# Evaluating the Sustainability of Traffic Growth in Malaysia

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***Abstract*—This paper evaluates the sustainability of traffic growth in Malaysia.The number of registered vehicles is used as an indication of traffic growth.Also, the number of registered buses is considered as an indication of public transportation usage. The results indicate that the traffic growth is mainly due to increases in the private cars motorcycles, while the rate of increase for buses is very small.The percentages for passenger cars and motorcycles are increasing while the percentage of buses is slightly dropping down, which is a negative indication regarding the traffic growth in Malaysia. The trends for the rate of vehicles per capita, unit GDP, and unit length of the road network have been discussed. Most of the trends indicate that the current growth trends of traffic in Malaysia are unsustainable. The paper also provides some recommendations for the Malaysian government to maintain a sustainable traffic growth in the country.**

***Index Terms*—traffic growth, sustainability, private car ownership, public transportation**

## I. Introduction

Most of the cities in Malaysia have witnessed significant population and economic growth over the past two decades. As a result of this growth, there was an increase in the number of registered vehicles.However, for this growth to be sustainable, it has to show a higher rate of growth for public transportation modes when compared to private transportation modes (mainly passenger cars and motorcycles).

In a country where almost every household owns at least one private vehicle, it is not surprising that public transportation in Malaysia is not a popular option as a mode of urban travel [1]. The public transportation mode share in Malaysia is almost 20%, which is an alarming sign that Malaysia needs to rethink its future direction in terms of urban transportation. Policies that favor private vehicles ownership, rather than promoting public transportation ridership, are at fault for this situation and have been followed, without further evaluation, since Malaysia obtained its independence in 1957.

Historically, Malaysia was an agriculture nation but was transformed into an industrialized nation by the ex-Prime Minister – Tun Mahathir Mohamad. With the transformation, the country gained wealth, which caused the Gross Domestic Product (GDP), at constant price, to grow from RM5.1 billion in 1957 to RM766 billion in 2010 [1]. As a result, in 2011, it is reported that Malaysians earned an average of RM5,000 a month [2]. The personal wealth is used most often to finance the purchase of private vehicles – cars and motorcycles – which are deemed as a necessity now, not so much for the status anymore.

The Malaysians' appetite for private vehicles are fed by three Malaysian car manufacturers – Proton, Perodua and Naza – a big number for a population of approximately only 30 million people. Coupled with low interest rate, relaxed loan approval process and highly subsidized petrol fuel, it is easier and cheaper than before to own a car or a motorcycle. Now, with only a diploma as a proof, a fresh graduate may own a car faster than they can land a job. And, the fact that Malaysian cities are highly sprawled doesn't help the case for using public transportation.

As a result, in 2012, there were more than 20 million registered vehicles in Malaysia [3]. This number presents significant challenges and issues to a country with just over 5 million households. Problems such as traffic congestion are the norm for urban areas. Fatal accidents are no longer news as they happen on daily basis. Road infrastructure construction and maintenance takes huge chunk of national budget.

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Only recently, the authorities realized that some actions must be taken to curb excessive dependence on private car usage. Among the first right actions taken by the government is to streamline government agencies that look after transportation agenda. With only a single entity – Suruhanjaya Pengangkutan Awam Darat (SPAD) or Land Public Transport Commission – as compared to three previously (i.e. Ministry of Transport, Road Transport Department, and Commercial Vehicle Licensing Board), decisions are now considering the national transportation objectives rather than the individual department's Key Performance Indicators (KPIs).

With SPAD, the focus now shifts to public transportation as the solution to transportation woes. Projects like Bus Rapid Transit (BRT) and Mass Rapid Transit (MRT) are new initiatives that take precedence in national agenda over road construction, except for rural area. Also, still in its infancy are initiatives that push for a more sustainable transportation like hybrid vehicles and biomass fuel. Undoubtedly, these are steps in the right direction, but, positive results are yet to be seen.

This paper presents an analysis of the vehicle registration record over a period of ten years.The results show an effort to quantify the problem in hand.

