

Empowering Public Transport for Urban Environmental Management

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ABSTRACT

One of the key elements in urban environmental management is minimising dependence on the polluting petrol-propelled motorised vehicles. Use of low-occupancy vehicles such as personal cars and motorcycles is contrary to the aim of creating an environmentally sustainable eco-city because emissions from fuel-propelled vehicles are damaging the environment and health. This paper examines critically the current state of public transport service and efforts to empower its use as a way of minimising air pollution in Putrajaya, Malaysia's newest federal government administrative city. Due to insufficient interest in public transport among the city dwellers, the city's bus system was operating without profit and heavily dependent on the city authority to survive financially. The quality of the bus services was not very much dissimilar to those in other cities in the country in terms of availability, punctuality and reliability. The use of private cars and motorcycles is increasing rapidly and it is a matter of time before it will cause adverse impacts on the city's environment. Signs of future environmental degradation in terms of reduced air quality, traffic noise, road accident, congestion and traffic chaos are already emerging. If the city authority failed to reverse this trend, Putrajaya would become just another city in the country where roads and highways are being dominated by private vehicles. To avoid this, and to revitalise public transport, the city has to adopt new approaches in the management of its bus system, and in determining the fares so that public transport will be more attractive.

ABSTRAK

Satu daripada unsur penting dalam pengurusan persekitaran bandar ialah pengurangan pergantungan kepada kenderaan bermotor. Penggunaan kenderaan penumpang sedikit seperti kereta and motorsikal adalah bertentangan dengan matlamat mewujudkan bandar ekologi yang mampan alam sekitar kerana pencemaran daripada kenderaan yang dipacu oleh bahan api fosil mengancam persekitaran dan kesihatan. Kertas ini membincangkan hasil pemeriksaan kritis tentang situasi semasa perkhidmatan pengangkutan awam dan usaha memperkasakannya di Putrajaya, bandar pentadbiran kerajaan

persekutuan yang baru bagi Malaysia. Disebabkan minat yang kurang di kalangan orang ramai, sistem pengangkutan awam bandar ini beroperasi tanpa untung dan bergantung kuat pada sokongan kewangan pihak berkuasa bandar. Kualiti perkhidmatan pengangkutan awam didapati tidak jauh bezanya dengan bandar-bandar lain di negara ini daripada segi kesediaan bas, kekerapan dan ketepatan jadual perjalanan. Penggunaan kereta persendirian dan motorsikal sedang meningkat dengan pesat dan bandar ini tidak perlu menunggu lama untuk melihat kesan buruknya terhadap alam sekitar. Tanda-tanda kemerosotan alam sekitar daripada segi penurunan kualiti udara, kebisingan trafik, kemalangan jalanraya, dan kesesakan lalulintas sudah mulai kelihatan. Kalau pihak berkuasa bandar gagal menterbalikkan tren ini, Putrajaya akan menjadi seperti bandar-bandar lain di negara ini di mana jalan dan lebuhraya didominasi oleh kenderaan persendirian. Untuk mengelakkannya, dan untuk memperkukuhkan pengangkutan awam, bandar ini perlu mengadaptasi pendekatan baru dalam pengurusan sistem basnya, dan dalam menentukan tambang, supaya bas menjadi lebih menarik.

INTRODUCTION

One of the key elements in urban environmental management is minimising dependence on the polluting petrol-propelled motorised vehicles. The main argument of this paper is that using low-occupancy vehicles such as personal cars and motorcycles is contrary to the aim of creating an environmentally sustainable eco-city because emissions from fuel-propelled vehicles are damaging the environment and health. In urban areas, the use of bus and rail as an alternative to private car can help reduce pollution for at least two reasons. First, despite similarly depending on fossil fuel, a bus has a much higher passenger load capacity per unit of petrol use than a private car, thus taking into consideration all vehicles in a city, it comparatively pollutes much less. Second, rail-based public transport systems such as light rail transit, urban commuter rail and monorail are propelled by electricity, thus they do not emit pollutants into the air (Abd Rahim Md Nor & Nor Ghani Md Nor 2004). In the long run, empowering public transport, i.e. buses in this paper, can be seen as part and parcel of a successful urban environmental management. This paper provides a critical examination of the current state of public transport service and efforts to encourage its use as a way of reducing pollution in Putrajaya, Malaysia's newly developed federal government administrative city.

