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An Overview of Renewable Energy Programmes towards A Green City Development Concept at Melaka Local Government

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Abstract

This study presents an overview of renewable energy (RE) programmes and the Green City Concept (GCC) by the local governments in promoting a Green City at the local level to be part of a successful agenda. It also elaborates on the action plans undertaken in Malaysia and the implementation of green city projects initiated by the local governments. Thus, this study explores the existing pool of literature to provide an explanatory perspective for the research with a diverse range of elements in renewable energy programmes such as the model of RE and GCC and programmes in enhancing the performance of the Melaka local government. The study shows that the local governments play a significant role in implementing more potential RE programmes under GCC in supporting communities effectively for their future betterment. Therefore, the outcome of this study is expected to provide significant information for the government to play a greater role in creating awareness to the community on realising the implementation of the GCC in the local government administration.

Keywords: Green City Concept, Renewable Energy Program, Local Government, Implementation of Green City Concept

Introduction

In the face of economic globalisation and strained resources, the development of green economies is inevitable. Accelerating the construction of green cities is a growing trend. The construction of a green city is a complex integrated project and requires a comprehensive evaluation index system and a scientific evaluation model (Lee & Kim, 2016). It is an important aspect of green economic development and its connotations.

Green City is a widely and frequently used term — it is a contemporary commonplace idea in politics, planning, science, and public discourse. However, each field attaches a different meaning and relevance to the concept. The Green City carries the mutual notion of a positive goal, which is either already achieved or yet to be reached. This sense of a positive goal needs to be specific and accessible, since cities are a local and concrete entity. Citizens

and their representatives, as well as the media and politicians, urge and postulate aiming for a Green City on a national, regional, and local scale. The Green City must thus establish concrete "green" content on a local scale. The concept should not only be considered as a vision but also as a realistic programme (Breuste *et al*., 2020).

Malaysia has a lot of potentials in renewable energy such as solar, wind, hydro, biogas and biomass but it is not yet fully explored. In fact, the countruly almost fully depends on fossil fuel (Abdullah *et al*., 2019; Abdul Hamid *et al.*, 2019; Lin & Zhu, 2020; Salleh *et al*., 2017; Shamsuddin, 2012). The usage of non-renewable energy known as conventional energy resources such as coal, natural gas and diesel can only outlast until 2025 (Haneym Binti Abdul Hamid *et al*., 2019; Maulud & Saidi, 2012). This sole dependency leads to many catastrophes especially environmental pollution. For example, the air pollution issue in China has become a national emergency due to the seriousness of their environmental pollution level (Lin & Zhu, 2020). Therefore, through a RE programme under GCC, it can reduce pollution and at the same time increase the quality of citizens' lives and many more (Brilhante & Klaas, 2018).

In Malaysia, the RE programme have been launched as the fifth fuel strategy in the energy-mix under the National Energy Policy in 2001 (Shamsuddin, 2012). The Green City term was first brought to public attention during the tabling of the Tenth Malaysia Plan by the former Prime Minister of Malaysia, Datuk Seri Mohd Najib. The term Green City has also been widely used in western countries since the early 1990s (Azmi & Romle, 2015). A Green City refers to a city that has been specially designed for people, and these people are very committed to reducing the waste output and pollution, amongst other things (Latif *et al*., 2013). Environmental awareness has increased since the United Nations Conference in 1972, and Malaysia gave its support at the Rio Summit, and later at the Malaysian Nature Environment in 1992 (Ramli *et al*., 2019). In the 21st century, the Green Revolution has become famous due to environmental climate changes and this has led to the emergence of GCC with the formation of the Green Neighbourhood Initiative. Energy conservation has now become one of the Malaysian government's indicators (Ramli *et al*., 2019).

The Malaysian government has created Malaysia's National Five-Year Development Plans to ensure a sustainable environment. The National Policy in Green Environment and Technology was also created to improve the quality of life (Azmi & Romle, 2015). Malaysia has implemented a good policy towards green environment since the Third Malaysia Plan (1976 – 1980) and has continued with environment protection as its key agenda as a national development framework in the Fifth Malaysia Plan (1986 – 1990) (Ramli *et al*., 2019). This was followed by the Eighth Malaysia Plan (2001 – 2005) to ensure that sustainable development of energy resources, RE and green building became part of the sustainable environment for the benefit of future generations in the Tenth Malaysia Plan from 2010 until 2015 (Azmi & Romle, 2015; Ibrahim *et al*., 2015). The planning was still ongoing in the Ninth Malaysia Plan (2006 – 2010) with the Eleventh Malaysia Plan still focussing on green development and sustainable development (Ramli *et al*., 2019). Malaysia has become more serious and aggressive in its journey towards sustainable development through Agenda 2030. For example, the Subang Jaya Greenest City Action Plan 2030 has become one of the local government's initiatives towards a Green City in the hope that the Subang Jaya Municipal Council will become the Greenest City by 2030.

