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The Use of Non-Motorized For Sustainable Transportation in Malaysia

M. R. Mat Yazid^{a*}, R. Ismail^b, R. Atiq^a^a*Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia*^b*School of Psychology and Human Development, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia*

Abstract

Non-motorized is vital for sustainable living. The characteristics of sustainable transport are safe, comfortable and efficient in terms of economic and energy consumption and minimize environmental pollution. Today, transportation systems in most cities are no longer sustainable due to lack of natural materials such as oil reserves, increasing the number of deaths and injuries by motor vehicle accidents and traffic congestion. The carbon emissions into the atmosphere contribute to environmental pollution in terms of quality deficiencies that affects mobility of life in general. This study aimed is to design sustainable transport in terms of non-motor vehicle for a city that promises a better world for future generations. It provides strategies to change the choice of transport modes to road users of motor vehicles to non-motor vehicles through integration of land use and transportation planning. By improving pedestrian path and cycling zone to increase non-motorized travel and reduce motor vehicles travel. The use of non-motorized transportation such as cycling and walking is not only to reduce carbon but also healthy lifestyle and a physical activity.

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Keywords: Bicycle; Non-motorised transportation; Motor vehicles; Pedestrian; Sustainable transportation; Walking

* Corresponding author. Tel.: +6-019-959-5319; fax: +6-038-921-4429.

E-mail address: razulfi@yahoo.com.

1. Introduction

Non-Motorized Transportation (NMT) includes all forms of travel that do not rely on an engine or motor for movement. This include walking and bicycle, and using small-wheeled transport (skates, skateboards, push scooters and hand carts) and wheelchair . These modes of transport can provide both recreation and transportation. For example, some people will choose to walk or bicycle rather than drive because they enjoy the activity. The importance of non-motorized transport can be summarized as follows: they provide door-to-door transport; Non-motorized infrastructure usually has a very high spatial penetration; Non-motorized do not lead to waiting, times compared with waiting at public transport stops; Non-motorized have a favorable environmental performance; they are cheap transport modes; Non-motorized are essential elements in multimodal transport chains; Non-motorized are healthy activities [1].

The concept of sustainable transportation is vital to ensure environment clean, healthy and high quality. The concept also emphasis on the human life and the environment, to meet current and future needs. Today, the transportation systems in major cities have shown a bad image because of have traffic congestion, accidents, lack of access to public transport and carbon emissions to the atmosphere of space contributes to environmental pollution and imbalance in terms of quality of life in general mobility. Along with the promising concept of sustainable transport services to consumers and at the same time ensure the safety of road users and also help towards the welfare and the environment. Transportation facilities and activities have significant sustainability impacts, including those listed in fig.1.

Economic	Social	Environmental
Traffic congestion	Inequity of impacts	Air and water pollution
Mobility barriers	Mobility disadvantaged	Habitat loss
Accident damages	Human health impacts	Hydrologic impacts
Facility costs	Community interaction	Depletion of non-renewable resources
Consumer costs	Community livability	
Depletion of non-renewable resources	Aesthetics	

Figure.1. Transportation impacts on sustainability. *Source:*Litman and Burwell, [2].

The concept of sustainable development emerged from the Earth Summit in Rio de Janeiro in 1992, and concerns Brundtland Commission Report 1987 : Sustainable development “meets the needs of the present without compromising the ability of future generations to meet own needs.”[3]. Sustainable transport system can be defined also as a transportation demand but does not affect future transport demand [4]. and Sustainability is “..sustainability is not about threat analysis; sustainability is about systems analysis. Specifically, it is about how environmental, economic and social systems interact to their mutual advantage at various space-based scales of operation.” [3]

