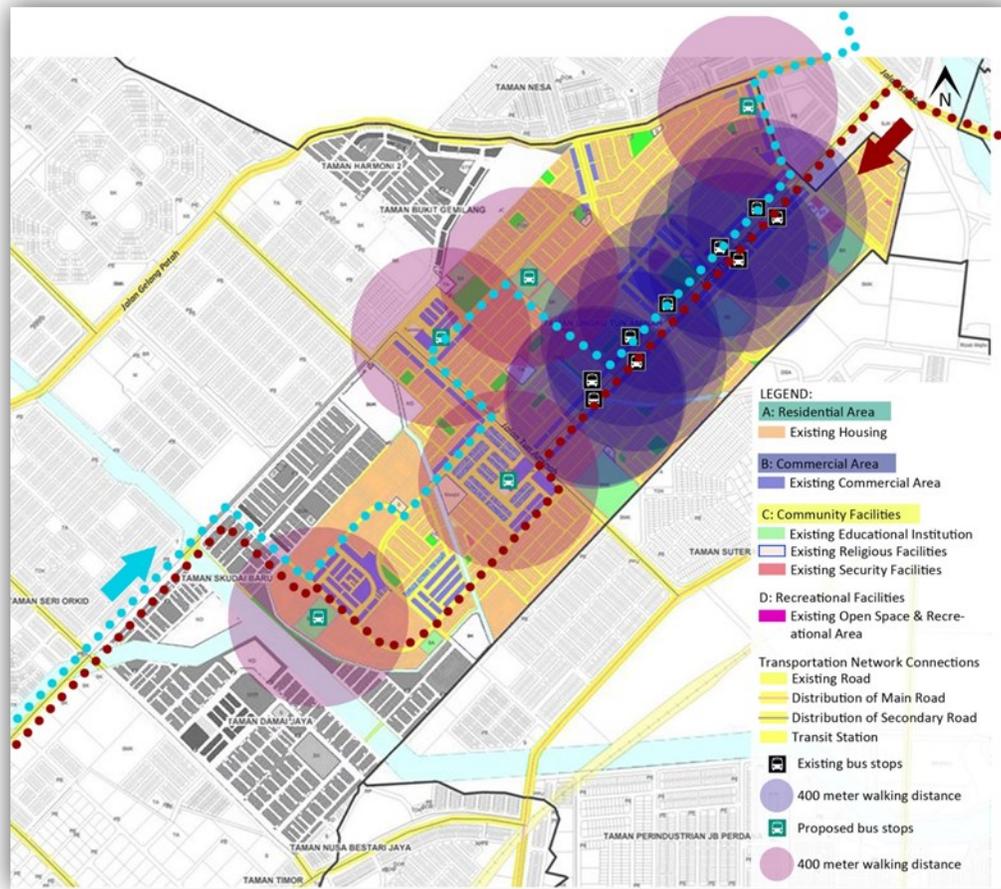


Figure 11: Proposed new bus routes and bus stops inside the study are.

Table 8: The proposed new bus routes across the study area

New bus route Number	Routes
1	Aft Jalan Tun Teja – Opp. Poliklinik Yap – Nor AutoWorkshop – Bef Tan Furniture – The Store Taman Ungku Tun Aminah - Sekolah Jenis Kebangsaan (T) Taman Ungku Tun Aminah
2	Sekolah Jenis Kebangsaan (T) Taman Ungku Tun Aminah - The Store Taman Ungku Tun Aminah - Sekolah Menengah Kebangsaan Taman Ungku Tun Aminah – Union Inn – Shophouses @ Jalan Nakhoda 2 – Bef Terminal TUTA – Poliklinik Yap – Klinik Chan & Ng

implemented on existing bus routes, namely 666, 1B, 15 and CW4S.

- In addition, at the reversed direction where buses come from Selesa Jaya, new bus stops are proposed to be located at several location, i.e. The Store Taman Ungku Tun Aminah, Sekolah Jenis Kebangsaan (T) Taman Ungku Tun Aminah, Sekolah Menengah Kebangsaan Taman Ungku Tun Aminah and shop lots at the fringe of Taman Ungku Tun Aminah.

5.2.2 Proposed Inner city Bus Routes

It was observed that existing bus route covered most of the landmark within 5 km radius from Taman Ungku Tun Aminah such as Sutera Mall, Bukit Indah and Taman Universiti. Sutera Mall, as a major attraction within 5km radius of the site is only reachable by bus routes 1B and CW3S (GoogleMaps, 2016). It is suggested to provide higher frequency ob bus service to Sutera Mall to fulfil the residents’ needs. Moreover, a new bus route is proposed to serve places located at northern side of the study area for connecting this place to Johor Premium Outlet and Senai Airport on a same route. The new inner city bus routes are proposed in order to encourage residents to use public transportation by providing the public with convenient destinations.

