

Global Warming Mitigation Effort in Malaysian Transportation Sector

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Abstract: Climate change issue has received global attention for several decades. In the pledge to reduce 40% of Carbon dioxide (CO₂) emission by Gross Domestic Product (GDP) intensity, Malaysia exhibits active participation in the global effort to reduce CO₂ emission. Among various economic activities, transportation sector appears to be the largest emitter that requires particular attention, especially, due to its increasing rate under population growth scenario. Therefore, this study analyzed the CO₂ emission data in the transportation sector and discussed energy policy and project specifically designed for transportation sector to achieve the goal. Projects such as use of B5 biofuel, Putrajaya Green city and enhanced rail transportation were planned and implemented in order to achieve the required transportation sector CO₂ emission reduction from 77.61 to 69.33 Mtonnes annually. Comparison with other countries in term of energy policy in transportation sector was conducted. Several recommendations on how the nation can further improve her reduction strategies were also discussed.

Key words: Climate change, greenhouse gas, CO₂, Malaysia, energy policy, transportation

INTRODUCTION

The warming of the climate system is undeniable because of the presence of abundant scientific evidences. If global warming crosses safety threshold of 2°C, then the consequences could be between bad and catastrophic (Pachauri and Meyer, 2014). There is some evidence showing that safety threshold may actually be 1.5°C instead (Schleussner *et al.*, 2016). Therefore, it is crucial for human being to act now to mitigate the negative effects from climate change. The utmost challenge for this effort is to stabilize the increasing of atmospheric concentration of CO₂. Hence, stopping a net zero annual increase in CO₂ emission can suppress the global warming.

During COP15 in Copenhagen, Malaysia pledged to reduce 40% CO₂ emission by Gross Domestic Product (GDP) intensity in 2020 compare to 2005 level (Razak, 2009). Furthermore, Malaysia pledged in Paris Agreement to further reduce her CO₂ emissions intensity per GDP by 45% by 2030 (UNFCCC., 2015).

Many human activities produce CO₂ but approximately two-third of total anthropogenic emission comes from fossil fuel combustion in transportation, building and industry (Ghadimzadeh *et al.*, 2015).

Malaysian transportation sector is accounted for about 35% of total energy consumption, second only to electricity power generation and produced about 50 million tonnes of CO₂ in 2015 (UNFCCC., 2015). Due to heavy dependency on fossil fuels, this sector was identified as the main focus in lowering of the nation's carbon dioxide emissions.

Thus, this study reviews carbon emission of Malaysia in transportation sector and highlights the national policies towards global warming mitigation effort. In addition, a comparison with other countries is made along with recommendations to assist Malaysia in global warming mitigation.

MALAYSIAN CO₂ EMISSION

Figure 1 shows that Malaysian CO₂ emission has gradually increased and is expected to increase further. Nevertheless, in 2013, emission intensity by GDP had decreased by 33% where it is near to the reduction target (Bekhet and Othman, 2018). In 2015, Malaysia had submitted her new proposal target to reduce her CO₂ emission intensity by 45% relative to 2005 by 2030 (UNFCCC., 2015).



Fig. 1: Malaysia carbon dioxide emission

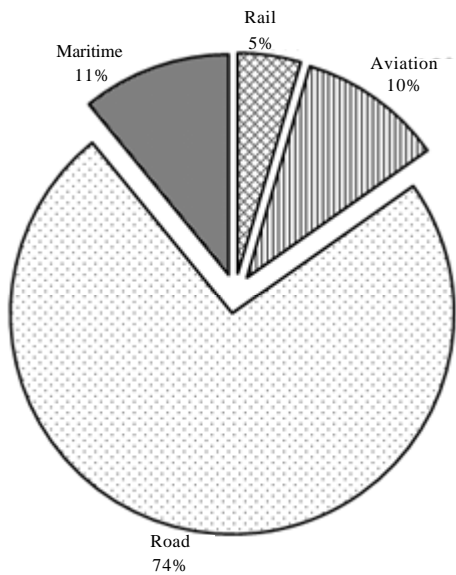


Fig. 2: CO₂ emission by transportation mode

In term of transportation sector, Malaysia is the second largest per capita CO₂ emitter among ASEAN countries (Saxena, 2009). Massive growth in economy, urbanization and rising income resulted an increased demand in personal vehicle. Transportation sector is currently one of the largest emission sources where it involves different mode of transportation such as road, rail, aviation and maritime. Figure 2 indicates CO₂ emission by transportation mode in Malaysia (Kasim, 2017). Over the last few years, the number of vehicles registered in Malaysia increased from about 23.7 million in 2013 (Long, 2013) to 28.2 million in 2017 (Kasim, 2017). The energy consumption in transportation sector is about 36% from total national energy consumption (Mytelka and Boyle, 2008). The increase in the vehicle amount has resulted in a significant rising in carbon dioxide emission because more than 80% of these vehicles depends on petroleum fuels (Mustapa and Bekhet, 2016). Thus, in order to meet the 40% emissions intensity reduction target, CO₂

emission in transportation sector was proposed to reduce from 77.61 million tonnes to 69.33 million tonnes (Mustapa and Bekhet, 2016).

Malaysian mitigation efforts: In overall carbon dioxide life cycle analysis, it is anticipated that biofuel that is carbon neutral can provide about 80% of carbon dioxide emission reduction compare to fossil fuel. Therefore, the government implemented National Biofuel Policy in 2011. The policy mandated a compulsory blending of 95% mineral diesel and 5% biodiesel which is named B5 biodiesel. Apart from this, the biofuel implementation included the RM 43.1 million instigation of depot with inline blending facilities. Malaysia required about 10 million tonnes of diesel fuel annually. This amount will decrease 500,000 tonnes by using B5 biodiesel (Masjuki *et al.*, 2013).

