# Study Report for FY2020

# MOE City-to-City Collaboration for Zero-Carbon Society project

(Project developing a policy and implementation framework for building energy efficiency through city to city collaboration between Kuala Lumpur Government and Tokyo Metropolitan Government)

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Institute for Global Environmental Strategies

Tokyo Metropolitan Government

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FY2020 MOE City-to-City Collaboration for Zero-Carbon Society project （Project developing a policy and implementation framework for building energy efficiency through city to city collaboration between Kuala Lumpur Government and Tokyo Metropolitan Government）

2 Project outline

Kuala Lumpur, the capital of Malaysia, is located on a hillside of the southern end of the Malay Peninsula. Kuala Lumpur is one of the largest cities in South East Asia with a population of 1.8 million in the central district that reaches 7.23 million when expanded to the greater Kuala Lumpur area. It was ranked 52 out of 57 municipalities in the Climate Change Performance Index for 2009. The rise in consumption for energy and electricity in the commercial and residential sector is notable compared to the industrial sector.

The “Kuala Lumpur Low-Carbon Society Blue Print 2030” which defines actions required to reach the city’s 2030 target of reducing carbon intensity per GDP by 70 %, was used as reference when developing Structure Plan 2040, the statutory guideline for managing the city’s development. Low carbon policies are now mainstream in the city’s plan.

This project is based on the collaboration between Tokyo Metropolitan Government and Kuala Lumpur City Government started in 2019 for a maximum of three years, with the purpose of developing a system to decarbonize Kuala Lumpur by learning from Tokyo’s energy efficiency policies for buildings, their impacts, and discussing key technology for it to happen and their feasibility in Kuala Lumpur.

This year, the project proponents supported Kuala Lumpur in defining the technical selection criteria to install or replace appliances required to realize energy efficiency and renewable energy generation; developing a plan for replacing equipment; and prepared for the coming discussions on developing building guidelines with energy efficiency and renewable specifications. (contract specification 4-1(1)-(3), 4-2(1), (2))

Next, project proponents studied the characteristics of buildings per usage (office, hospital, hotel, housing etc.) in the greater Kuala Lumpur area by $CO_2$ emissions and energy consumption. (contract specification 4-1(4))

Lastly, support was offered to develop Kuala Lumpur’s zero-carbon scenario which is the first for a metropolitan city in Asia. As a result, a scenario for becoming carbon-neutral by 2050 was developed. (contract specification 4-1(5))

Project proponents and their respective roles

| | |
|---|---|
| Institute for Global Environmental Strategies (IGES) | Overall project management |
| Tokyo Metropolitan Government, Bureau of Environment (TMG) | Knowledge transfer of building related policies for energy efficiency and CO2 reduction |
| Kuala Lumpur City Government (DBKL) | Adopt energy efficiency and renewable measures for their public buildings |
| Sustainable Energy Development Authority（SEDA） | Offer input of Malaysia's energy efficiency and renewable energy policies |
| Universiti Teknologi Malaysia (UTM) | Scenario analysis and coordination of the project members on the Malaysian side |
| E-konzal | Scenario analysis |

# 3 Background

## 3.1 The climate in Malaysia

The tropical climate in Malaysia is due to its location near the equator. It rises to 32 degrees Celsius in the daytime and drops to 22 degrees Celsius in the nighttime. The sun shines for a relatively long duration at an average six hours per day. The wind does not blow as strongly, making natural ventilation challenging in concrete structured buildings and ventilation equipment necessary.

## 3.2 Energy policy in Malaysia

Malaysia enjoys abundant energy resources, and is a major exporter of oil and gas, particularly strong in liquid natural gas. Malaysia is a net energy exporter and from the need to reduce oil for generating electricity efforts were made to distribute the energy mix under the 10th Malaysia Plan (2011-15) by expanding use of coal and liquid natural gas, promoting construction of hydropower and super critical coal thermal power generators. Under the 11th Malaysia Plan (2016-20) the focus shifted to the introduction of more renewables as an energy source. Recently, a plan was made public to increase renewables from one % of the energy mix to 20 % by 2025. To act upon the Renewable Act and the New Renewable Action Plan, the Sustainable Energy Development Agency (SEDA) was established to develop the required human capacity, and the feed-in-tariff system was introduced.

