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Malaysia Commitment towards Low Carbon Cities

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Abstract

Introduction: Low Carbon City (LCC) is a city that comprises of societies that consume sustainable green technology, green practices and emit relatively low carbon or Green House Gases (GHG). **Objective:** The overall objective of a LCC is to significantly reduce its carbon footprint in ways that do not compromise a city's economic development potential. **Method:** Secondary data are collected with regard to "low carbon cities" scope matters. **Result.** The carbon dioxide (CO₂) emission in 2008 was an estimated 2,347,538 tonnes and this is expected increase up to 11,689,308 tonnes by 2020. Hence, Malaysia's leaders have made ambitious commitments to reduce the carbon and energy intensity of the economy and transition to a low-carbon growth path. In 2009, Malaysia in COP15 at Copenhagen, Denmark, proposed to reduce CO₂ emission intensity in Malaysia to 40 per cent by the year 2020 compared with its 2005 levels. Since that, Malaysian Government actively advocates and promotes green and low carbon development especially in the city. The Low Carbon Cities Framework (LCCF) was initiated to provide a framework to achieve sustainable developments that will subsequently reduce carbon emissions. The progress of LCC initiatives is through the years with phase by phase, and city by city. **Conclusion:** To meet national ambition to be as many as a carbon-free cities in Malaysia, its needs a strong and effective coordination between international, national, regional and local institutions, integration into different sectoral priorities and policies, and engagement between the public, private and civic sectors as well.

Keywords: Low Carbon City, Greenhouse Gases, Malaysian Government, Carbon Emission, Road Map.

Introduction

The leading cause of climate change is human activities which releasing of greenhouse gases (GHGs), mainly carbon dioxide (CO₂) in the atmosphere. Generally, carbon emissions in Malaysia are high compared to other countries at similar stages of development. It elucidates Malaysia's total greenhouse gas emissions increase by 45% in 2000 compared to the 1994 levels (The Sunday, 2014). Related to that, cities in Malaysia are seen as the main source of CO₂. According to Edenhofer et al.

(2014), cities are currently responsible for 67–76% of energy use and 71–76% of energy-related greenhouse gas (GHG) emissions with energy and transport as main contributors. Given the need for urgent climate action, urban development decisions taken in the next few years will be crucial in determining the success of global climate mitigation efforts. Hence, for cities, this will require a massive reduction in greenhouse gas emissions from new and existing buildings. Thus, a new development pattern with less energy consumption is urgently required.

Studies also showed that population and economic growth are the major driving forces behind increasing CO₂ emissions worldwide over the last two decades. It is particularly true in developing countries such as Malaysia, where the impact of population on emissions has been more pronounced. On average, it is found that a 1% increase in population is associated with a 1.28% increase in CO₂ emissions (Shi, 2001). With such magnitude, global emissions are likely to grow substantially over the next decades. Thus, the international negotiation and cooperation on curbing the rapid growth of CO₂ emissions should take into consideration the dynamics of future population growth as well instead of development. Planning of low carbon cities needs to incorporate the ideas of low carbon society (LCS) and low carbon economy in urban areas. The concept of LCS was introduced by Japan in 2007. The underlying idea was “No Low Carbon Society, No Low Carbon Technology”. Those two concepts are closely related. A LCS attempts to transform people’s consumption patterns and lifestyles, while the low carbon technology attempts to transform the energy patterns. The main idea of both concepts is the same: reduce CO₂ emissions while creating economic growth (Yang & Li 2013).

Towards to that, the concept of Low Carbon City (LCC) was adopted to deal with environmental degradation caused by rapid urbanization. From that, this concept is becoming popular worldwide including in Malaysia as well. For Malaysia developing LCC is inevitable and necessary choice to deal with climate change and create sustainable urbanization. LCC can be defined as a city that comprises of societies that consume sustainable green technology, green practices and emit relatively low carbon or GHG as compared with present day practice to avoid the adverse impacts on climate change. A LCC is therefore, above all, a sustainable, efficient, livable, and competitive city. The overall objective of a LCC is to significantly reduce its carbon footprint in ways that do not compromise a city’s economic development potential. Hence, the low-carbon development angle adds an important additional lens for evaluating a city’s sustainable development objective (KeTTHA, 2011).