Malaysia to build guided by the national agenda and Vision 2020 for Malaysia realizing a fully developed nation in terms of economic, social and environment in 2020. The government has taken several initiatives to create sustainable transport for a long time. Among them is a systematic approach includes research in the social category aspiration understanding of the features and aspects of transportation demand to improve the provision of transportation by offering study support the traffic and transportation engineering and road safety research to help the welfare of consumers and research in intelligent transportation systems through the use of technology to help countries achieve the aspirations of sustainable transport systems. Greenhouse effect has become the most hotly discussed issues now where the production of transport accounts for 26 % of global CO₂ emissions and is one of the few industrial sectors where emissions are still growing [5]. With fuel consumption is increasing in this world,

people are looking for a replacement and fuel alternatives such as bio-fuel, hydrogen, natural gas, hydrogen and electric vehicles [6]. To ensure efficient use of energy by both environmental and human health, United Nations Department of Economic and Social Affairs has launched the Agenda 21 as a guideline for all countries and Malaysia have signed an agreement during the introduction of Agenda 21 Earth Summit, Rio de Janeiro in 1992. Two important aspect of the agenda is the Local Agenda 21 and Sustainable Development.

Each individual can also play a role in supporting sustainable transport system, the easiest way is to use bicycles or walk to work. Walking and cycling is the ultimate 'zero carbon' and environmentally friendly solution to pollution by motor vehicles that have been used continuously for more than 20 years ago [5]. Fig.2 shows factors having an impact on the use of non motorized vehicles [7]. As suggested by [7], ten population segments have been placed on a spectrum of high, medium and low propensity to use non – motorized modes. This is shown in Fig.3

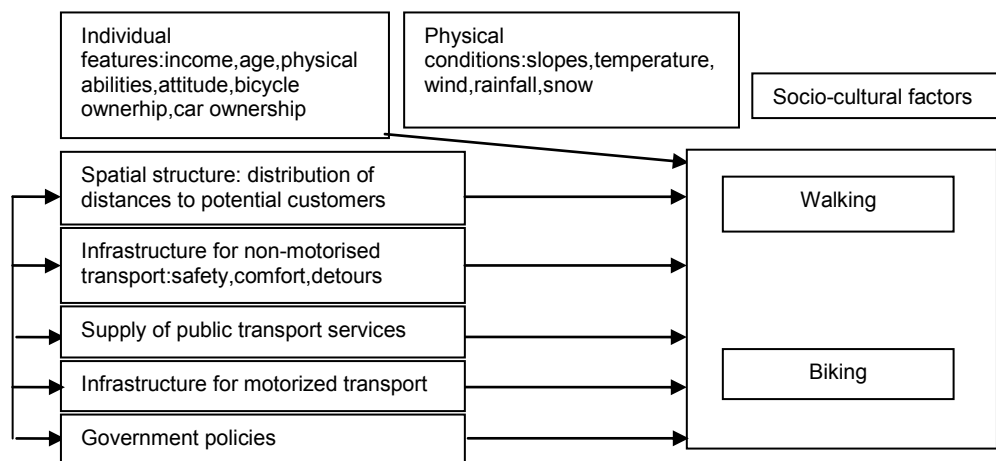


Figure. 2. Factors having an impact on the use of non-motorised transport modes. *Source:* Ryley, [7].

Low Propensity	Medium Propensity	High Propensity
High earner without children (most car dependent)	Mid earner (live in flats, but many do not have bicycle available)	Student (high non- motorized mode usage)
Retired in a couple (low non-motorized mode usage)	Child minder (low cycling usage, high utility walking usage)	In – between jobs (high non – motorized mode usage)
Retired living on own (low non motorized mode usage)	High earner with children (many have bicycles available, high car dependency) Part timer with children (many have bicycle available, moderate non-motorized mode trips)	Part – time without children (high bicycle availability, most utility walking trips)

Figure. 3. The ten population segments on a spectrum of propensity to use non-motorized modes. Source: Ryley, [7].