Malaysian government has committed to reduce CO₂ emission by building low carbon city of Putrajaya Green city. The city of Putrajaya where Federal Government Administrative Centre is located was designed based on principles of sustainable development for over 50,000 people. The Green city concept encourages people not to rely on vehicles too much. Walking and cycling are emphasized as modes of low-carbon transportation together with energy-efficient hybrid or electric vehicles. Cycling is considered as low-carbon transportation because it emits only 21 g CO₂/km. Walking and cycling by the entire Putrajaya population is estimated to reduce CO₂ emission by 53 ktonnes or 3% of the total reduction target by 2025 (Othman and Wang, 2016).

Private car emits more CO₂ per passenger compare to public transport. It is predicted that shifting from private car to public transport can reduced up to 94% of CO₂ emission and save 6% of total fuel consumption. Considering the average road use by car drivers, driving a car emits 271 g CO₂/passenger-km (Franklin, 2013). In addition, the average production process of a car alone is 42 g CO₂/km. If there is traffic congestion where vehicles most likely undergo stop-and-go driving condition, the CO₂ emission per mile becomes even higher. CO₂ emission can be reduced up to 45% if there is no traffic congestion. Taking the public transport such as bus would lead to more than half of CO₂ emission reduction as a bus only emits 101 g CO₂/passenger-km. Therefore, Malaysia has been committed to increase public transport effectiveness in order to reduce carbon dioxide emission. The plan on decent raising population is taken into consideration by expanding and enhancing Malaysian rail network (Zuo *et al.*, 2018). Rail transportation is 3-10 times less CO₂ intensive compared to road and aviation transportation. Mass Rapid Transit (MRT) service in

Malaysia capital, Kuala Lumpur (KL), helps to decelerate the number of vehicle on road. At present, there are around 464,000 of passengers per day using public rail transportation. Additional MRT lines costing RM 80 billion have been proposed to decrease 337,800 tonnes of CO₂ annually compare to use of private transportation. These represents 6% of CO₂ emission reduction from private transportation in KL and give an important health co-benefits for KL population (Kwan *et al.*, 2017). Apart from Peninsular Malaysia, Sarawak is planning to construct their first Light Rapid Transit (LRT) in Kuching that is equipped with hydrogen fuel, an alternative fuel produced using renewable hydroelectric in Sarawak. There Kuching LRT with the total length of 155.2 km connecting Kuching with surrounding townswill reduce 30-48% of current travel demand (Ogilvy, 2018).

Other than governmental effort, private sector had also participated in the effort to reduce CO₂ emission. Air Asia Sdn Bhd launched 'Green24 Campaign' at the end of 2014 and they managed to decrease 22,602 tonnes of CO₂ emission in 2015. One of their initiatives was to install sharklets on A320 aircrafts. When the aircrafts fly, the part of the wing is moving skyward to decrease the amount of drag and thus, reduce the fuel needed. On the other hand, McDonald's Malaysia implemented the use of biodiesel in their dispatch trucks. They collect and convert waste cooking oil into biodiesel. The biodiesel contain 15% processed cooking oils (Satibi, 2018). At present, there is 26 McDonald's truck that runs on biodiesel.

POSSIBLE ADAPTATION FROM FOREIGN COUNTRIES

In 2016, United Kingdom emitted 410.4 million tonnes of carbon dioxide which subsequently reduce to 398.2 million tonnes in 2017. UK is committed to meet the required target of 80% reduction of CO₂ emission by 2050 with 1990 baseline. Similar with biofuel in Malaysia, they target to mix transportation fuel with at least 12.4% biofuel by 2032. In comparison, Malaysia are promoting the enforcement of B10 and increase the implementation of biodiesel to 10% by 2019 (Ooi, 2018). Therefore, Malaysia could consider to further increase the blend of biofuel.

In COP15 at Copenhagen, Indonesia had pledged to reduce 41% of greenhouse gases by 2020. Indonesia implemented the installation of converter kits for public vehicles where it is to replace oil fuel with the Compressed Natural Gas (CNG). This strategy reduced up to 20% of carbon dioxide emission. Indonesia had succeeded in

reducing 15.5% of CO₂ emission (Chambliss and Bandivadekar, 2014). As for Malaysia, promotion of CNG vehicles has not drawn much attention. Experience could learn from Indonesia as combustion of CNG emits less CO₂ compare to oil fuel. Indonesia had cut her subsidies for transportation fuel which results the increase the fuel price by 30%. Cutting fuel subsidies could reduce emission around 5% because citizens would shift to the use of public transport under high fuel price (Benes *et al.*, 2015). Malaysia could learn from Indonesia in this matter but it requires higher political will in reducing fuel subsidy because it is an unpopular policy.

On the other hand, CO₂ emission in Thailand increased from 294.0 MtCO₂ in 2016 and to 298.8 MtCO₂ in 2017. Apart from this, Thailand has introduced bioethanol bus technology (ED95) in order to reduce the fossil fuel consumption and CO₂ emission. The ED95 is using 95% hydrous ethanol and 5% ignition improver in refined Compression-Ignition (CI) engine. The use of carbon neutral biofuel such as biodiesel and bioethanol could reduce net emission of CO₂. Malaysia could also adapt this bioethanol technology but further feasibility study must be conducted to search for most optimized choice among carbon neutral biofuels.

CONCLUSION

Malaysia is a developing country but still shows her commitment to reduce CO₂ emission under Paris Agreement. Many initiatives include national policy and mitigation effort in meeting CO₂ emission reduction target taken by Malaysia is reviewed. On the other hand, mitigation measures of other countries are also compared with Malaysian effort.

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