Malaysian government has made commitments towards reducing their emissions in order to avert the worsening climate change scenarios. One of the means of achieving and translating such commitments is through LCS initiatives that are particularly targeted for cities. Malaysia hopes to have a city or township with zero carbon emissions in all 14 states by the year 2026 with Malacca City and Iskandar Malaysia are expected to be “carbon neutral” by the year 2020. Though a national goal to limit carbon emissions has been set, major barriers still limit the widespread adoption of low carbon integrated development within Malaysian cities. Hence, a LCC is to ensure low CO₂ emissions in the urban areas. Planning a LCC uses sustainable development principles demonstrates a high level of energy efficiency using low carbon energy sources and production technologies. It also adopts patterns of consumption and behavior that are consistent with low levels of greenhouse gas emissions in the urban areas (Chin et al., 2007).

In Malaysia, the National Low Carbon Cities Masterplan is a national-level policy document that outlines the direction and plans for the transition towards LCC in Malaysia. It defines what is required for a city to declare itself as a LCC and provides implementation actions required by the Federal, State and Local governments to promote a LCC agenda. The Masterplan will consolidate and streamline all national policies to provide clarity for cities to embark on their low carbon journey. Five cities (Putrajaya, Iskandar Malaysia, Cyberjaya, Petaling Jaya and Hang Tuah Jaya) are chosen as pilot cities to adopt policies and processes in city planning to urgently address the climate crisis in line with the Paris Agreement and the Sustainable Development Goals (KeTTHA, 2011). To be successful, the awareness of the society and their support are needed to create a successful LCC apart from the highest levels of government commitment. Thus, a sustainable lifestyle, particularly its implementation, should be developed among Malaysian in order to achieve as many as LCC implemented in this country.

Methods

This review paper involved with secondary data which are collected from multi sources such as journal, proceedings, books and social media using the keywords of “low carbon cities”. Articles with key words in its titles or abstract were selected. This was done for articles published mainly in 2016-2018. As preliminary studies, only 30 related articles were referred.

Results and Discussion

i) Why Low Carbon Cities

By 2050, around 1.4 billion people are expected to be living in Asian cities compared with today. As urban populations in Asia have continued to grow and become more economically prosperous, then this has led to a significant corresponding increase in their consumption of energy and key resources. When considering the challenges of climate change and the need to cut carbon around the world, cities are currently responsible for 67–76% of energy use and 71–76% of energy-related greenhouse gas (GHG) emissions (Edenhofer et al. 2014). Given the need for urgent climate action (IEA 2013), urban development decisions taken in the next few years will be crucial in determining the success of global climate mitigation efforts. Cities meet approximately 72 percent of their total energy demand from coal, oil, and natural gas, the main contributors to GHG emissions.

The International Energy Agency (IEA) estimates that cities in 2006 emitted 19.8 gigatonnes of CO₂e (GtCO₂e) from energy use, which was 71 percent of global energy-related GHG emissions. By 2030, this number is expected to increase to 30.8 GtCO₂e, or 76 percent of global energy-related emissions. But there is enormous potential to reduce these emissions through cost-effective energy efficiency measures delivering immediate cost and carbon savings, at the same time as strengthening the local economy and creating a better place to live (IEA, 2008).

In 1970 barely a quarter of Malaysia’s population lived in cities. Today three out of four Malaysians live in an urban environment, and the proportion continues to increase. Alongside this urbanisation there has been a period of remarkable economic growth, leading to an explosion in energy demand and carbon emissions. Perhaps more importantly this has massively increased the levels of air

pollution, harming the health of those that live in cities with thick hazes of fossil fuel fumes (<https://www.carbontrust.com/news/2014/08/low-carbon-cities-malaysia-green-future/>). Based on the research from Universiti Kebangsaan Malaysia (UKM), the CO₂ emission in 2008 was an estimated 2,347,538 tonnes and this is expected increase up to 11,689,308 tonnes by 2020. According to BP's research, Malaysia's CO₂ emissions amounted to 250.3 million tonnes in 2018, up from 241.6 million tonnes in 2017 (Khoo, 2019).