IMPACTS OF FOSSIL FUEL-PROPELLED MOTORISED VEHICLES ON HEALTH AND THE ENVIRONMENT

Private car use has degradation effects on the environment, and has direct and indirect damaging impacts on human, animal, vegetation, soil, geomorphology, water, climate and the atmosphere. Studies (see for example, Gordon 1995; Abd Rahim Md Nor 2001) indicate that fuel-dependent transport activities emit harmful pollutants into the atmosphere. The oxides of nitrogen and hydrocarbons combine in the presence of sunlight to form urban ozone. Ozone and its components, as well as particulate matter, can have significant undesirable impacts on the human respiratory system, causing ailments ranging from breathing difficulties to lung cancer from carcinogenic hydrocarbons or particulate matter. Carbon monoxide can lead to death from asphyxiation in the extreme case, but it can also contribute to heart disease in some cases. In urban areas, excessive noise from loud vehicle engines and horn is associated with accelerated hearing loss and sleep disturbance (Singh & Rao 2001; Wong et al. 2002). Frequently trapped in traffic congestion in the city centre can lead to increased stress levels, resulting in cardiovascular morbidity and lost work productivity (Greenwood et al. 1996). Emission of pollutants from motorised vehicles can lead to childhood asthma (Guo et al. 1999), and adult chronic obstructive pulmonary disease exacerbations, chronic bronchitis and increasing greenhouse gas emissions (Stott 2000; Patz et al. 2000). Lead in leaded-petrol may cause lead toxicity and subsequent reductions in child intelligence quotient, behaviour and hearing (Kagawa 1994). The convenience of using personal cars leads to dependency on door-to-door transport and reduces walking and biking, thus contributing to obesity and its subsequent co morbid conditions (cardiovascular, musculoskeletal and endocrine) (Swinburn et al. 2002; Tudor-Locke et al. 2003).

STUDY AREA AND METHODS

Putrajaya is the new administrative capital of Malaysia located some 25 kilometres south of Kuala Lumpur (Figure 1). The need for a new capital city was seen inevitable because of the severe congested conditions and land limitations in Kuala Lumpur. It is also in line with the aim of having a new and well-planned capital city that reflects Malaysian identity,

befitting the country's aspiration to become a fully developed nation in 2020. Situated in a 4,932 hectare area of mainly former oil palm plantation, Putrajaya was officially proclaimed the new federal

