Towards greener environment: Energy efficient pathways for the transportation sector in Malaysia

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Abstract. Transportation sector is the second most energy consuming sector after industrial sector, accounting for 40% of total energy consumption in Malaysia. The transportation sector is one of the most energy intensive sectors in the country and relies primarily on petroleum products, which in total account for nearly 98% of the total consumption in the sector. Since it is heavily reliant on petroleum based fuels, the sector contributes significantly to the greenhouse gas (GHG) emissions. The need to reduce the greenhouse gas emission is paramount as Malaysia at Conference of the Parties (COP15) pledged to reduce its carbon intensity by 40% by 2020 from 2005 level subject to availability of technology and finance. Transport sector will be among the first sectors that need to be addressed to achieve this goal, as two-thirds of the emissions come from fuel combustion in transport sector. This paper will analyse the factors influencing the transport sector’s growth and energy consumption trends and discuss the key issues and challenges for greener environment and sustainable transportation in Malaysia. The paper will also discuss the policy and strategic options aimed towards energy efficient pathways in Malaysia.

1. Introduction
Malaysia has experienced tremendous economic success in the last three decades, which has triggered massive urbanization and led to a rise in the per capita income of its population. Transportation sector one of the most energy intensive sectors in the country and relies primarily on petroleum products, which in total account for nearly 98% of the total energy consumption in the sector. As this sector is heavily reliant on petroleum, it contributes significantly to the greenhouse gas emissions. The need to reduce the greenhouse gas emissions is paramount as Malaysia has set a voluntary target to reduce its carbon intensity by 40% by 2020 from 2005 level. To achieve these levels of CO2 emission reductions, transport sector will have to be among the priority sectors that need to be addressed, as two-thirds of the greenhouse gas emissions come from fuel combustion in the sector. This paper will analyse the past trends of transport sectors’ growth and the key issues and challenges faced for sustainable transportation in Malaysia. The paper will also discuss the policy and strategic options aimed towards energy efficient pathways for transport sector in Malaysia.

2. Energy Consumption and GDP Trends in Transportation Sector
Transport sector in Malaysia relies heavily on petroleum products for meeting its energy needs. Among all the fuels, motor petrol dominates the energy consumption in the sector. Motor petrol accounted for the largest share in fuel consumption (53.60%) in 2008, followed by diesel (32.22%) and aviation fuels (ATF) with a share of 12.88%. Usage of natural gas (1.18%) and electricity (0.09%) in the transport sector was minimal. The heavy reliance of transport sector on petroleum products (98%) is a worrying trend for the future. The lack of diversification of the fuel basket in the sector has triggered some policy action; the country is currently pursuing a five-fuel diversification policy, however its impact on the transport sector has been insignificant.
Within transport sector, road transport is the main consumer of energy. The share of road transport in the total energy consumption of the transport sector in 2008 was the highest at 78.6%, followed by air transport (12.9%), maritime transport (8.1%) and railways (0.4%).

Rapid population growth coupled with economic growth has increased the demand for transport services in Malaysia. Consequently, transport sector’s Growth Domestic Product (GDP) has grown rapidly from RM 5,910 million in 1987 to RM 46,185 million in 2009, an increase of about eight times. However, the share of transport sector in the country’s GDP has remained almost constant at about 7% during this period. The cumulative annual growth rate (CAGR) of transport sector’s GDP was 12.1% from 1987 to 2000. From 2000 onwards, the CAGR of the sector’s GDP has declined to 7.1%.

3. Motorization and growth in Vehicle Ownership

The total number of vehicles in Malaysia has increased from about 5 million in 1991 to 19 million in 2009, an average annual growth rate of about 8%. The growth in the number of vehicles in the country has been much faster than the growth in population; while the total population has increased by one and a half times from 1991 to 2009, the total number of vehicles in the country has increased by about four times figure 1.

Vehicle ownership is defined as the number of vehicles per thousand people. The vehicle ownership levels in Malaysia have increased from about 266 to 672 vehicles per thousand population from 1991 to 2009, an increase of about 2.5 times. Car ownership has shown the highest increase of about three times from 98 to 300 cars per thousand population during this period, followed by two-wheelers which showed an increase of about 2.3 times (140 to 316 two-wheelers per 1000 population). Ownership of public transport modes in Malaysia is very small as compared to personal modes; it had only 6 public transport vehicles per 1000 persons in 2009 figure 2.

4. Higher Growth Rate of Private Vehicles

Cars have shown the highest growth rate in Malaysia during the period 1991 to 2009 with an average annual growth rate of about 9%, followed by two-wheelers (7%), whereas public transport modes (buses, taxis and hire and drive cars) have registered a much slower growth rate of about 5% during this period Cars and two-wheelers have had the highest share in the total vehicles registered in Malaysia in the last two decades.