Furthermore, looking at the impact that Malaysians are having on climate change when compared with neighbouring countries, the average per capita carbon footprint is around twice that of Thailand, four times higher than Indonesia or Vietnam, eight times that of the Philippines, and twenty-four times greater than in Cambodia (although it is just half of Singapore) (<https://www.carbontrust.com/news/2014/08/low-carbon-cities-malaysia-green-future/>). Thus, LCC development has become a central part of the Malaysian government's strategy to meet its greenhouse gas commitments.

Malaysia's energy demand tripled between 1990 and 2010, from 12.9 million tonnes of oil equivalent (Mtoe) to 40.8 Mtoe. The composition of energy demand remained largely constant during this period, although the residential and commercial sectors increased their share by about 6% at the expense of the industrial sector. The transport sector continued to have the largest share at 42% of national energy demand (excluding agriculture) in 2010. The rapid growth in energy consumption has been enabled by Malaysia's large oil and natural gas production capacity: the country has the fifth largest oil reserves in the Asia-Pacific and is investing heavily in refining and storage capacities. Individual energy consumption is relatively high in Malaysia at 2.63 toe per capita, compared to other fast-growing high-middle income countries such as China at 1.7, Brazil at 1.37 or Turkey at 1.54. High energy consumption per capita combined with relatively carbon-intensive energy means that emissions in Malaysia are about 64% higher than the world average (Gouldson et al., 2014).

However, many Malaysian cities have created ambitious, low-carbon visions in order to meet national targets. However, many cities don't yet have a credible GHG inventory or a comprehensive blueprint to help them systematically implement and monitor low-carbon actions. Without such a framework, it is nearly impossible to establish baseline measurements, set goals, or measure progress (<http://www.wri.org/blog/2013/04/lessons-learned-low-carbon-city-planning-malaysia>). For example, the mayor of Kuching North City Hall announced his vision to turn Kuching into a LCC with taking to reduce GHG emissions from transportation and wastes. There is very strong political commitment from the city and state governments, but there is not yet a comprehensive understanding of the city's existing emission profile and a blueprint to mitigate the emissions. The effectiveness of the city's measures, therefore, is not clear (<http://www.wri.org/blog/2013/04/lessons-learned-low-carbon-city-planning-malaysia>).

ii) Roadmap for a LCC

Strength cooperation from various stakeholders are the best way to shift a city to a more energy efficient towards low carbon development path, even there are major obstacles that often prevent cities from acting on such a far-reaching agenda. Does, a road map can be an important useful tool

where it provides guidance on implementation. It also allows a quick start to a journey to achieve a specific goal. A roadmap is typically less detailed, and includes the preparation of a master plan as a basis towards making a city greener.

Cities can take action on both mitigation and adaptation to reduce carbon emission to mitigate the climate change. Mitigation aims to prevent further climate change; adaptation involves readjusting life to the reality that a certain amount of climate change will inevitably occur. While the distinction may initially appear to be a conflict of optimism versus pessimism, an effective approach to tackling climate change at the city level requires a synergy of both mitigation and adaptation.

In order to help cities become low carbon, five components as a road map need to be given as priority (Xiaodong et al., 2012):

1. Cities should make a consistent effort to reduce carbon emissions by sustaining demand-side energy efficiency measures—particularly in the industrial, power, heating, and buildings sectors. This should be combined with a focus on increasing the use of clean, renewable sources of energy.
2. Cities should minimize emissions from the transport sector through the adoption of new technologies and the provision of high quality public and non-motorized transport.
3. Cities need to carefully direct their spatial growth and urban form. Cities with higher densities emit less GHG. Cities will need to grow not only denser, but also smarter, through public transport networks and compact urban forms.
4. Cities should seek the support of their citizens and build a consensus around a resource-efficient and low-carbon lifestyle. With rising income and higher individual purchasing power and demands, a low carbon lifestyle will be key to lowering future energy demand in many cities.
5. Cities will need to address their economic structure, as future GDP growth will increasingly be driven by a city's services and lower carbon industries, both decisive factors for reducing carbon intensity in many Chinese cities. However, simply relocating higher emission industries outside a city boundary to reduce that city's carbon footprint—while reducing GHG emissions locally—would make little, if any, difference on larger spatial scales. In general, the guiding principle for all cities will therefore need to be to develop strategies to lower their respective carbon footprints relative to the existing carbon intensity baseline. In particular, the less industrialized cities have an opportunity to leapfrog into a lower carbon trajectory from the outset.