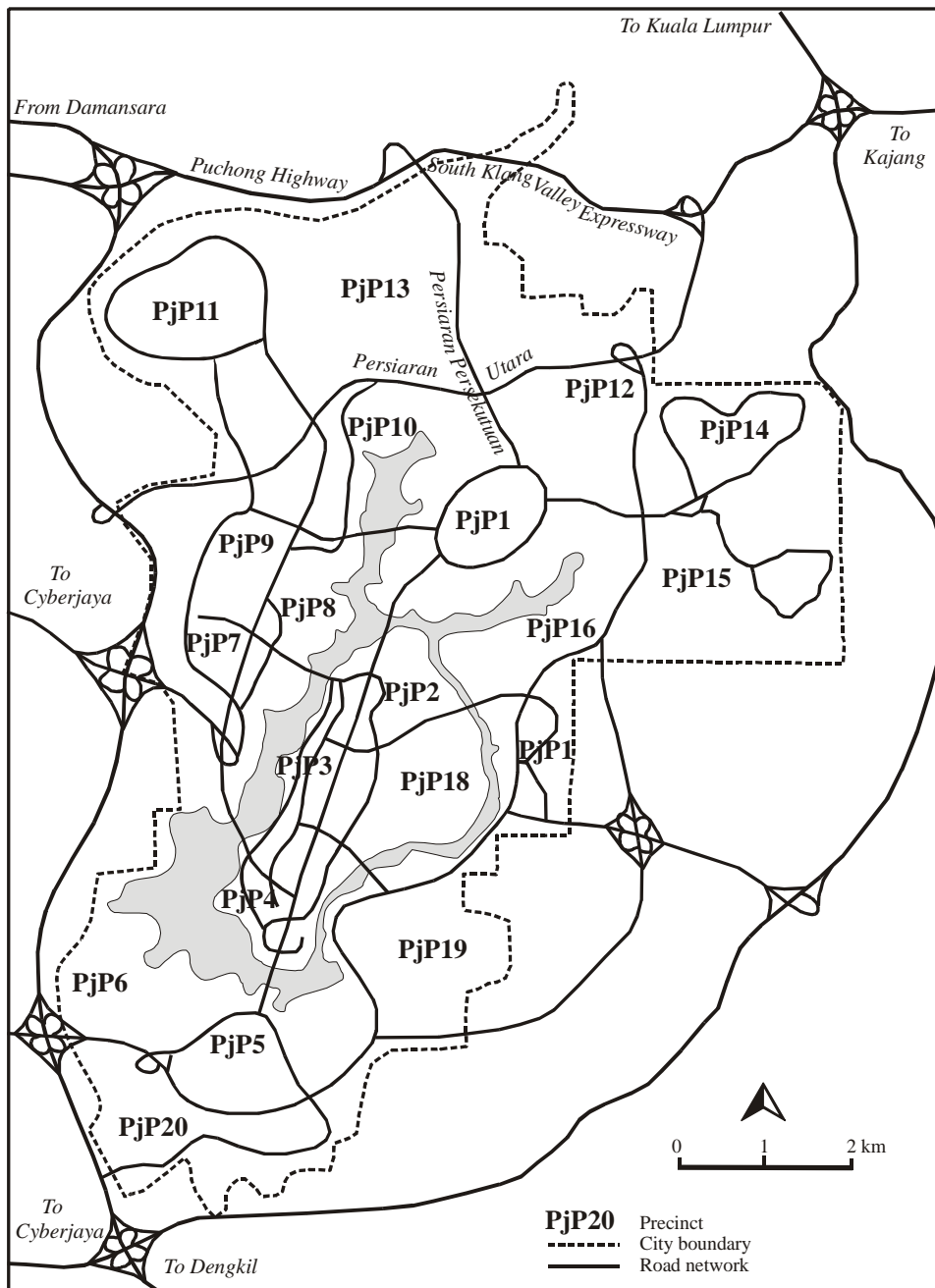


Figure 1. Study area

government administrative centre of Malaysia on 1st February 2001. At present, development is being pursued actively, and when it comes to total completion expected to be in 2012 it would have a total population of 330,000 people with 254,000 job opportunities. The planning concept for Putrajaya is based on three main principles of relationships namely between man and creator, man and his fellow man, and man and nature. Landscape development is aimed at minimising motorised vehicle pollution, enhancing local microclimate, preserving the natural habitat, and providing ample recreational facilities for the city dwellers. According to the city's master plan (Putrajaya Corporation 1997) one of the goals in the formulation of the transport strategy for the city is to 'provide an attractive built environment that is, as far as possible, free of congestion and has minimal levels of air and noise pollution'.

The first method in this study was the review of public transport decision-making process in Putrajaya. This task includes identifying relevant public transport policy decision-making bodies, departments and agencies, examining public transport operation regulators, and critical reviews of relevant master plans that have been published for Putrajaya. As far as the paper is concerned, the most important master plan was the Transport Action Plan (2003). The second method involves interviews with the management of public transport company currently operating the bus system in the city as well as discussions with managers of inter-city public bus companies operating the routes to Putrajaya from neighbouring towns and cities. The third method was an interview survey programme carried out on regular intra-city public transport users using a set of pre-tested questionnaire.

The questionnaire requires the respondents to furnish their socio-economic and demographic characteristics, and contains questions on several aspects of public transport use and users' attitude towards its services. Air quality measurements were also carried out at various locations in the city. Finally, ground-truth investigations were carried out at various locations within the city area to examine traffic conditions, parking of private cars and motorcycles, facilities at bus stops and terminals, conditions and facilities inside the buses, behaviour of the drivers and conductors, and bus information for the public.

PRIVATE CAR USE AND ADVERSE ENVIRONMENTAL THREATS

The majority of private car traffic in Putrajaya is contributed by commuters from Kuala Lumpur who commute to work in the city daily. When most federal government ministries and departments were relocated into the city, many government servants did not move because they have already bought houses in Kuala Lumpur, and they have to commute daily to the new city. Traffic and travel data gathered from fieldwork and traffic counts carried out as part of preparing a transport action plan (Putrajaya Corporation 2003) indicate that demand for private motorised vehicles in Putrajaya is extremely high and rising. Total daily travel demand in Putrajaya is about 20,673 person trips.

Demand for mobility is expected to increase tremendously in the next ten years as the city is fast growing in terms of population, infrastructure development and economic activities. Total travel demand was expected to increase to 71,456 in year 2005, and 121,797 in 2010 and increase further to 156,476 in year 2012 when the physical development for the city come to the full level. In the morning peak hours, most trips in Putrajaya (i.e. 52%) are generated from outside areas, especially from staff attached to various government departments who commute daily to Putrajaya from neighbouring towns and cities especially Kuala Lumpur, Banting, Kajang and Seremban.