2. Case Study

In this study Kota Bharu was selected for the analysis. Kota Bharu is the state capital of Kelantan. Kota Bharu were chosen as study area because it is one of the city with the existing facilities are lacking, unlike in most other states. In Malaysia, the concept of sustainable city has used its official start of the Third Malaysia Plan (1976 - 1980) up to the Eighth Malaysia Plan (2001 - 2005) . MURNInet (Malaysian Urban Indicators Network) is an existence of a database application that can measure and assess the sustainability of cities in Malaysia based on 56 indicators of a sustainable city. The status of sustainable against it of major cities in Malaysia for 2009 are shown in Table 4. Kota Bharu from 42 cities measured, that 69.84 percent reported moderate sustained based on 56 indicators in 11 sectors of the demographic, housing, economic, utilities and infrastructure, community facilities and recreation, environment, sociology and social impact, land use, tourism and heritage , transport and aksesibiliti and management and finance [8]

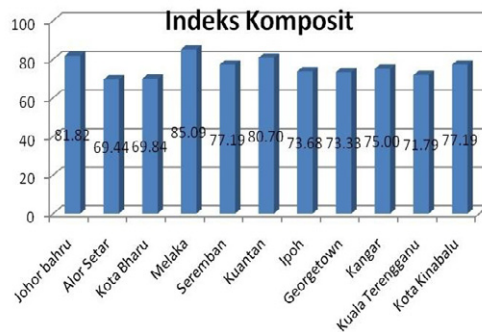


Figure. 4. Status of sustainability performance by the major cities in Malaysia. Source: [8]

Urban Sprawl is low density, automobile dependent development beyond the edge of service and employment areas. It is ubiquitous and its effects are impacting the quality of life in Kota Bharu, in our large cities and small towns. Prices of residential units is lower and environmental comfort in the established suburbs are among the factors driving the phenomenon of downstream the population in urban centers. If this trend continues the population will create a distribution shaped ‘donut cake’. Economic and social activities in the city of Kota Bharu will be more limited at night due to reduction in the size of the population to support it. Fig. 5 shows the emigration rate of population by region in 2000-2007.



Figure 5. The emigration rate of population by Region 2000-2007

Society today is very dependent on transport vehicles such as cars, motorcycles, trucks and trains are shown in Fig.6. Every movement of motor vehicles using a lot of energy and almost all of produced by burning fossil fuels, which produce smoke and noise of an adverse effect on local conditions [2]. In the transportation sector, motor vehicles are major contributors to air pollution [9]. The use of motor vehicles will not reduce the impact of pollution on the environment [10].



Figure 6. Chart Emission of pollutants by source, Malaysia, 2008. Source: DOE [11]

In Malaysia the number of registered vehicles in 2009 is 18,528,262 as shown in fig. 7 while the index of deaths by road accident 10,000 registered vehicles in Malaysia is 3:55 in 2009 [12]. These numbers will continue to increase every year.

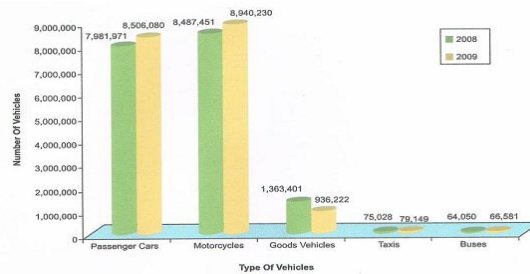


Figure 7. Number of Registered Vehicles in 2008 and 2009. Source: JPJ [12]

Ambient air quality depends on type of transport used, type of energy source, the engine technology and the amount of energy required [7]. Figure 8, shows the air pollutant index (API), which was recorded at the selected stations is calculated based on average concentrations of each air pollutant Sulfur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Ozone (O_3) and Fine Particulate (PM10). Results showed that in the early stages of API is at a moderate 51 -100.