Although many policies and programmes have been designed, the status of RE development in Malaysia to date, at approximately only 2%, has not reached its target and it still needs a long journey to achieve its target of 20% by 2025 (Abdullah *et al*., 2019; Islam *et al*., 2009). This shows that the execution of its policy is still at a very slow pace. To mitigate

the slow pace, a plan is being drafted by the Sustainable Energy Development Authority (SEDA) and it will be part of the Twelfth Malaysia Plan (2021 – 2025). Malaysia needs a lot of improvements on the implementation of initiatives towards a Green City in terms of policy systems and processes (Ibrahim *et al*., 2015). The local governments were able to generate public attention, mobilise firms and develop new public–private partnerships to get the economic benefits that accompany enhanced green technology exports and greater ecotourism (Demaziere, 2020).

Overview of RE and GCC

RE Programmes and GCC

The largest renewable source of energy in Malaysia is hydro energy which contributes 16.6% of electricity production compared to others at only 0.7% (Haneym *et al*., 2019). However, another study also found that solar energy is one of the most prospective and the most abundant source of energy available in Malaysia (Haneym *et al*., 2019; Islam *et al*., 2009). Furthermore, solar thermal and wind are two of the best RE that have potentials to be developed in Malaysia (Haw *et al*., 2006). The usage of RE in green buildings leads to energy efficiency and environmental sustainability (Todorović, 2012). Green building is the action of establishing structures and handling environmentally responsible processes and resource-efficient for the whole of a life-cycle of a building from seating to design, construction, operation, maintenance, renovation and deconstruction ("Basic Information | Green Building |US EPA", 2016). The RE has become a main role of Green City performance (Brilhante & Klaas, 2018).

RE programmes have been implemented by the Malaysian government (Mekhilef *et al*., 2014). This can be shown from previous researches, namely:

1. The Small Renewable Energy Power (SREP) Programme
2. The UNDP-GEF Biomass Power Generation and Demonstration (BioGen) Project
3. The Malaysian Building Integrated Photovoltaic (MBIPV) Project
4. The Economic Transformation Programme (ETP)
5. The Feed-in Tariff (FiT)

Besides, as shown from the Selangor Green Technology Action Plan from 2016 until 2018, RE programmes are one of their central plans towards the Green City development. There are seven action plans, which are:

1. Green Urbanisation through a Low City Framework Carbon
2. Government Green Acquisition
3. Electric Vehicle Charger Network Installation
4. Electric Bus Use for 'Free Bus' Programme
5. Solar Roof Installation for Selangorku Housing Project
6. Energy Efficient Building in the Selangor State Government Building
7. Industrial Park Greening Programme

Theory and Model of RE and GCC

The image below shows the conceptual framework of the FiT mechanism for RE resources, namely biogas, biomass, solar PV, small hydro and geothermal in Malaysia.