## II. Literature Review

The Malaysian government has recognized the importance of developing a sustainable transportation system in order to achieve the national goals and objectives.The 10th Malaysia Plan, for the period 2011 to 2015, considered the development of a comprehensive and efficient public transportation as an essential element to achieve a sustainable transportation system.Also, the livability of large and medium cities is strongly affected by the level of mobility provided through public transportation. The lack of an efficient public transportation system may result in more congestion levels, higher loss of productivity, lower quality of life, and less level of livability and competitiveness [4]. In the 9th Malaysia Plan, covering the period 2006 – 2010, it was indicated that there should be more focus on developing rail system within the country as the public transit mode share has dropped from about 35% in mid-1980's to be less than 20% in 2003.The plan suggested a 30% public transportation mode share as a target value [5].

One of the main side effects of road transportation is vehicles' emissions, which result in some negative impacts on air quality and global warming.It was estimated that the road transportation CO2 emissions, in Malaysia, were about 60,000 ktonnes in 2007.Based on a parametric study, the promotion of public transportation was proven to be an effective strategy as it showed a potential to reduce fuel consumption by about 1000 ktonnes and reduce CO2 emissions by about 7% [6]. The Vehicle Miles Travelled (VMT) is one of the main indicators of the level of CO2 emissions.A study evaluated the VMT for 22 residential developments, which were constructed between the pre-1980s and 2000s.The study concluded that the use of private transportation (private car or motorcycle) is the most common mode of transportation for the majority of the travel within Iskandar, Malaysia. It also indicated that the newer developments are producing much higher emission levels as the residents are travelling for much longer distance/household/day.The study suggested some solutions to reduce VMT and emissions, such as; developing the public transportation system, applying concepts of compact communities, and adopting a fuel and parking pricing strategies [7]. Some other studies considered the use of biofuels and natural gas as an alternative to reduce fuel consumption and CO2 emissions [8]-[10].

The development of transit oriented neighborhoods was suggested as a supporting concept to increase the use of public transportation, which reduces the use of private transportation. Such reduction in private transportation use has a direct effect on limiting traffic congestion and level of emission [11]. A related issue to transit oriented development is the park and ride facilities.Kadar Hamasa *et al*. [12] evaluated the parking occupancy, accumulation, turnover, and duration at one of the major park and ride facilities in Putrajaya, Malaysia.The results showed a very low occupancy rate for the multistory parking buildings (about 50%), which is an indication that the park and ride facilities are not fully utilized.In addition, it is also an indication of low mode share for public transportation.Likewise, a more detailed study [13] considered the park and ride facility in Putrajaya, Malaysia, where it was found out that the occupancy rate is as low as 2% in some of these facilities.The study was based on field observations and car owners' surveys. The study recommended a reduction of the waiting time at the Park and Ride facility through increasing the bus frequency.It also suggested adding more restrictions for the on-site parking, within cities, in order to make it less attractive for the car users.

Some other studies [14], [15] considered the demographic and travel characteristics of public transportation usersand their satisfaction level in an effort to understand the main reasons for the low public transportation mode share.It was indicated that the public transportation mode share in 2010 was between 10% and 20% in different cities.These percentages are very low when compared to the public transportation mode share in some neighboring countries where this percentage ranges from 60% to about 90%.Based on the conducted surveys, it was concluded that the two top reasons for the low public transportation mode share are the low frequency and lack of punctuality.Providing the public buses' locationsin real-time through a web application has been suggested as a solution to reduce the waiting time for bus users.

As it appears from the literature review, the public transportation in Malaysia is not capturing an acceptable percentage of the travel demand.Considering that most of the governmental plans and previous research have recommended the promotion of public transportation, the current public transportation mode share is very

low.Therefore, there is a need to quantify the problem and examine the suatainability of traffic growth in Malaysia.

## III. Methodology

The available data for this research includes the following:

- The population data, which is available for years 1980, 1991, 2000, and 2010 [16].
- GDP per capita, at constant price, for the period 2000 to 2011 [17].
- Total number of registered vehicles and their classification for the period from 2003 to 2012 [18].
- Total length of road network in Malaysia from 2003 to 2012 [18].
- The total length of railway tracks from 2006 to 2013 [19], [20] and the number of passenger journeys using rail system for the period from 2003 to 2011 [21].

Unfortunately, the data for the public transportation ridership was not available to the authors.