Thus, governments can encourage investments by providing supporting incentive and subsidy regimes, for example through feed-in tariffs or tax allowances for renewable generation or through reducing subsidies for fossil fuels such as coal in energy generation or petrol in transportation. They can also encourage investment by creating stability and reducing risk – for example by committing to long-term targets for energy efficiency, by supporting pilot projects that prove the viability of new business models or by acting as the “anchor client” for new initiatives such as district heating schemes implemented by city scale energy service companies. Governments can enable different actors to respond to market opportunities and policy signals through education and information provision, for

instance by environmental labeling or through support for R&D in different areas of the low-carbon economy. They can also support the building of new capacities to act by promoting community engagement and civic movements or market development and economic networks. Ultimately, governments could mandate investment through regulation – for example through the adoption of tougher vehicle emissions standards or building energy performance standards. Such policy interventions are likely to be needed both across levels (national, regional and local) and between policy areas (energy, finance, housing, transport and economic development, as well as environment) (Gouldson et al., 2014).

iii) Towards Low Carbon City in Malaysia

The rapid increase of CO₂ emissions has caused many concerns among Malaysian policy maker. In order to plan for LCC in Malaysia, it is more effective to look into the urban areas as they are engines of economic growth as well as main contributors to CO₂ emission. In the case of Malaysia, the natural resource management through spatial planning approach integrates environmentally sustainable development concepts. These strategies are incorporated into the National Physical Plan and then translated into structure plans where it also identifies and manage environmental sensitivity areas (ESAs) including forest and green lung reserves (Chin and Foong, 2007).

In Malaysia, from 27% in 1960 to 42% in 1990, the urbanisation rate continued to grow to 54% in 1994 and 61.8% in 2000. The population in urban areas grew at a rate of 2.2% per annum versus the rural growth rate of 1.6%, over the period of 2000 to 2009. In 2008, the urban population in Peninsular Malaysia reached 67% of the total population, and this is expected to grow to 75% by 2020 as the nation develops (Census Data, 2010 & 2001 RFN). The above numbers show that more and more people prefer to live in urban areas

Therefore, Malaysian Government actively advocates and promotes green and low carbon development especially in the city. Malaysia's leaders have made ambitious commitments to reduce the carbon and energy intensity of the economy and transition to a low-carbon growth path. To achieve low-carbon outcomes, city leaders will need to engage in a comprehensive set of actions. All key sectors under city management will have important roles, including land and spatial development, urban energy use for industry and buildings, transport, and municipal services. In some cases, elements of good practice need to be scaled up. In others, there is a need to significantly change existing ways of doing business and forge new partnerships. Moreover, policy themes that cut across sectors need to be addressed to provide a supportive environment to realize sectoral priorities (Axel et al., 2012).

The development of LCC in Malaysia is still quite new where it requires an active promotion and uses of green technologies and sustainable method in the development and operation of a city. The framework and planning should involve all key stakeholders. At a local scale, urban development in Malaysia is governed by the Federal Department of Town and County Planning, while most mitigation actions are sectoral and directed by the relevant government agency.

In 2009, Malaysia in COP15 at Copenhagen, Denmark, proposed to reduce CO₂ emission intensity in Malaysia to 40 per cent by the year 2020 compared with its 2005 levels, subject to assistance from developed countries. The number will be increased by 45% in 2030. Thus cutting carbon emissions to fight climate change should be a key priority for all cities. Malaysian has specific domestic and international commitments to reducing emissions of greenhouse gases and improving the deployment rates of low carbon technology. The Low Carbon Cities Framework (LCCF) in Malaysia was resulting from collaboration between the Energy, Green Technology and Water Ministry with the Malaysian Green Technology (GreenTech Malaysia) and Malaysian Institute of Planners (MIP), among others. LCCF serves as a guide for developers, local councils, town planners or non-governmental organisations to reduce the levels of carbon emission in cities. The objectives of LCCF are:

1. To encourage and promote the concept of LCC and townships
2. To increase the compatibility of cities/township with their local ecosystem
3. To guide cities in making choice/decisions towards greener solution

The Tenth Malaysia Plan (2011–2015) establishes or maintains a number of national low carbon programmes. These include a renewable energy target of 985 MW by 2015 (5.5% of installed capacity), facilitated by a feed-in tariff; an energy efficiency target of 4000 ktoe per year by 2015, prioritizing more efficient lighting, appliances and buildings; and the construction of energy-from-waste infrastructure (Economic Planning Unit 2010). Figure 1 shows the benefits of LCC to the residents, businesses and local authorities.