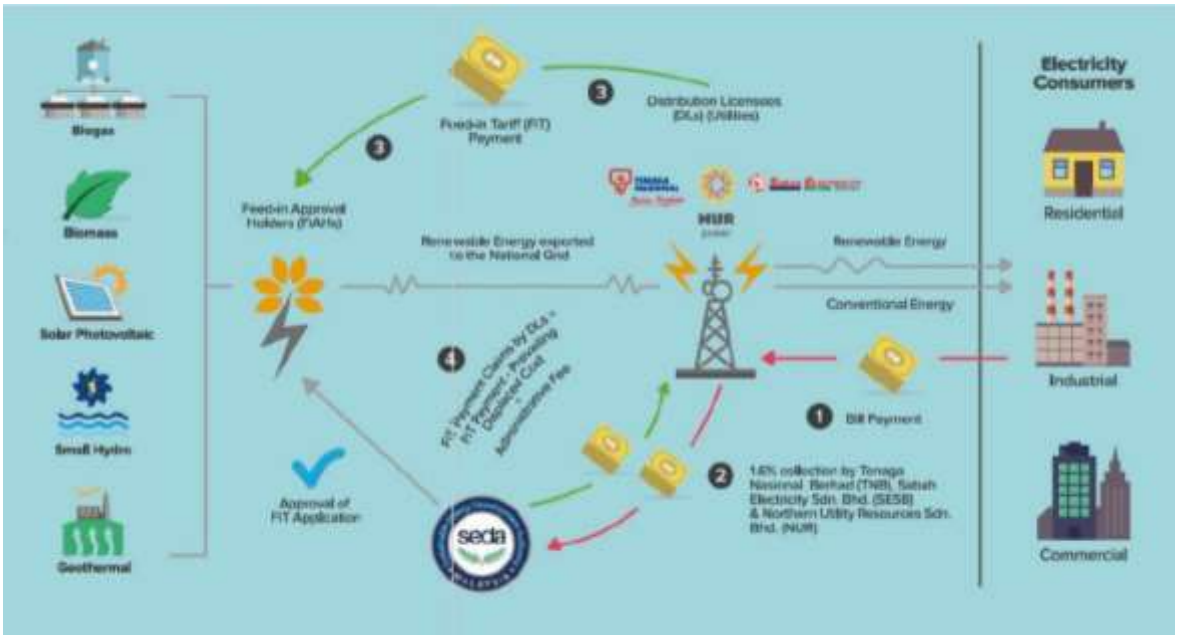

Figure 1: Conceptual Framework of the Feed-in Tariff (FiT) Mechanism
Sources: Annual Report 2017 by Sustainable Energy Development Authority (SEDA) Malaysia

Besides, the Green City Conceptual Framework from (Brilhante & Klaas, 2018) research has been proposed by the Institute for Housing and Urban Development Studies (HIS) as a method to measure Green City performance while RE acts as one of the independent variables that influences the performance of Green City. This research found that RE and efficiency of energy are the most important activating factors for the GCC.

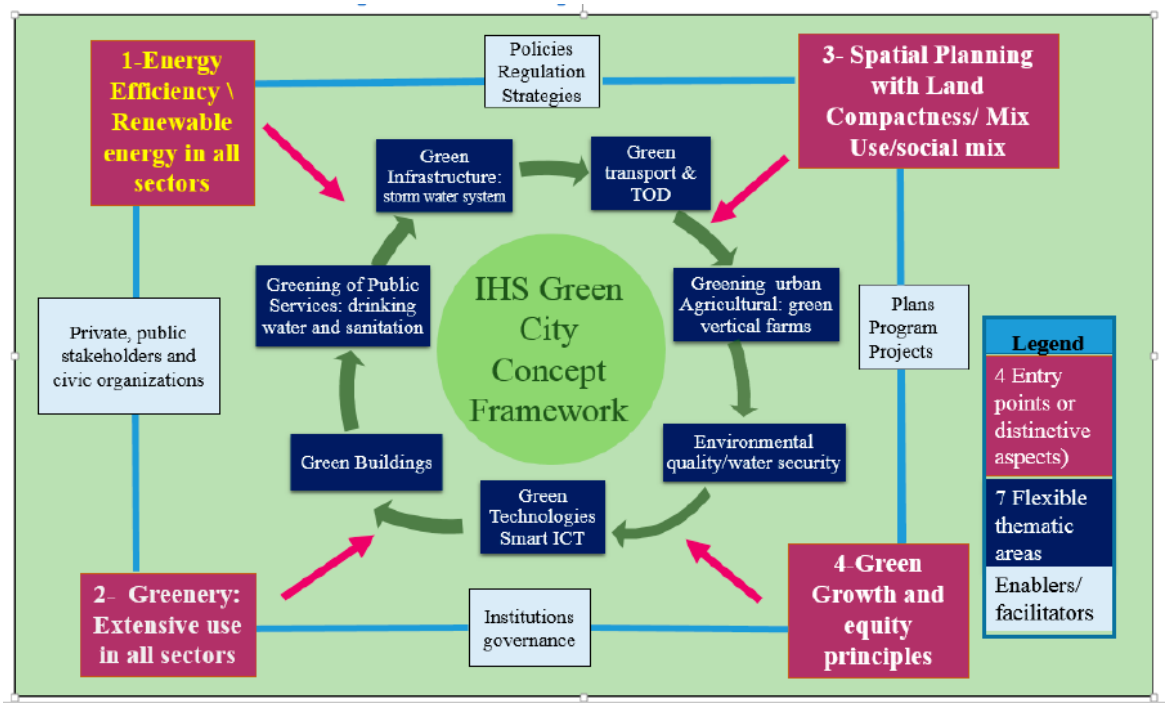

Figure 2: Green City Conceptual Framework by the Institute for Housing and Urban Development Studies (HIS, 2019)