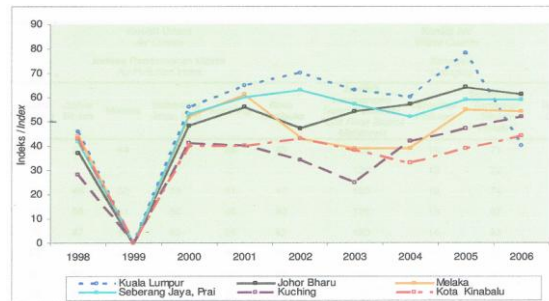


Figure. 8. Annual Average Air Pollutant Index for Selected Stations,1998 – 2006 in Malaysia. Source:DOE [11]

To overcome this problem the concept of sustainable cities should be implemented to achieve the aspirations of sustainable transport systems. Method of cycling and walking seems to have been successfully practiced in the developed countries like the Netherlands, Germany and Japan. Given the problems mentioned above, this review covers the following areas:

- a. Understanding requirements and constraints by user group.
- b. Understand Local physical environment – Areas in terms of demographic,spatial and geographical layout, distance, weather conditions,etc.

3. Factors toward sustainable non-motorized transport in Malaysia

The application of non-motorized maintain such be maximize. In this one of the crucial question arise is that why the use non-motorized at low level. Some of the key factors have discussion below.

3.1. Understanding requirements and constraints by user group.









Non-motorized Transportation (NMT) includes all forms of travel that do not rely on an engine or motor for movement. This includes walking and bicycling, and variants such as small-wheeled transport (skates, skateboards, push scooters and hand carts) and wheelchair travel. These modes provide both recreation (they are an end in themselves) and commuting (they provide access to goods and activities), although users may consider a particular trip to serve both objectives.

Table 1 provides a breakdown of the user groups, their purpose and their requirements and constraints. Every non-motorized transport pelan requires a careful consideration of the groups important to the area. Travelers can be classified into two groups: choice riders and captive riders. Choice riders have two travel modes to select : NMT or motorized service (bicycle and motorcycle) whereas captive riders have only one travel mode option to select i.e. the non-motorized transport. The requirements and constraints vary in each situation.

Malaysia is currently a town dominated by motorized vehicles, particularly private cars, with priority afforded to vehicles, often at the expense of other road users. Even within the CBD area, where pedestrian levels are high, the attempts to redress the balance through the inclusion of pedestrian facilities have only group in most areas. The main means of transport in this area is cars followed by motorcycles.

The biggest differences, over the past two decades, cycling has increased significantly in The Netherlands. The number of bicycle trips has grown substantially. The bicycle's share of local trips is 30% in The Netherlands [13].

Table 1 : Non - Motorized Transport User Groups in Malaysia

Type	Recreation / commuting	Sub types		Objective	Requirement / constraints
Pedestrians	Commuting	Children Adolescents Adults Disabled		School University/College Work / Shop/ Enjoy	No awareness of danger, Distances get bigger, need safe environment
	Recreation	Children Disabled Elderly Adults		Play Enjoy Enjoy Enjoy	Short distance, no awareness of danger, need safe environment, Steep hills, natural guiding
Cyclist	Commuting	Children Adolescents Adults		School University/College Shop / work	No awareness of danger, Distances get bigger
	Recreation	Children Elderly Adults		Play Enjoy Enjoy / Sosial	no awareness of danger, need safe environment
Animal moved vehicles	Commuting	Horse - box		Tourism	Limited space
Man moved vehicles	Commuting	Cycle-rickshaws 'Beca'		Work, Shop, Enjoy	Flat surface, limited space
	Recreation	Cycle-rickshaws 'Beca'		Tourism	Go to hotel, interest places
Skaters/ Rollerblading	Recreation			Enjoy	Flat surface, high speed by user compared to pedestrian.

3.2. Understand Local physical environment

Understanding the relationship between travel mode choice and attributes of the local environment such as topography, spatial, residential density, weather condition, distance, origins and destinations and the presence of non motorised paths, is of paramount importance.

The study area distinguishes the challenges and obstacles while developing a NMT network. By identifying these characteristics, optimizing the area for NMT purposes will be easier. Based on the users group and maps of the area the following characteristics can be identified: Topography layout – hills, flats, river, ocean, etc; Demographics – age groups, residential density, etc; Spatial layout – origin and

destinations, residential areas, schools, hospital, industrial areas, etc; Weather condition – temperature, humidity, rain, etc

To the extent that the results of this study hold more generally, this research will suggest that inclusion of the most likely areas and links for NMT use and also obstacles in the study area limiting NMT use. The presence of sloping terrain decreases the attractiveness of NMT.