Currently, a number of Government Departments and Government funded bodies exist with a remit to action reductions and increase deployment rates. Malacca has a stated ambition to become a carbon-free city, and is currently taking the first steps towards creating a smart electricity grid. This is being done as part of an initiative to create a Green Special Economic Zone which focusing on renewable energy and clean technology.

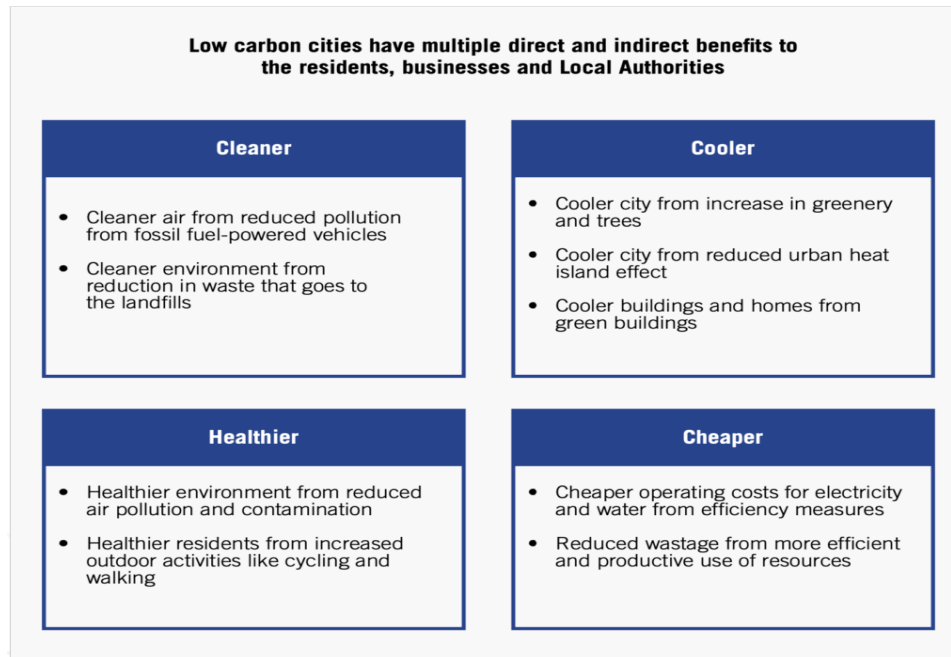


Figure 1: Benefits of LCC to the Stakeholders (Green Tech Malaysia, 2019)

To enable the widespread adoption of these measures, policy interventions are likely to be needed from national, state and local governments and from policy areas including energy, finance, housing, transport, land use planning and economic development. Pursuant to that, a numbers of policies have been introduced to help in meet this ambitious target. Among that:

- i. The National Green Technology Policy (2010) aims to accelerate technology deployment through training.
- ii. The Renewable Energy Act (2011) aims increase the uptake of renewables.
- iii. The National Energy Efficiency Action Programme (2014) presents a strategy for the implementation of energy efficiency measures.
- iv. The Low Carbon Cities Framework was developed to achieve sustainable development and the reduction of carbon emissions.
- v. The Green Technology Application for LCC was introduced facilitates implementation of low carbon initiatives in at least five cities in Malaysia as guidance to a clear and integrated approach to successful low carbon urban developments.

Furthermore, on 24th July 2009, the government unveiled the National Green Technology Policy (NGTP), which was a turning point in the country's history of initiatives on sustainable growth and development. One of many initiatives is to showcase Putrajaya and Cyberjaya as pioneer green cities. In line with the NGTP, the Low Carbon Cities Framework (LCCF) was initiated to provide a framework to achieve sustainable developments that will subsequently reduce carbon emissions. The document can be used by all stakeholders, in human settlements of any size, be they cities, townships or neighborhoods either new or existing, to measure the impact of their development decisions in terms of carbon emissions and abatement. LCCF is a national framework and assessment system to guide and assess the development of cities and to support holistic sustainable development in Malaysia. It

will provide for equivalent GHG as a result of human activities in cities so that there may be awareness towards how these GHG can be reduced (KetTHA, 2011).