In Malaysia, power generation has been deregulated but the transmission and distribution lines are controlled by three companies TNB, ESB and Sarawak Energy Berhad in the regions they each control. TNB is the largest of the three, as it distributes to the Malay Peninsula. The feed-in-tariff is financed from the 1.6 % tariff imposed on the monthly bills for electricity consumers using over 300kWh/month. The regulator Energy Commission has offered licenses to over 10,000 applicants for 598mW. A large amount licenses are allocated in biomass rich Sabah of Borneo Island as well as Selangor of west Malaysia Peninsular, Pahang of east Malaysia Peninsular. The FiT faced difficulties when the applications began to exceed the available license quotas, and it was realized that the funding was enough. When the price of solar photovoltaic panels become more affordable, the

government decided to switch the monetary incentive scheme from the feed-in-tariff to the net energy metering program (NET) and the large scale solar (LSS). The NEM applicants enjoy a performance incentive that results in the electric consumption being measured as the net of the electricity users' overall monthly consumption and the monthly output from the same users' solar panels. The LSS program was developed for mega-solar projects allowing applicants to generate large volumes electricity from renewables. The self-consumption program (SELCO), and solar leasing programs for vacant roof space, were also introduced. NEM will be upgraded to allocate different quotas for residential housing, government buildings and commercial buildings in 2021.

### 3.3 Energy efficiency and conservation policy in Malaysia

Malaysia's basic philosophy to promote sustainable economic growth was to supply stable and affordable energy resources to the domestic market. The philosophy increasingly became a burden to the national coffer since Malaysia's energy subsidies are more substantial compared to other countries, and the rules for Efficient Management of Electrical Energy (EMEER) was introduced in 2008.

In 2010, the Ministry of Energy, Green Technology and Water developed the National Energy Efficiency Action Plan (NEEAP) with respective sectors details as in: plan duration; targets; and policies required to achieve those targets. According to the NEEAP, reduction potential is largest for the industrial sector, and especially in those for cement and lumber. The commercial and residential sectors should increase their energy consumption in proportion to the economic growth, and by foreseeing this trend, minimum performance standards (MEPS) of energy efficiency for five home electric appliance including air conditioners and refrigerators were developed. MEPS defines the compulsory minimum level of energy efficiency for all of these appliances, and to which sales will be suspended if not observed.

Education and training courses were offered with the support by UNIDO, UNEP and other international organizations and under the supervision of the Energy Commission. Energy management and energy audit courses, among others, are now offered by SEDA, the Green Technology Corporation and private training institutions. It is mandatory for offices and factories

with electricity consumption exceeding 3MkW per six months to have an energy management personnel.　1444 have been registered.

The Energy Efficiency Conservation Act (EECA) which is hoped to promote further efforts, is on its way to be enacted in 2021 for actual implementation in 2022.　When enacted, buildings will be regulated for their thermal energy in addition to electricity, and offices/factories with smaller electricity consumption will also need to have energy management personnel on their grounds.

### 3.4　Climate change policies in Malaysia

Malaysia's carbon dioxide emissions was 248,195Gg$CO_2$（2014 年）out of which 54% is from the energy sector, 25% from the transportation sector, and 9% from the industrial sector.　The commercial and residential sectors were minor each only accounting for approximately 1%.