Green solutions have become the popular choices around the world to lower pollution and resolve environmental issues in the big cities. The term green city has become increasingly popular in recent years although it has been put into practice and implemented in western countries since the early 1990's. In Malaysia, the term was first brought to the public when it was announced by Datuk Seri Mohd Najib Tun Abdul Razak, the former Prime Minister when tabling the Tenth Malaysia Plan where Cyberjaya and Putrajaya were selected as a pilot model. According to (Noranida & Khairulmaini,2014), sustainable development that is locally relevant and culturally appropriate could include several common goals or themes. The International Implementation Scheme for the United Nations Decade of Education for Sustainable Development (UNDESD) identified key areas of the concept as:

i) Society: an understanding of social institutions and their role in change and development, as well as the democratic and participatory systems which give opportunity for the expression of opinion, the selection of government, the forging of consensus and the resolution of differences.
ii) Environment: awareness of the resources and fragility of the physical environment and the effects on it of human activities and decisions, with a commitment of factoring environmental concerns into social and economic policy development.
iii) Economy: sensitivity to the limits and potential economic growth and their impact on the society and on the environment, with a commitment to assess personal and societal levels of consumption out of the concern for the environment and for social justice.

Sustainable development ensures the well-being of humans by integrating social equity, economic viability, and environment conservation and protection. Most interpretations of sustainable development work within the Brundtland formula but vary in relation to the emphasis placed on each of these three components of sustainable development, namely economy, environment and society . According to (Chua *et al*., 2013), there are two National policies on the environment and technology in Malaysia, namely the National Policy Key Emphasis National Policy on the Environment (2002) and the National Green Technology (2009). The National Policy Key Emphasis National Policy on the Environment (2002) focusses on economic, social and cultural progress through environmentally sustainable development. Meanwhile, the National Green Technology (2009) focusses on Sustainable Development Energy which seeks to attain energy independence and promote efficient utilisation, conserves and minimises the impact on the environment, enhances the national economic development through the use of technology and improves the quality of life for all.

Implementing Green City Action Plan in Malacca

A green city can be defined as a city that is resilient, inclusive, manages its natural resources well, and promotes low carbon growth to remain competitive and enhance liveability for all its residents. In order to implement the green city action plan, a key step is breaking down the plan initiative into achievable actions and assigning subcommittees known as Intragovernmental Urban Management Partnerships with the responsibility for implementing their respective actions and/or projects, thus collectively delivering the goals of the initiative. Melaka has implemented this step in several ways.

Melaka prepared the first action plan as part of the initiative and set an example for other cities within the subregion. City government departments, local residents, the business community, national ministries, and development agencies have since pursued a way forward

for sustainability, which led to several initiatives that mark the implementation of the action plan planning process. Melaka has started to implement the Green City Action Plan (GCAP) through its renewable energy programme, a 5-megawatt solar farm that was inaugurated in 2013, and established the Melaka World Solar Valley. Moreover, Melaka has started transforming the Melaka River from a polluted backyard drainage canal to a popular cultural amenity, tourist attraction, and enjoyable green space. Melaka has several other implementation efforts underway, including a pilot energy efficiency project to upgrade streetlights and selected public buildings, electric vehicle charging stations, development of the Hang Tuah Jaya Green City, conversion of diesel buses into electric buses, and initiation of the Melaka Green Seal for buildings certification. The action plan provides Melaka with a path towards becoming a sustainable community, and it reflects a comprehensive approach that brings together individual actions that have already started.

One example is the formation of the Green Technology Council, and their service as executing agency for the Green Cities Follow-Up TA. Another step is summarised by the aphorism "What you measure is only what you manage," implying the need for establishment of indicators and associated indexes. These are measures of the effectiveness of management performance. In a city context, indicators are measures of a city's performance. Given that the city management involves a complex and integrated set of activities, it becomes necessary to prioritise those activities and the associated indicators as key performance indicators (KPIs). Similarly, there are other initiatives, which provide useful benchmarking information based on KPIs about how one city compares with other cities. This information is for the city's use to drive performance improvements. While there are a number of KPI frameworks for intercity comparisons, there are also intracity ones to compare the city's own performance over the course of time. These identify KPIs across categories of environmental or other sustainability issues. All of these KPIs tend to be outcome indicators, which reveal how well the city has performed in the context of that category.

The 9th Indonesia–Malaysia–Thailand Growth Triangle (IMT-GT) Chief Ministers and Governors Forum (CMGF) held in 2012 pursued a new initiative for Green Cities in IMT-GT through the creation of green city action plans. The action plans take into account existing Green City examples, frameworks, development master plans, and planned anchor projects to identify potential actions and projects that will support these communities to become models of urban sustainability. The Asian Development Bank (ADB) responded by assisting the cities of Melaka (Malaysia), Songkhla and Hat Yai (Thailand), and Medan and Battam (Indonesia) to develop comprehensive Green City Action Plans (GCAP).