Apart of that, The Carbon Trust's Low Carbon Cities Malaysia Programme also introduced. The Carbon Trust's Low Carbon Cities Malaysia Programme was a framework, process and set of tools designed to help cities in Malaysia manage the effects of climate change, as well as to become more sustainable and more efficient. This framework is built around the Carbon Trust's five step process which has been tailored to the needs of Local Government in Malaysia. As of 2018, 52 Local Authorities (out of a total of 154) have been introduced to LCCF, 19 of these Local Authorities have established their carbon emissions baseline (selected Low Carbon Zones) and developed their Low Carbon Action Plan (Figure 1). These 19 Local Authorities have been awarded the Provisional Certificate for their efforts. Out of these 19, 5 Local Authorities have gone on to the next step and have actually reduced their carbon emissions and have received the Diamond Recognition award from the Ministry of Energy, Science, Technology, Environment, and Climate Change (MESTECC) (Khoo, 2019).

Instead, several Malaysian cities and regions are pursuing climate mitigation actions within the frameworks of the National Physical Plan and State Structure Plan (Ho et al., 2013). The first phase of the LCCF project involves five cities including Iskandar Malaysia in Johor Baru, Hang Tuah Jaya in Malacca, Petaling Jaya in Selangor and Miri in Sarawak. Foremost among these is the Iskandar Malaysia Special Economic Corridor, which has set an emission intensity reduction target of 50% by 2025 relative to 2005 levels (UTM, IRDA, & Kyoto University, Okayama University, National Institute for Environmental Studies 2012).

Local Government was recognizing as key stakeholder to achieve this objective. The reason is the agency as third administrative in Malaysia involved directly with many planning, taxation, transportation and community engagement to bring a low carbon transition. To achieve that, a three year programme was planned which working together with municipalities within Greater Kuala Lumpur to create Low Carbon City Strategies. Following extended application processes in 2014, 2015 and 2016, all municipalities within Greater Kuala Lumpur were invited to express interest in participating in the programme, Kuala Lumpur City Hall (DBKL), Petaling Jaya City Council (MBPJ) and Ampang Jaya City Council (MPAJ) have been selected to work in partnership with the Carbon Trust and the UK Foreign & Commonwealth Office, receiving dedicated support to develop robust five-year carbon management strategies for the Council own administrative estates as well as city-wide carbon reduction strategies. This approach has enabled the chosen Councils to lead by example in driving climate change mitigation initiatives in Greater KL, as well as saving energy costs for their own taxpayers. The Carbon Trust project team has worked closely with all three municipalities to develop a city-wide carbon reduction plan. The plan outlines the strategy for reducing the carbon intensity of the cities' buildings, transport and waste infrastructure. It also details the cities' plan for the uptake of renewable technology.