Although Putrajaya is provided with a well-planned road networks and excellent highways, and accessible from many directions (Figure 1), current traffic circulation within the city area shows signs of imbalances. Currently most of motorised traffic concentrated on two of the many main accesses to the city, namely Persiaran Persekutuan and Persiaran Utara, and this trend is expected to remain so in the future. Heavy traffic noticeable on certain roads was due to most traffic concentrated only on a few roads. Field surveys show that in morning peaks, external trips bound for Putrajaya came mainly from the north through two main channels namely the South Klang Valley Expressway which contributes 64.6% of total trips, and Damansara Puchong Highway which contributes 21.9% (Putrajaya Corporation 2003). In Putrajaya, most of the traffic from these highways entering the city used only two main roads to reach the city centre and other places within the city area. For example, nearly all (98.2%) traffic from the South Klang Valley Expressway entered Putrajaya through Persiaran Utara. For traffic from Damansara Puchong Highway, about 63% entered through Persiaran Persekutuan and another 18% used Persiaran Utara.

In the afternoon peak hour, out-bound traffic from Putrajaya destined for similar highways but it differs in terms of route taken. For example, most (63%) of traffic bound for the South Klang Valley Expressway used Persiaran Persekutuan and another 37% used Persiaran Utara as outlet. The different in the traffic pattern is due to the fact that there is no turning facility at Persiaran Persekutuan-Persiaran Utara intersection for traffic from Precinct 1, one of the most active areas in the city in terms of economic and population activities. For traffic destined to the Damansara Puchong Highway, about 50% used Persiaran Persekutuan and another 37% used Persiaran Utara. The concern over the adverse environmental impacts of motorised vehicles in this city is also justified when one looks at the type of vehicles used. In terms of traffic composition, low-occupancy vehicles especially personal cars contribute most of the traffic on Putrajaya roads and highways with 79.8% of the total trips, while another 14.2% came from motorcycles. High-occupancy vehicles which emit less pollution in terms of per passenger such as public buses contribute little to the total traffic, about 2.1%.

In Putrajaya, excellent road and highway networks, with the capacity and quality comparable to most cities in advanced countries, have apparently enticed people to use personal motorised vehicles, despite the fact that public buses are provided. Being low-occupancy vehicle, the inability of private cars to transport people in the city is limited. The transport action plan study revealed that the average vehicle occupancy for private cars commuting to Putrajaya daily was around 1.69 persons. The public bus system in the city is not popular to the people because the service is unreliable, not punctual and takes longer travelling times. Field investigations show that average vehicle occupancy for a conventional bus was around 25 persons compared with its legal load capacity of 44, indicating that it failed to attract the public.

Such an extremely high reliance on low-occupancy private cars has produced signs of traffic problems in certain parts of Putrajaya, and this can be considered as the spawning ground for traffic circulation chaos in the future. Field investigations revealed that currently congestion is already noticeable in some parts of the city especially in areas of relatively high population density and active social and economic activities. On-road parking is common near commercial buildings and markets in Precinct 8, the most developed part of the city. In some parts, personal cars can be seen being parked at bus stop bays in this area, blocking the buses from entering the bays for loading and unloading passengers. Indiscriminate stopping and parking by parents sending off

their children in the morning and fetching them in the afternoon is a common scene on roads near the schools.

During sending and fetching times, the roads turned into a traffic hazardous zone when schoolchildren cross the road in between parked cars instead of using pedestrian crossing facilities which are provided in the areas. In the nearby commercial areas, indiscriminate parking by private car owners can be seen at all times during daytime but most rampant during afternoon lunchtime, disregarding yellow lines and the no-parking signs on the roads. Signs of either inadequate space for parking for private cars or undisciplined car owners can also be seen in areas around most of the administrative buildings in the city. On-the-road parking is commonplace around building clusters in Parcel B, C and D where most of the federal government offices are located. To a large extent, the parking chaos around these buildings is caused by visitors who parked their cars on roads and road shoulders. Field investigations revealed that during the busiest times, the illegal parking extended to the main road which forms parts of the huge round-about in the most developed zone.

PUBLIC TRANSPORT MANAGEMENT AND OPERATION

Intra-city bus services in Putrajaya began its maiden operation in January 2001 when, through an agreement, the city authority appointed a private company to be the sole bus operator to operate, manage and maintain three conventional long buses owned the company. Later the city authority bought three used buses, one of which was propelled by CNG (compressed natural gas) while the other two used diesel fuel, and handed over to the private company for operation. In February 2002, another contract agreement was sealed, allowing the private bus company to continue managing and operating the buses until January 2007 when the agreement will expire. Inter-city buses were provided by various companies based in the neighbouring towns and cities. Table 1 shows intra-city bus system characteristics in Putrajaya based on data from the management gathered during the fieldwork. For inter-city, the government-owned RapidKL buses served the route to Kuala Lumpur city centre *via* several intermediate passenger pick-up points including Serdang where there is a rail commuter and light rail transit stations.