This paper considers mainly two types of transportation modes, public and private.The private transportation is represented by the number of private cars motorcycles.Since the available data on vehicle registration does not differentiate the public buses from the other buses (such as, company buses, school buses, tourist buses …etc.), the total number of registered buses is considered as an indication of the trend of increase in public transportation. In addition to that, the length of railway tracks is also considered as an indication of public transportation as well.

The methodology for this research includes examining the trends of:

- The growth in number of each type of vehicle and the length of railway tracks over time.
- The change in traffic composition (i.e. the percentage of each type of vehicle over time).
- The change in number of vehicles per capita
- The change in number of vehicles per unit GDP per capita.
- The change in the number of vehicles per unit of total road network length.

Based on these trends, the authors provide some discussion and recommendations regarding the sustainability of traffic growth in Malaysia.

## IV. Analysis and Results

It should be noted that the total length of railway tracks was 1,949 km in 2006 and then dropped down to 1,792 from 2007.This fact contradicts the objectives that were set in the 9th Malaysian Plan [5]. Therefore, it is not included in the analysis as there is no change in this parameter.Also, the number of passenger journeys using the rail system, shown in Figure 1, does not show a clear trend and there is a weak correlation.Based on that there will be no consideration of rail system in the analysis.

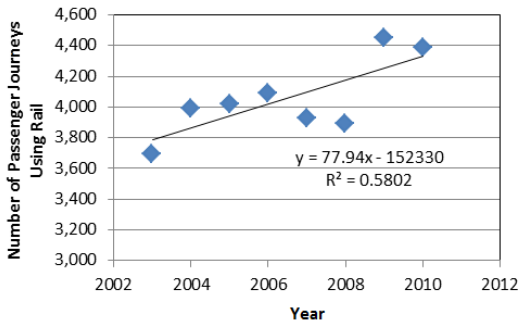


Figure 1. Passenger journeys using rail

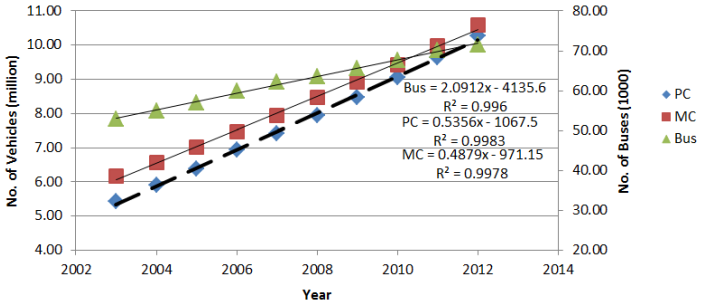


Figure 2. Passenger car, motorcycle and bus registration

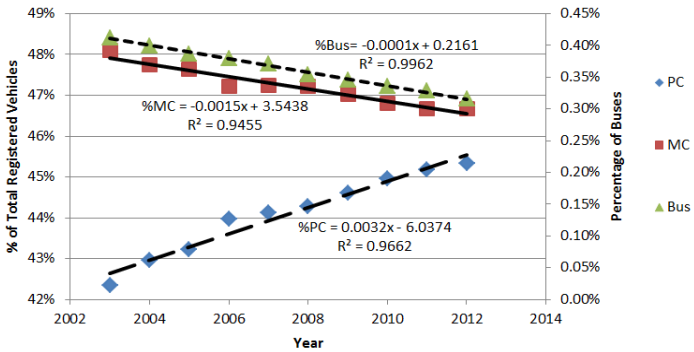


Figure 3. Percentages of PC, MC, and Buses

The number of registered passenger cars (PC), motorcycles (MC), and buses from 2003 to 2012 can be summarized as shown in Fig. 2. It is clear that the three types of vehicles have an increasing trend over the study period.In addition, the passenger cars show a rate of increase that is higher than that of the motorcycles. Based on the regression analyses equations, depicted in Fig. 2, it is expected that the number of private cars will be higher than the number of motorcycles in Malaysia by year 2020.In addition to that, the rate of increase of PC and MC is around half a million per year for each of them.On the other hand, the rate of increase for buses is only about 2000 buses per year.Keeping in mind that there is no increase in railway track length and usage and the mentioned increase is the total increase in number of buses, not only for public buses, then the rate of increase in public transportation is much less than the increase in private transportation.