The Population density (people per sq. km) in Malaysia was reported at 82.22 in 2008. Small, compact cities are more amenable to non-motorized since more destinations are accessible within a short trip distance. The relatively short distances between residential and business areas, the opportunities for non-motorised transport modes are most favourable for short distance trips. The Netherlands results in about 50% of all trips are shorter than 3.5 km. The number of bicycles in The Netherlands is higher than the number of inhabitants. About 85 % of the total population own a bicycle (13 million out of 15.5 million). A major feature of NMT use in The Netherlands is that used for education has a high share with 74% [18]. Figure 9 were travel mode split in 2002 in Germany. The data show that NMT is prevalent in short trip distance less than 2 kilometer.

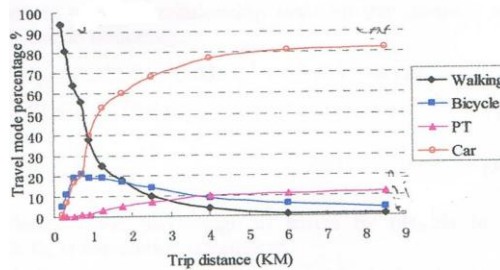


Figure. 9. Model split by trip distance . Source: Scheiner, (2009).

The security aspects of NMT in The Netherlands is increased by people being able to see the street from their window, the layout of the houses and offices next to a major bike lane support that purpose. Figure 11. The

picture shows a riding a bicycle in Amsterdam. Kota Bharu is currently a town dominated by motorised. Even within the CBD area, where NMT levels are high, the attempts to redress the balance through the inclusion of NMT facilities have only been partially successful and vehicle remain the priority user group in most areas. Figure 12. The picture shows usage is NMT in the Kota Bharu

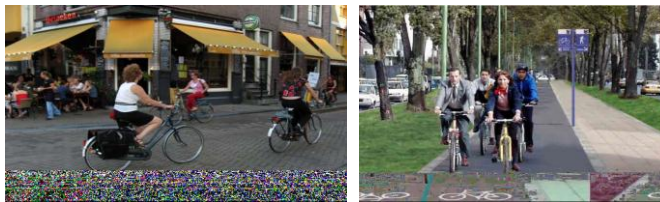


Figure. 11. The picture below shows a lady riding a bicycle in Amsterdam



Figure. 12. The picture shows the usage is non motorised in the Kota Bharu

Non-motorized levels are obviously affected by climate. Malaysia features a tropical rainforest climate. Malaysia does not have a true dry season as all 12 months sees on average more than 60 mm of precipitation. However, Malaysia experiences noticeably heavier rainfall from August through January. Also, in comparison to the rest of the year, Malaysia experiences slightly cooler temperatures between December and February, than it does during the rest of the year. The city sees on average about 2700 mm of precipitation annually. Average high and low temperature for yearly is 30.6 °C and minimum temperature 23.3 °C. Yet the effect of climate on NMT may be exaggerated.

4. Conclusion

The use of sustainable non - motorized transport in Malaysia may elevate the environmental awareness in the country. However is not easy to implement due to the clogging up of central business districts with cars, and the recent economic crises. Sustainable transportation seems to mean that it is the right time now to implement non-motorized transportation as an integral part of the transportation system. The decision will also be an opportunity for the design and development of as well as motorized non-motorized facilities including the layout of buildings and infrastructure.

Most European cities give priority on non-motorized vehicles on certain streets and intersections when designing green phases at traffic lights. Some one-way streets have been transferred into two-way streets for non-motorized moreover non-motorized vehicles are exempted from many turn restrictions for cars. Some European cities have dedicated car parking space to non-motorized lanes or non-motorized parking. In case of Malaysia the same move can be done by upgrading the non-motorized facilities. Malaysia needs to focus on designing networks in neighborhood areas and focuses on linking with existing road infrastructure to improve non-motorized quality. These can be achieved by implementing European model the of non-motorized transportation.

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