Table 1. Daily intra-city bus operation characteristics

Bus operation characteristics	Total
Total bus fleets	14
Total mileage (km)	2518
Total trips	127
Bus route distance (km)	234
Total passengers	2554
Total fare collection (RM)	1141
Total rent revenue from city authority (RM)	5312

There are direct bus services from neighbouring towns of Kajang, Banting and Sepang in which each route is served by separate private bus companies. There is no bus links to major transport hubs like Seremban and Kuala Lumpur International Airport despite the apparent importance of these cities in the region.

Table 2 shows the typical daily intra-city passenger patronage and fare revenue for an average bus in the city. With monthly operational cost of RM9305 for each bus and the patronage was so low that bus fare collection can only cover 21.4% of the total costs, the bus company is heavily dependent on the city authority to float financially. On typical working day the intra-city buses ferried some 2418 passengers compared with about 1550 passengers on non-working days. On an average day, the bus company collected RM1209 fares from passengers for all its buses and handed over to the city authority in line with the agreement, while the city authority paid the bus company RM5626 as fees for operating the bus system and maintaining the buses. Despite there is a potential demand for travelling, response from the public was not totally encouraging. The actual bus patronage was so low compared with its capacity.

Table 2. Typical daily intra-city bus patronage and fare revenue

Type of day	No. of passenger	Fare revenue (RM)
Working day (early week)	252	110.85
Working day (late week)	155	75.22
Non-working day (Saturday)	106	51.00
Non-working day (Sunday)	95	43.76
Daily average	152	70.21

The interest among the people in Putrajaya to use public bus was low that only a small section of the population who are captive users used

it because they did not own personal vehicle, used it. These users can be easily identified from their socio-economic and demographic characteristics. Field surveys show that a typical bus user was a young passenger with a mean age of 24 years. The low standard deviation of around 9 years indicates small variability in their ages. Most of them (82.1%) were singles, and more than half (60%) were females. Around one-third (65.7%) worked as government servants in various job categories, approximately one fifth (19.1%) were unemployed, while the rest either worked in the private sector or self-employed mostly as petty traders. In general, the users came from the less educated sections of the community with the majority (44.1%) completed secondary schools, 15.2% completed primary school and only 15.7% obtained either diploma or degree. The Chinese, who is the highest among the three main ethnic groups in the country in terms of socio-economic status, formed only small percentage (0.8%) of the total passengers compared to Indian (1.6%) and the Malays (93.7%). Some foreign workers were also found to be regular users of the public transport system. The study also revealed that most of the bus users and their spouses did not have access to personal car or motorcycles either because they did not own the vehicles or they did not have valid driving license (Table 3).

Table 3. Access to personal vehicle

Aspects of access	Per cent
Do not own car driving license	72.1
Do not own motorcycle driving licence	78.6
Spouse do not own personal car	88.3
Do not own personal car	89.0
Spouses do not own personal motorcycle	91.1
Do not own personal motorcycle	92.5

In general they belonged to the low income families with a mean monthly personal income of RM1, 024 and RM 1,944 for their spouses. The small standard deviation of the personal income of RM564 indicates small variability, implying that they belong to a particular section of the city population identified with low socio-economic status. Their housing status confirmed further their socio-economic conditions. For example,

about 93.7% lived in flats, the rest lived in single-storey terrace houses, and 75.5% rented their houses for an average monthly rent of RM391.

A large majority (51%) of the passengers left home at as early as 7am in the morning to wait for the buses. Although Putrajaya is not a big city, the study found that passengers took relatively long time to reach their destinations using the intra-city buses, indicating inefficient circulation system in the intra-city's bus operation. As captive public transport users, they used bus because they did not own personal car or motorcycle, and not so much because the bus system was attractive in terms of availability, comfort and punctuality (Table 4).

As a way of soliciting users' evaluation of the quality of bus services in the city, several attitude statements associated with passengers' preference and satisfaction were presented to them during the interview surveys using 7-point Likert-type scale. Two of the questions presented in Table 4. Reasons for using public transport

Reasons	Per cent
Cheap bus fares	76.6
Did not own personal car	74.2
Did not possess car driving license	56.7
Comfortable bus services	54.7
Public buses were always available when required	38.9
Bus adhere to trip timetable	32.0

the questionnaire are 'In using public transport, what aspects of service quality you are looking for?' and 'Please rate public transport service quality in Putrajaya'. Effectively, these two questions detect aspects of quality in the bus system they were looking for and what was on offer in Putrajaya. The study revealed that bus stop, punctuality, bus availability and information on bus operation were among the items that the passengers did not satisfy with. The differences between what they expected and what was on offer in the city's bus system ranges from lowest 12.3 percent to the highest 69.1 per cent (Table 5).