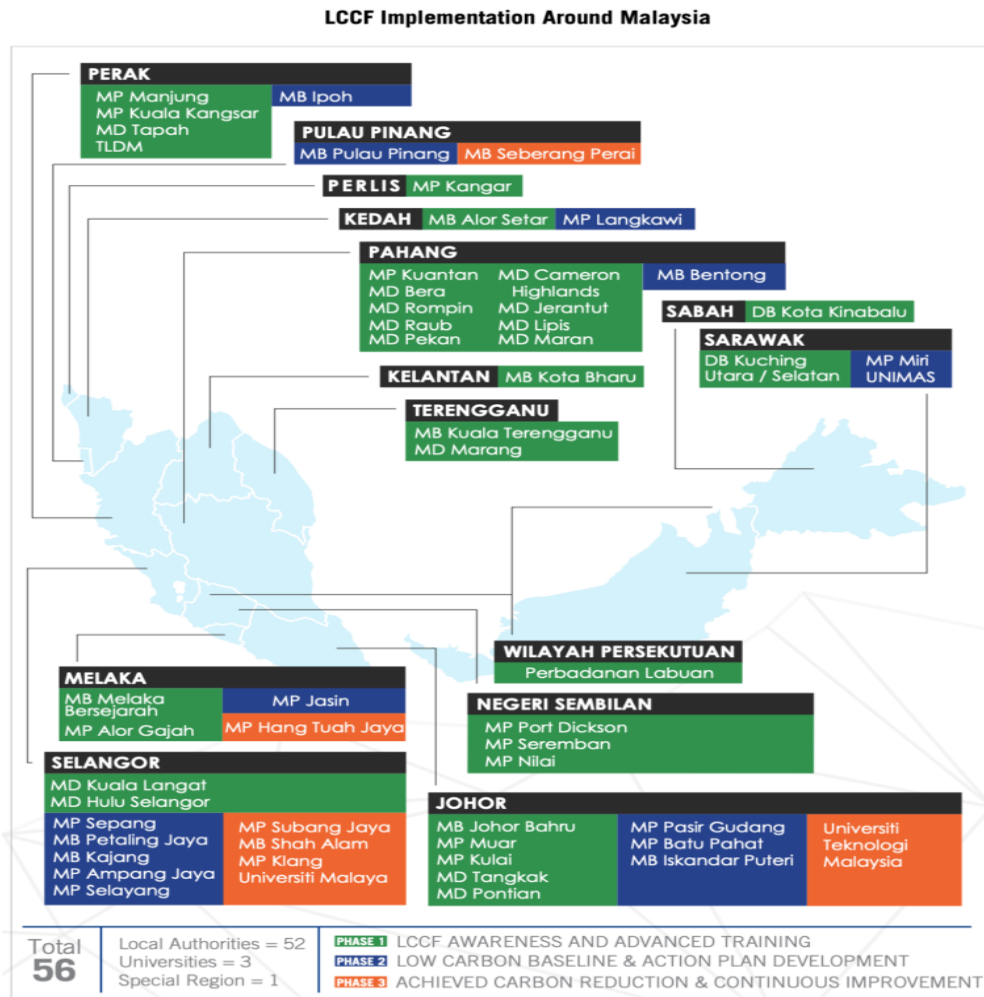


Figure: LCCF Implementation Progress in Malaysia (Green Tech Malaysia, 2019)

By 2010 as example, Majlis Bandaraya Petaling Jaya (MBPJ) target to reduce carbon footprint by 10% and increase to 25% by 2020 with a goal to tackle climate change. Thus, as early as 2014, MBPJ worked with Carbon Trust UK to identify carbon footprint of their own estate and ways which they can reduce it. MBPJ now has developed a city carbon action plan through to 2030. This action plan commits the city to a target of reducing CO₂ by 30% by 2030. By that, MBPJ also wants to be a leader in carbon management in Malaysia.

Next, Johor Bahru as the third largest city in Malaysia, and serves as an important industrial, logistics and commercial centre enjoys high growth rates after becoming the focus of Iskandar Malaysia regional economic corridor. Per capita incomes in the area are 48,880 Malaysian ringgit (MYR; US\$14,790) and per capita energy consumption is 70.2% of the OECD average in 2014. Economic and population growth will see substantial increases in absolute levels of emissions (83.8%), energy use (79.4%) and energy bills (139.9%) in Johor Bahru over the period 2014 to 2025. By estimated, Johor Bahru could reduce its carbon emissions by 24.2% in 2025, relative to Business As Usual (BAU) trends, through cost-effective investments worth MYR3.3 billion (US\$1.0 billion). These would

generate annual savings of MYR2.6 billion (US\$0.77 billion), with the emission reductions distributed among the commercial (1.2%), domestic (19.6%), industrial (18.3%), transport (52.2%) and waste (8.7%) sectors. Reinvesting the returns on these investments in other low-carbon measures could enable investment in a cost-neutral package of measures worth MYR18.5 billion (US\$5.6 billion), which would deliver emissions reductions of 45.4% relative to BAU at no net cost to the city (Gouldson, 2014).