5.2.3 Improving the conditions of the bus stops

The study area is already provided with a central bus stand along with Taxi stand. This central bus stand can also be updated for the use of inter-town bus interchange. Moreover, for improving the condition of the existing individual bus stop, some proposals for the modernization of the existing dilapidated ones in the study area is given below.

- The bus stops will be provided with comfortable and spacious sitting arrangements so that the passengers feel convenient to wait for the approaching bus.
- The material of the bus stop’s ceiling and wall will be durable and heat resilient.
- There will be sufficient air ventilation and natural luminosity in the

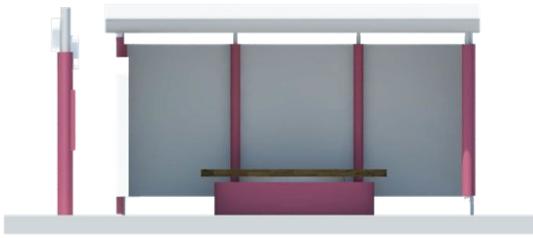


Figure 12: Front View of the proposed design of the Bus Stop

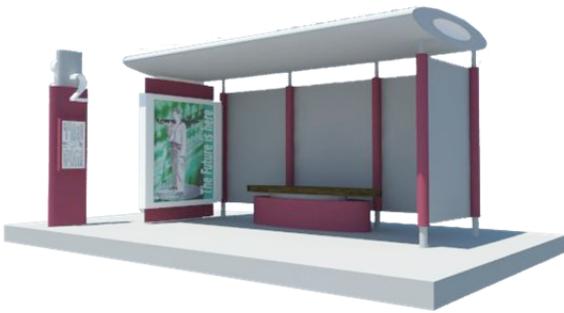


Figure 13: Angled View of the proposed design of the Bus Stop



Figure 14: Perspective View of the front of proposed design of the Bus Stop

day time at the bus stops to make them lively and energy saving condition.

- The route map and schedule of the buses will be displayed in a large scale board at a suitable position of the bus stand so that they can be clearly visible by the users.
- There should be separate lane for approaching bus within 100 meter of the bus stops so that the passengers can safely board on and alight from the bus.
- There should be separate board for advertisement which will be rented by the authority. The profit from the advertisement can be used for the maintenance of the bus stops.
- There should be separate waste bin nearby the bus stop so that the place can be kept clean and environment friendly.

Above all, the proposed bus stands will be the display of modern architecture and design so that they can easily attract the passengers and create a lively environment with the balance of nature and social coherence. The following figures 12, 13, 14 show the detail design of the proposed bus stops.

5.2.4. Introducing Real Time Information Smart Phone App

Introducing GPS based real time smart phone app is now a demand of present time. With smart phones and GPS technology, riders can even track the progress of a bus toward their location or destination in real time.

In Johor Bahru there is a requirement of such kind of app that will display information on the bus routes, schedule, location of bus stops etc. The major feature of such kind of app will be as follows.

- Providing static information on bus schedules and maps to the users in a more convenient and user-friendly format.
- Providing real-time information which will show where the bus actually is, using GPS systems to communicate to users the current status of the transit system.
- Using 'Find-My-Way' to search for information on public bus services and shuttle bus boarding locations to help commuters find their way.
- Enhance the travel experience using the public transport 'Journey Planner'.
- Searching and locating nearby bus stops and service number with bus route details.
- Checking estimated Bus Arrival Time and capacity of the bus.
- View live traffic images along all expressways around the city.
- Providing riders with instant information about the approaching time and delay time through electronic signs at the bus stops and stations, then via the internet, and finally via smart phone.
- Electronic ticketing via smart phones will enhance the potential to reduce the hassle, delay and cost of paying transit fares by seamlessly linking fare payments to a credit card account or other digital payment method (Source: mytransport.sg, 2016)

5.2.5 Introducing Bike Share Service to the bus stops

Bike share service nearby the bus stops can be very innovative idea. This can be very effective idea for encouraging both public transport and non-motorized transport for the residential neighbourhood like Taman Ungku Tun Aminah. Especially, this service can be introduced at the proposed new bus stops nearby the educational institutions for the students.

5.3 Policy recommendations for the enhancement of public transport

Iskandar Malaysia has already taken several steps to revive the public transport usage and turn Johor Bahru into a major transportation corridor. Nevertheless, there is enough lacking in proper policy options for the local bus service in the residential areas. The strategic actions that can be taken by the respective authority besides their present policies are mentioned below.