Table 5. Bus service attributes quality (percent)

Bus service quality attribute	User's Priority	Users' Satisfaction	Difference
Covered bus stops	86.3	17.2	69.1
Punctuality	87.7	22.7	65.0

Availability	86.2	22.3	63.9
Spacious	83.2	23.6	59.6
Enough travel information	78.4	20.5	57.9
Bus not overloading	81.2	25.9	55.3
Disciplined drivers	91.0	42.5	48.5
Safety of passengers	89.9	43.3	46.6
Passenger-friendly conductor	80.4	35.6	44.8
Clean exhaust	82.9	40.3	42.6
Easy for the disabled	83.9	43.5	40.4
Music on board	66.1	26.4	39.7
Comfortable seats	82.9	45.0	37.9
Clean inside bus	80.7	46.1	34.6
Affordable fare	84.1	58.4	25.7
Beautiful colour and design	64.5	42.7	21.8
Good air-conditioning	90.7	78.4	12.3

PUBLIC TRANSPORT EMPOWERMENT: THE 'PROVIDE-AND-MONITOR' CONCEPT

In the last two sections of this paper, before conclusion, two new approaches in empowering public transport in Putrajaya will be present. The first concerns on the way in which the bus system is managed and operated and the second deals with a new concept of determining bus fares. These two new approaches was proposed in the latest planning of the city's public transport system in which the author personally involved as a consultant. These new approaches are new not only to Putrajaya but also to most of towns and cities in Malaysia. Except Kuala Lumpur, public transport services in other municipalities nationwide are provided and managed totally by private companies without subsidy from the local authorities or the federal government (Abd Rahim Md Nor, 2002). In Malaysia, fare in increase is a sensitive issue as far as the government is concerned because any change in fares will invariably adversely affect users who come from the low income section of the community. Bus companies have to be efficient to remain in business, but in many cases efficiency means a reduction in service quality.

The poor state of public bus supply in Putrajaya is the result of poor demand from the population. As a result, revenues from fare collection alone would be insufficient even to achieve revenue break-even point. During the survey, bus fare collection can only cover 21.4% of the total

costs, and the bus company is heavily dependent on the city authority to float financially. Current Federal Government policy dictates that there should be no subsidy for inter-city and intra-city private bus operators in the country, and the no-subsidy policy also applies in Putrajaya. The financial support that the bus company in Putrajaya received was only a temporary measure provided by the city authority as a special effort to enable the bus company floats and carry on with its services. Because providing bus services is not a profitable business, Putrajaya is unlikely to be able to attract private companies to operate in the city. Interviews with the managements of public transport companies in Klang Valley indicates that they were not willing to operate business in Putrajaya without direct subsidies from either the Federal Government or local city authority. If the trend of low patronage continues, public bus system in Putrajaya would be facing a dilemma because of the non-subsidy policy and the unwillingness of bus companies to come.

One way out is to review the method in which the bus is managed in the city. It is proposed that Putrajaya introduce the 'provide-and-monitor' concept in its public transport system. Under this approach, the city authority provides buses while a private company will be appointed to operate and manage the bus operation. Under this concept, the following rules apply: the city authority provides the number of buses required for the city; a private company is appointed to operate and manage the bus system, including providing drivers and supporting staff; the management fees to the company are chargeable to city authority; maintenance (repairs, spare parts) and services (cleaning, servicing) of the buses will be carried out by the private company and the costs are chargeable to the city authority; revenues from fare would be collected by the company and handed over to the city authority; the city authority would have full control of the whole bus system, management and operation.