Moreover, in 2011, experts from the Universiti Teknologi Malaysia (UTM) convened a working group to help the Iskandar Regional Development Authority (IRDA) develop a blueprint to make Iskandar, Malaysia the first low-carbon development region in the country. Iskandar Malaysia is a Special Economic Corridor located in the state of Johor at the southern part of Peninsular Malaysia. The state is part of the SIJORI (Singapore-Johore-Riau) Growth Triangle, one of the largest hubs in Southeast Asia in terms of population, industry and tourism. IRDA aims for Iskandar Malaysia to become a “strong and sustainable metropolis of international standing” that can serve as a regional role model in low carbon development, among other social, economic and environmental goals. The blueprint contains the current level of GHG emissions, GHG reduction targets for 2025, and step-by-step action plans to achieve these targets. The Blueprint calls for a 50% reduction in emission intensity by 2025, relative to a baseline year of 2005, for Iskandar Malaysia. The initiative received strong political buy-in at both the local and national levels, as it is in line with the federal government’s pledge to cut emissions. With both a vision and a plan to achieve it, IRDA is ready to implement the low-carbon actions to reach its goals for 2025 (<http://www.wri.org/blog/2013/04/lessons-learned-low-carbon-city-planning-malaysia>). Iskandar Malaysia has its own Low Carbon Society (LCS) blueprint which it has developed in collaboration with several partners.

Along the way to achieve as many as LCC, policy-makers have to exploit the early stages of the low-carbon transition where there are economically attractive options, while ensuring that they create the conditions for the later stages of transition that could be more challenging. For this to happen, low-carbon transitions would need to be seen as an opportunity rather than a threat, by city-level decision-makers, and they need to be taken from the periphery of urban decision-making and mainstreamed into the key areas of urban policy such as planning, energy, housing, transport and economic development. Appropriate stakeholder engagement and governance capacities need to be established to ensure that the transition is not a technocratic exercise but is ‘socially steered’ so that choices reflect different social concerns and build public support over time. New financing arrangements and delivery models need to be built, and enabling policies need to be introduced at different scales. Lessons from the front-runners then need to be identified – for example through robust evaluations of early experiences – so that good practice can be rapidly developed within and transferred between cities. And all of this needs to be done in a way that stimulates a long-term vision of, and a commitment to, a more deeply decarbonized city. If all of this can be achieved, then exploiting economically attractive low-carbon options in cities in the short term could be a major contribution to successful climate change mitigation at the global scale in the longer term.

Malaysia also needs to adopt the pathway towards the low carbon society mainly to cut high increase in greenhouse emission and increasing public awareness in Malaysia. Thus, a holistic approach needs

to be incorporating not only energy policy but also comprehensive policy of sustainable development which covers social, economic and ecological approach. Moreover, pathway towards LCC requires concerted effort from the experts, government and political will to realize this vision.

Cities will also have to seek the support of their citizens and build a consensus around a resource-efficient and low-carbon lifestyle. With rising incomes and higher individual purchasing power and consumption demands, a low-carbon lifestyle will be a key determinant of future energy demand in Malaysian cities. Some tools have been developed internationally to engage citizens in understanding their individual and household carbon footprints and in taking actions to reduce them. Similar partnerships at the city level can generate interest in Malaysian households to improve the quality of their lives in less carbon-intensive ways (Axel et al., 2012).

Conclusion

The concept of LCCs is closely aligned with sustainable development. Through the adoption of the principle of sustainability, carbon emissions can be reduced through the means and ways in which cities are designed and developed, and the ways resources are consumed (KeTTHA, 2011). The Malaysian government is cognizant of the effects of global warming and is committed to minimize it with developing of as many as LCC in this country because LCC are an opportunity to reduce carbon emissions while offering tremendous economic opportunities. Furthermore, LCC measures such clean energy, energy efficiency, sustainable transport and integrated waste management can help cities to leapfrog to a sustainable and green development pathway. However, in order to meet national ambition to be as many as a carbon-free cities in Malaysia, its needs a strong and effective coordination between international, national, regional and local institutions, integration into different sectoral priorities and policies, and engagement between the public, private and civic sectors as well the adoption of carbon reduction initiatives in cities often depends on city leaders' ability to relate climate change mitigation efforts to local co-benefits (ibid.). A key co-benefit for resource-constrained decision-makers is the ability of investments in energy efficiency and other low-carbon development measures to generate economic benefits for the city (Gouldson et al., 2014). To conclude, there are several strategies to achieve LCC through sustainable development. Apart from urban planning, roadmap to achieve LCC require strong political will and decisive actions especially incentives of non-spatial such as to promote energy efficiency, renewal energy, recycling and spatial policy, regeneration/Brownfield development, and energy saving building (Chin and Foong, 2007).

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