Programmes Under the Green City Action Plan Renewable Energy Programme (REP)

Transforming the Melaka River

The Melaka River, the oldest river settlement since half a millennium ago, practically had no reserve along the banks. Indiscriminate and ad-hoc development of houses and shops along the river over the centuries had resulted in haphazard encroachment into the river. The masterplan of the project provides for the right-of-way behind these illegal extensions, allowing for the rehabilitation of the river banks once again.

The Melaka River, which runs through the UNESCO World Heritage City, became once again the main lifeline for the city, as more and more activities are generated and the original buildings co-exist on the new river promenade. The constraints included legislations, demolition of existing structures, construction space and sensitivity to the well-being of existing buildings which were built almost 100 years ago. The transformation of Sungai

Melaka can be tagged as 'out of the ordinary'. From a river which was once muddy and choked with floating garbage, Sungai Melaka has been transformed into a clean and beautiful river. No more of the dirty backyards of shops and houses. No more of the rather repulsing or revolting setting where rubbish was seen dumped into the river. Instead, there are stunning landscapes that attract the attention of the camera-happy tourists on the river cruise boats.

Now Sungai Melaka is a major tourist attraction for this world heritage city and also part of Melaka's economic cake. The Melaka River Beautification Programme was inspired by a similar effort done on the San Antonio river in Texas, United States which is famous for its beauty and is able to draw some 13 million tourists a year. The programme to enhance the beauty of the Melaka River was implemented under four phases at the cost of RM30 million that began in 2002.

Pilot Energy Efficiency Project to Upgrade Streetlights and Selected Public Buildings (2016-2017)

The objective of the project is to upgrade the road lighting system of the state of Melaka using energy efficient LED lamps purposely to reduce CO2 emissions, lower the cost of road lighting and to improve road safety. About 100 thousand HPS luminaires will be replaced with an LED system at an estimated cost of RM45 to RM60 million. The capital cost of the project can be partially recouped through energy and maintenance savings generated in the operation phase and the client is the Melaka Green Technology Corporation, an organisation owned by the Melaka state government and tasked to implement environmentally-friendly projects in Melaka. It is the intention that the pathfinder project will be replicated across other states in Malaysia and other countries in Asia.

Electric Buses

In 2015, Melaka started with two electric buses operating around the Unesco World Heritage Site in Bandar Hilir. The State Transport and Project Rehabilitation Committee chairman, Datuk Lim Ban Hong said the 'hop-on hop-off' bus service would be operating with a one-price ticket system. It became the first electric bus used in Malaysia on public roads and it is believed that the usage should help in reducing traffic congestion, air and noise pollution. The electric bus service operates under the state government's subsidiary company. Lim said the two buses were among 40 electric buses expected to be fully operational throughout the state by the end of 2016. The state received another 38 electric buses from the Shanghai Automotive Industry Corporation in China in stages from early 2016. Lim said a fully-charged bus could travel as far as 180km and the battery would take 100 minutes to recharge. It can travel up to a maximum speed of 76km per hour. The 33-seater bus has one seat for the disabled and is also equipped with nine CCTV cameras. Lim said a charging station has been built at the Melaka Sentral Bus Terminal for the electric buses.

Contribution of the Study

Awareness and understanding are the most efficient way to overcome problems in green city projects. This study provides a better understanding of the RE programs and the GCC by the local governments. It also helps to build strong awareness and understanding with all local authorities to implement the goals and vision of green city programs to be a part of successful agenda. Furthermore, this study formulates solutions to minimize problems in RE and GCC between local governments with the exploration of guidelines in promoting green city in Malaysia.

Conclusion

The potential outcome of this study would help the local governments, especially the Melaka local government to mitigate the challenges facing the Green City development by using renewable energy as its main programme. Furthermore, proactive steps need to be taken among non-organisation agencies and also the public to ensure fast development of renewable energy. The local government of Melaka must have initiatives or creative techniques to deliver the information for public awareness (Islam *et al*., 2009). Furthermore, the efficiency and effectiveness of renewable energy programmes will increase the sustainability of nature. The reduction of fossil fuel as the main source of energy in many industries will reduce the air pollution level (Ahmad *et al*., 2016). Besides, it plays a major role in the depletion of the greenhouse effect by transforming the energy system especially transform it into electrical system as the electricity is the main power to all activities happen and it led to carbon dioxide release (Abdelwahab et al., 2018).

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