Another way of considering the traffic composition is to consider the percentage of each mode out of the total number of registered vehicles.These percentages are illustrated in Fig. 3, which shows that the percentage of buses out of the total registered vehicles is generally less than 1%, while the PC and MC represent about 90% of the total vehicles registered in Malaysia.Also, the trends shown in Fig. 3 indicate that the percentage of PC is increasing over the study period, while the percentages of MC and buses are reducing.The reduction in percentage of MC is a good indication, as the MCs have been considered the major contributor to traffic fatalities in Malaysia [22], [23]. On the contrary, the reduction in the percentage of buses is a negative indication of unsustainable growth.

The population data is reported every 10 years and the available data shows the population for years 1980, 1991, 2000, and 2010, as shown in Fig. 4. The data can be very well represented by a straight line, as illustrated in Fig. 4, as the coefficient of determination is almost 1.0.The equation shown in Fig. 4 is applied to estimate the population for years 2003 – 2012.

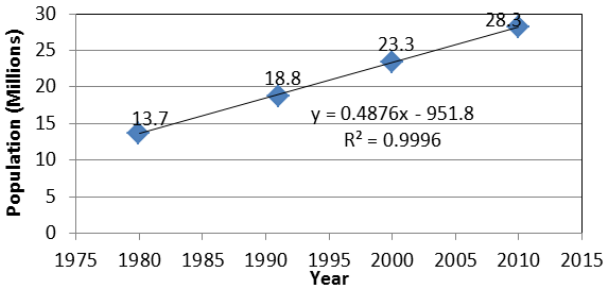


Figure 4. Population Data for Malaysia

In order to consider the population growth and the traffic growth combined, the number of vehicles per 1,000 capita is calculated and presented in Fig. 5.It should be noted that the population for the study period years has been estimated based on the regression line equation shown in Fig. 4.The data in Fig. 5 illustrates an increasing trend for the three types of vehicles considered.

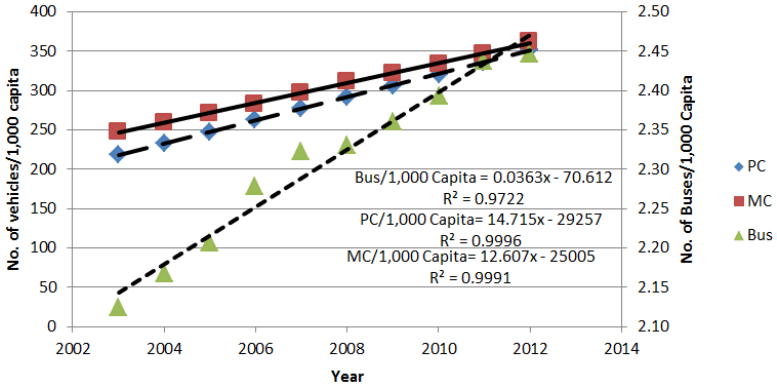


Figure 5. Passenger car and motorcycle registration per capita

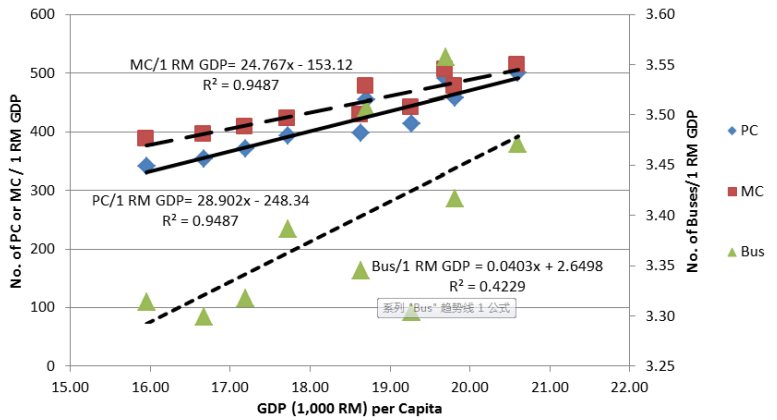


Figure 6. Passenger car and motorcycle registration per unit GDP

This can be attributed to the major economic growth that Malaysia has witnessed over the considered years and the perception of Malaysians to car ownership.The results of a study by Abdalla Nurdeen Kamba *et al*. [24] suggested that the main reasons for Malaysian travelers to choose private cars as a mode of transportation are better travel time and travel costs offered by the private cars when compared with transit systems.