ENTICING PASSENGERS WITH AFFORDABLE FARE

In Putrajaya, where public bus patronage is low, enticing the public to leave their cars at home and use public buses is of paramount importance. Despite increasing operational costs, the danger of increasing fares is that bus companies will lose its passengers. In Putrajaya as in any city in the country, the cost of owning personal car or motorcycle is relatively cheap that any major increase in public transport fares will push the passengers to leave the bus and use private cars. For Putrajaya, a flat rate fare system is proposed whereby each passenger pays a fixed fare of RM0.60 a trip on a route regardless of distance travelled. This rate is slightly higher

than the current flat fare of RM0.50. The proposed fare would be increased gradually in the future as it is considered low in comparison with personal income and standard of living of the population living in the city. The proposed fare rate is reasonable considering the cost of living prevalent in the study area. A passenger commuting daily from Kuala Lumpur to Putrajaya pays a minimum RM6.00 for return direct bus service from city centre. A private car user pays four times the bus fare. The proposed rate also takes into consideration the prevailing stage bus fares in the country and in line with the bus fare guidelines published by the Commercial Vehicle Licensing Board. The flat fare system is very attractive to long-distance travellers because they pay less compared with the short-distanced passengers. It encourages more people to travel on bus because the perception that fare is cheap, even though it applies only to long distance travellers. Fare collection would be easier than graduated fare system, and it is user friendly as the fare is the same for any distance travelled. It will reduce dwell time at bus stop because the flat rate is easy to remember and many passengers would have prepared with the exact amount such that they do not need changes. Variation in trip length is small (mean 6.13km and standard deviation 2.9) because the majority of passengers originated from housing areas and destined to the Oval and Boulevard.

In determining the proposed bus fare for Putrajaya, several factors internal and external to the study area have been taken into consideration. The justifications are: travel distances for all the eight bus routes proposed for the city; graduated fare rate for air-conditioned stage bus currently being enforced nation-wide by the Commercial Vehicle Licensing Board; socio-economic characteristics, standard of living and personal incomes of the population in Putrajaya; the highly regulated land use pattern, density and type of buildings in the city; and bus route network, length, orientation and alignment. The fare rate is determined using the following formula:

$$Fare = W \bullet [MF + AF \bullet (\frac{1}{2} AD - MD)]$$

where:

- ❖ *Fare* is the proposed flat rate fare (in RM) for Putrajaya

- ❖ *AD* is the average bus route length (in kilometre) in Putrajaya based on the ‘periphery-centre’ route concept (21.13km)
- ❖ *MF* is the fare (in RM) for the first two kilometres of an air-conditioned stage bus under the graduated fare system currently being enforced in the country by the Commercial Vehicle Licensing Board or CVLB (RM0.60)
- ❖ *MD* is the distance (in kilometre) of minimum fare (in RM) on an air-conditioned stage bus under the graduated fare system (2km)
- ❖ *AF* is fare (in RM) for each additional kilometre travelled on an air-conditioned stage bus, on top and above the fare for the first two kilometres under the graduated fare system (RM0.06)
- ❖ *W* is a weight of between 0 to 1

While several of the parameters (*MF*, *MD* and *AF*) in the formula which is 0.60, 2.0 and 0.06 respectively, are determined by the Government through the CVLB, others need clarifications. The average bus passenger trip length (in km), *AD*, is the average distance people travels using bus in Putrajaya. This is determined based on the following assumptions. First, most people in this city (say 70%) travel from their house to the city centre i.e. the oval (Precinct 1) and the boulevard (Precinct 2, 3 and 4) because the centre is the ‘magnet’ of Putrajaya where most of the activities are happened here.

Second, based on the ‘periphery-centre’ route concept, there are 8 bus routes that can be established in Putrajaya with total length of 161 km and average length of 20.13 km. Third, to get the *average bus trip length* made by people in Putrajaya, the *average bus route length* is divided into half (0.5) because passengers are scattered along the continuum of each route, from the peripheral areas to the city centre or, in other words, some (those who live in the peripheral areas) take longer trips to the city centre while others (those who live in the middle or near to the centre) make shorter trips. The derived value for *average bus trip length* i.e. 10.06 km is higher than what is derived by the modelling from the planning sub-sector in this study i.e. 6.13 km because its was for the *private car* and calculated based on ‘shortest path’ whereas our calculation is for *public bus* which normally does not have straight routes.

The weight (*W*), with a value of between 0 and 1, is determined by professional judgement and city policy in public transport. In a city where both the graduated and flat fare rates are being applied like the former minibus system of Kuala Lumpur or the present Kajang, this value is basically the *amount of discount* for people choosing the bus which

charges flat fare rate. The selected value depends on the how attractive the flat fare system the city would like to see; the value should be *low* if it is to encourage people using the flat fare system. For Putrajaya, the proposed weight is 0.5. Therefore the derived formula for Putrajaya is:

$$Fare = 0.5 \bullet [0.60 + 0.06 \bullet (\frac{1}{2} \times 20.13 - 2.0)]$$

Under the proposed flat rate fare system, and based on the formula presented above, the appropriate fare for Putrajaya is RM0.55 and rounded to RM0.60 (Figure 2). Referring to the formula, this amounts to only about half of total fare (RM1.08) for travelling on an air-conditioned stage bus for an average regular traveller under the graduated fare system in other cities in the country. Based on land use pattern, bus route lengths, orientation and alignment, an average traveller in Putrajaya travels for a distance of 20.13km (AD) to reach a destination from their house. The CVLB guidelines stipulated that for an air-conditioned stage bus under the graduated fare system, a passenger pays RM0.60 (MF) for the first 2.0km (MD) travelled and another RM0.06 (AF) for each additional kilometre. The rate proposed for Putrajaya is reasonable considering the fact that passengers will be provided with a fleet of buses of much higher qualities in terms of comfort, availability, frequency and area coverage. All buses will be of the air-conditioned types, have low floors and are provided with on-board facilities expected by passengers characterised by moderate-to-high living standard such as in Putrajaya. In addition, passengers will be able to enjoy bus riding in return for the slightly higher fare than those prevailing in similar systems in other towns and cities in the country.

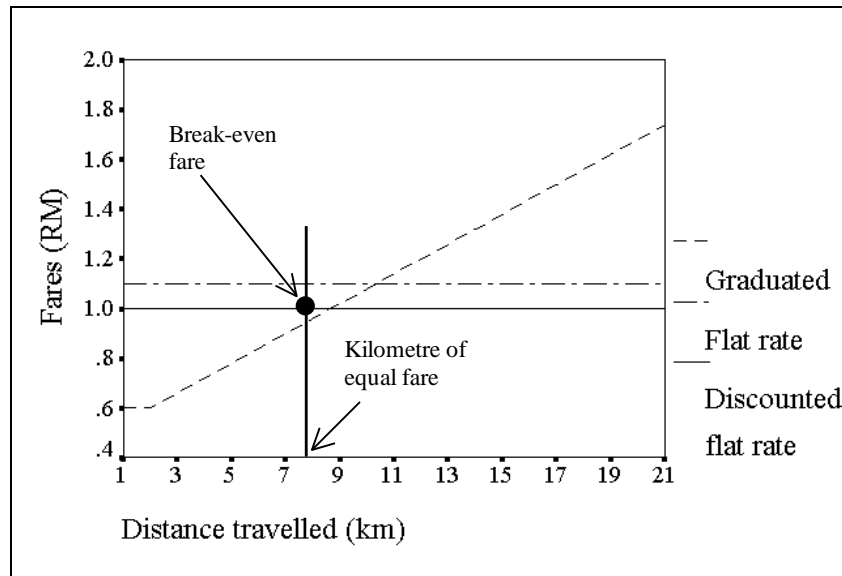


Figure 2 . Comparative bus fares proposed for Putrajaya

CONCLUSION

This article reports the status of public transport system in Putrajaya, Malaysia's new federal government administrative city, how it was planned and managed, and the public evaluation of its service quality. It was found that the city's bus system was operating without profit and heavily dependent on the city authority to survive financially. The quality of the bus services was not very much dissimilar to the situations in other cities in the country in terms of availability, punctuality and comfort. The use of private cars and motorcycles is increasing rapidly and it is a matter of time before it will cause adverse impacts on city's environment. Although currently the city's air quality is within the acceptable levels (Abd Rahim Md Nor & Kurnia Anggi, 2005), signs of future environmental degradation in terms of reduced air quality, traffic noise, road accident, congestion and traffic chaos are already emerging. If the city authority failed to reverse this trend, Putrajaya would become just another city in the country where roads and highways are being dominated by private vehicles. In such a situation the main trust of its urban planning of creating an environmentally friendly ambient and a model eco-city for the country would be shattered. Existing roads and

highways would be conquered by personal cars and motorcycles, and there will be no end to highway development in the future because any space created by additional investment in road infrastructure will be immediately swallowed by low-occupancy vehicles. Although bus is similarly dependent on fossil fuel and polluting, it has a much larger passenger capacity than personal car, thus relatively less polluting per road user. For a bus company to operate in Putrajaya, fare collection alone would be insufficient even to achieve break-even point. Conventional wisdom argues that running the buses by private company with direct financial helps from the government or city authorities is out of question in Putrajaya. The overall objective in the transport policy is for Putrajaya should be to become a 'public transport-dominant' and 'private car deprived' city in the near future, so that at least 70 % of person-trips in the core area during peak hours will be using public transport, in line with creating the concept of garden city with high-mobility circulation, economically vibrant activities and a pollution-free environment. To achieve this ambition, the city has to adopt new approaches in the management of its bus and in determining the fares as proposed in this paper.

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