5. Key Findings

5.1 Fast pace of motorization in Malaysia
The key drivers of rapid motorization in Malaysia, among others, include, i) increasing per capita GDP, ii) growing population and urbanization, iii) increasing subsidies on transport fuels, and iv) promotion of domestic automobile industry by the government.

5.2 Increasing share of private modes and declining share of public modes
Motorization in Malaysia is characterised by higher growth of private vehicles i.e. motor cars and motor cycles, which have the highest share in transport vehicles registered in the country; together the two modes had a high share of about 92% of the total vehicles in the country in 2009. While private vehicles have a high share and fast growth rate, public transport modes in Malaysia (buses, taxis and hire and drive cars) have a very small share in the total registered vehicles (about 1% only in 2009). The share of public transport in cities has continuously declined from 34% in 1985 to 20% in 1997 and is now closer to 10–12%.

5.3 Inter-modal shares skewed towards road sector
There has been an increase of about four times in on-road passenger transport activities in Malaysia between 1991 and 2009. In comparison to road traffic, rail traffic in Malaysia has not increased significantly. The railways witnessed an average annual decline of about 4% in the number of passengers from 7,614 thousand in 1992 to 4,267 thousand in 2009. The rail passenger traffic (passenger kilometres) has also shown a declining trend till 2003, after which there has been an upward trend, mainly due to efforts of the government to promote rail movement in urban areas.

5.4 Faster growth of road infrastructure as compared to rail infrastructure
In terms of transport infrastructure, there has been an increase of about eight times in road length in Malaysia from 14,446 km in 1980 to 117,604 km in 2007. However, the growth in railway track length in Malaysia has been quite slow as compared to the growth of road network. The track length increased at an average annual growth rate of about 1% from 1989 to 2009. However, there has been an increase of about 1200 km in the rail track length in the last year (2009 to 2010), which shows the increasing recognition given by government to the rail transportation.

5.5 Lack of adequate policies focusing on fuel diversification, promoting energy efficient and clean use of energy in the transport sector
The consumption of both petrol and diesel has been increasing rapidly with growing motorization and increasing dependence on private modes. There is lack of diversification of fuel basket for the transport sector. One of the ways to diversify fuel mix is by promoting biofuels. Moreover, the energy intensity of Malaysia is high as compared to most of the net energy exporter countries. One of the reasons for the inefficient use of energy has been the subsidised price of energy in the country, especially those of petrol and diesel. There are no major government policies focusing on promoting efficient and clean transportation within the country, especially for road transport sector as it accounts for the bulk of energy consumption in the sector.

6. Policy and Strategic Options aimed towards Energy Efficient Pathways

6.1 Arresting the fast pace of motorization (ownership and utilization of vehicles).
Government can consider adopting policies like vehicle quota system and can adopt fiscal measures like charging of fee for using congested parts of the cities, levy higher parking fees, increase vehicle registration charges, and increase fuel prices to arrest current trends of rapid growth in vehicle ownership and utilization.

6.2 Increasing share of public and non-motorised modes in urban areas.
Intra-urban public transport projects need to be undertaken in order to encourage a shift from personal to mass modes of transport. This can be done by improving public transport systems in terms of their capacity, coverage and quality. In addition to improve public transport and discourage the use of personal motor vehicles, government should target encouraging use of non motorized modes in cities, as they are ‘greener’ modes of travel.

6.3 Diversifying the fuel basket of transport sector by encouraging use of fuels other than petrol and diesel. The government needs to adopt a comprehensive strategy to diversify the fuel basket for the transport sector and adopt fuels like natural gas, electricity and biodiesel on a large scale.

6.4 Encouraging energy efficient road-based movement. The government can target developing mandatory fuel efficiency norms, stringent emission standards and strict inspection and maintenance regime that will encourage energy efficient and less polluting movement of road based modes.

7. Concluding Remark
Adopting energy efficient pathways for the transportation sector in Malaysia will have a critical role in achieving a greener environment. The paper has highlighted various issues from the analysis of past trends of population and economic growth, energy supply and consumption patterns and transport sector growth. A shift to public and rail-based transportation is one of the ultimate options towards energy efficient pathways. But, it is dependant on a number of factors such as the provision of infrastructure, introduction of mass transportation systems, incentives for shifting to mass transport modes, etc. The road towards energy efficient and sustainable pathways for transportation sector demands new interventions from the policy makers, political leadership, support from individuals, advancement in technology and major transformation of the energy market towards promoting efficient and sustainable transportation in Malaysia.

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