The second factor that has an effect on vehicle registration is the GDP. Fig. 6 illustrates the trends of PC, MC, and buses per unit of the GDP.From the shown trends, it is easily recognizable that the number of buses per unit GDP does not show strong correlation with the GDP per capita, while the MC and PC are showing very strong correlation. This is another negative indication regarding the allocation of funds to public transportation.

The last factor considered is the total length of the road network, which is presented in Fig. 7.The road network length shows a high increase starting from 2009 (year 7 in the figure).Starting from that year (2009), there has been a significant increase in the total road network, which is definitely due to high budget allocation to road construction. This can be attributed to the government's policy to increase the accessibility through road transportation and the construction of new highways and bypasses in an attempt to reduce traffic congestions, which is one of the negative indications as it shows large budget allocations to road construction without comparable allocation to the development of the public transportation system.

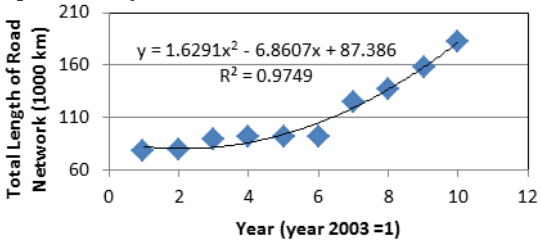


Figure 7. Total road network length

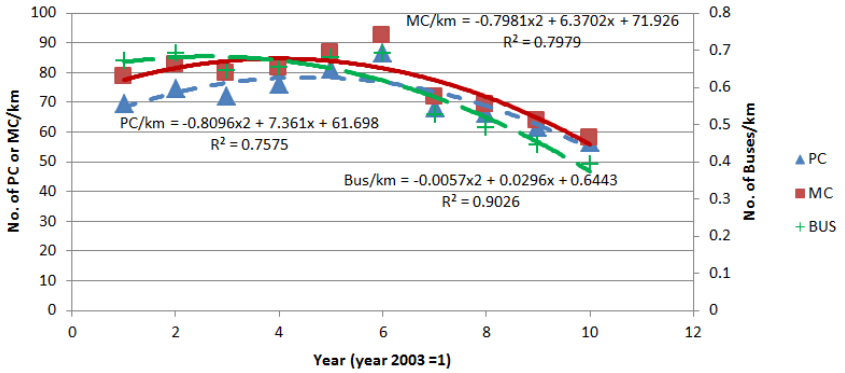


Figure 8. Number of vehicles per unit length of the road network

As a result of this policy, several major projects were opened to traffic during that year (e.g. the road network in Iskandar Malaysia, opening of new highways in the Klang Valley, opening of rural roads in Sabah and Sarawak, roadways within new residential development projects …etc.).

The trends for the number of vehicles per unit length of the road network, for the three types of vehicles considered, are shown in Fig. 8. It is noticed that the number of vehicles per unit length of the road network was increasing from year 2003 to year 2008 (years 1 to 6 in the figure).Starting from year 2009 (year 7 in Fig. 8), the rate started to decrease due to the significant increase in the road network length.It is also recognizable that the buses are following the same trend as that of the PC and MC, which is a negative indication of low investment in public transport. The level of investment allocated to road construction with limited allocation to public transportation is another indication of the lack of consideration for the sustainability of the transportation system in Malaysia.

## V. Conclusions and Recommendations

The paper presented an evaluation of the traffic growth in Malaysia relative to time, population, GDP and road network length.The analyses showed that the current trend of traffic growth in Malaysia is unsustainable as it is directed more towards an increase in the use of private transportation (PC and MC).Also, the level of investment in road construction is very good and there has been a significant increase in the total road network length over the past few years.However, the level of investment in public transportation does not match with that level for road construction.

Based on the analyses conducted in this research and the available literature review, it is recommended to the Malaysian government to consider the following:

- Allocate more funding for the development of public transportion systems (both buses and rail).The allocated funds should consider the level of population and economic growth in the country.
- Apply more strict requirements for registering private transportation vehicles, especially motorcycles as the motorcyclists are more likely to use the public transportation as an alternative to motorcycles.
- Strategies adopted for transportation systems management, especially for the road transportation system, must focus more on the provision of transit systems that are better than the private cars in terms of travel time and travel costs.

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