- Increasing the number of buses in the residential neighbourhood and maintaining appropriate schedules. But prior to that necessary demand analysis of the local areas should be done by the experts. Rather than increasing the number of full length expensive buses, small sized shuttle bus with lower fare can be launched on test,

operating only inside the connecting neighbourhoods.

- Though Bus Muafakat is already running across the neighbourhood with free of cost, this bus service needs to get more promotion and publicity as majority of the residents are not aware of this bus schedule and services.
- Government subsidy on public bus service needs to be increased and easy loan system for automobile ownership needs to be decreased.

In fact, there should be long term strategic actions regarding the supply of private vehicles and controlling the fuel cost. So that, proper initiatives to check the supply of automobile need to be taken along with boost up the demand of public bus. There should be two way interventions by the government and respective authorities.

6. Conclusion

As an old residential neighbourhood with lots of vital commercial activities and educational institutions, Taman Ungku Tun Aminah is very lively place with high potential of the improvement of public bus service. Though majority of the residents use their own private vehicle, there is much scope of enhancing the public bus service for medium and short distance travel, especially for the students and medium income people. In addition, for the sake of environmental sustainability and healthy living environment dependence on automobile must be checked by attractive public transport service and non-motorized vehicle. If the proposed recommendations can be implemented with some strategic direction and policy framework, there is greater possibility that the percentage of public bus ridership will be increased. However, without the integration of the policy makers and the authorities with the local residents, the success cannot be gained as people are very reluctant on using public transport in Johor Bahru. Hence proper strategic steps with long term goal for achieving sustainability should be drawn out keeping much emphasize on public transport network enhancement.

References

Alavi, S.V.K. and Mohamad, M.S. (2013). Urban Public Bus Adequacy Evaluation Analysis: A Johor Bahru, Johor, Malaysia Case Study. <http://www.tojsat.net/journals/tojsat/articles/v04i02/v04i02-01.pdf>. Retrieved on 8 October, 2016

Answers (2016). Population of Taman Ungku Tun Aminah. http://www.answers.com/Q/What_is_Taman_Ungku_Tun_Aminah_population#slide=3. Retrieved on 13 December 2016. Bus Interchange.net. (2015).

Johor Bus Routes. <http://businterchange.net/johorbus/routes.html>. Retrieved on 30 November 2016.

Causewaylink (2016). Johor Bus Schedule. <https://www.causewaylink.com.my>. Retrieved on 30 November 2016.

Department of Statistics Malaysia. (2013). Population and Demography. <https://www.statistics.gov.my>. Retrieved on 8 October 2016.

Google Map (2016). Taman Ungku Tun Aminah. https://www.google.com/maps?q=taman+ungku+tun+aminah&um=1&ie=UTF8&sa=X&ved=0ahUKEwiH9OadmVHQAhVMto8KHZ9sDPQQ_AUICCB. Retrieved on 1 November 2016.

Economic Planning Unit (2015). 11th Malaysia Plan 2016-2020. Prime Minister's Department, Malaysia.

Geoportal (2015). Taman Ungku Tun Aminah Map. http://geoportal.johor.gov.my/mapsserver2012/geojohor/awam/taskpane/johorbahru/KELAS_KEGUNAAAN/MBJBT/BP4-Taman%20Tun%20Aminah.pdf. Retrieved on 2 November 2016.

IRDA (2011). Transportation Blueprint 2010-2030 for Iskandar Malaysia. Iskandar Regional Development Authority. <http://iskandarmalaysia.com.my/downloads/Transportation-Blueprint.pdf>. Retrieved on 8 October 2016.

Land Transport Guru (2015). Bus Stops of Taman Ungku Tun Aminah. <http://landtransportguru.net/>. Retrieved on 30 November 2016.

Malaysia Public Transport Directory. (2016). Johor Bus Service. <http://www.mypublictransport.com/> Retrieved on 30 November 2016.

MyTransport Sg. (2016). My Transport. SG Apps. <https://www.mytransport.sg/content/mytransport/home.html>. Retrieved on 2 December 2016.

SPAD (2012). Land Transport Master Plan. Suruhanjaya Pengangkutan Awam Darat. <http://www.spad.gov.my/sites/default/files/national-land-and-public-transport-master-plan-final-draft.pdf>. Retrieved on 8 October 2016.

Tasek Maju (2011). Taman Tun Aminah. http://www.tasekmaju.com.my/taman_tun_aminah.html. Retrieved on 13 December 2016.

UTM Low Carbon Asia Research Center (2013). Low Carbon Society Blueprint for Iskandar Malaysia-2025. University of Technology Malaysia. https://www.nies.go.jp/media_kit/2014/4.4.pdf. Retrieved on 8 October 2016.