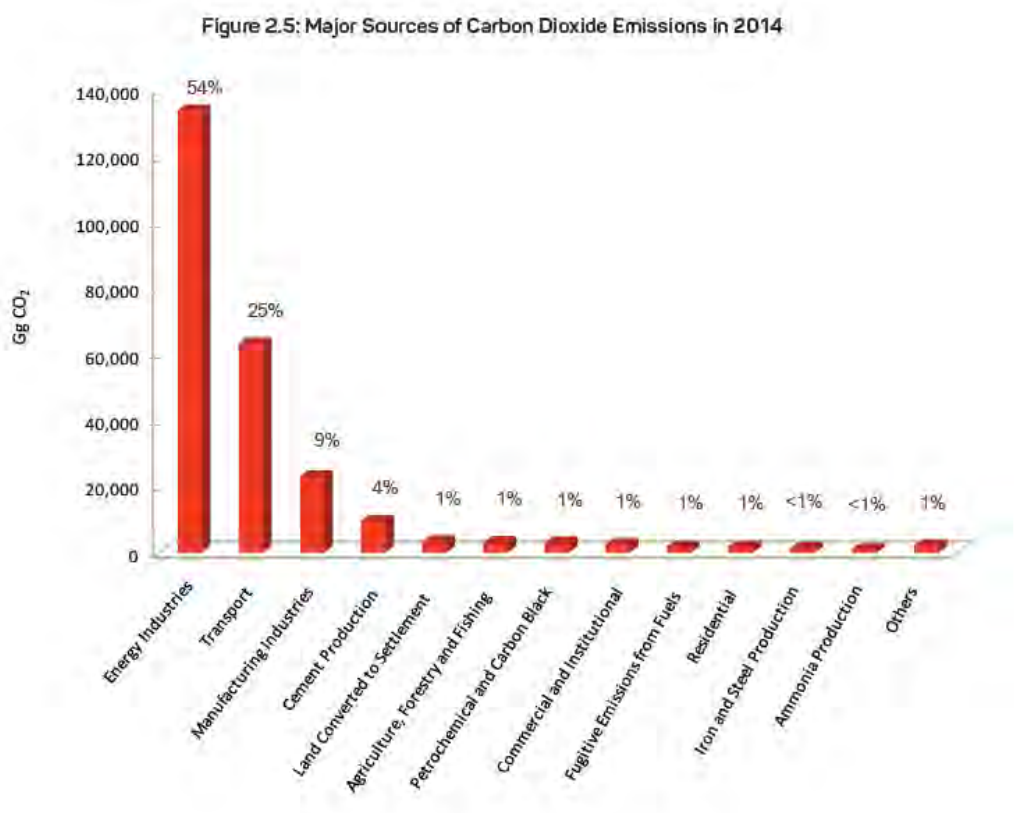



Figure 3-1：Carbon emissions per usage (2014)

Source: Malaysia's second biannual report in accordance to the UNFCCC

Malaysia's Ministry of Energy and Natural Resources and Ministry of Environment and Water are the main administrative agencies for climate change countermeasures. The Ministry of Housing and Local Government is added when it involves local policies. For example the ministry administers the national initiative Low Carbon Cities Framework which supports low carbon transitions in cities using a tool to calculate carbon emissions.

There is a new plan to develop a guideline for the 154 municipalities. SEDA, which promotes energy audit training and a rating mechanism for energy efficient buildings, is developing the National Low Carbon Cities Master Plan (2021-30) with the support of UNDP. Iskandar Regional Development Authority (IRDA)、Petaling Jaya City Council (MBPJ) 、Hang Tuah Jaya Municipality Council、Kajang Municipality Council and Shah Alam City Council (MBSA) are participating as model cities to this initiative by SEDA and UNDP, The Ministry of Energy and Natural Resources and the Ministry of Housing and Local Government, and the Ministry of Transport serve as members to the advisory board.

### 3.5 Green Building related policies

Green technology is hoped to be one of the major engines for green growth and sustainable development in Malaysia. The green technology strategy includes, among others, economic growth promotion, energy use reduction and environmental conservation for future generations. Energy, buildings, waste management, and transport are where development of technology is most prominent. Investment tax allowance for investment of green technology, and income tax exemption for use of services and/or systems were introduced in 2014 to enhance green technology development

This led to multiple green building rating systems being introduced in Malaysia to evaluate environmental quality in buildings. Green Building Index, GreenMark, Green Pass, PWD Green Rating System were are some examples, of which the Green Building Index (GBI) developed by Malaysia's association for architects and engineers is most prominently recognized and has rated 1144 commercial and residential buildings. Because GBI rates buildings using indictors for energy efficiency, waste and water resource management, a building can be highly rated if it receives high marks for waste and water management but low marks for energy, it is not always

suitable to offer buildings low carbon gradings. Meanwhile, GreenPass which is supported by SEDA uses energy consumption and carbon dioxide emission reduction as indicators, and is appropriate for the Low Carbon Cities Framework that aims to realize low carbon. The National Low Carbon City Action Plan's five model cities have all registered some of their public buildings into GreenPass's online monitoring system BEDOS. Once more buildings are registered into GreenPass there will eventually be meaningful results based on quantitative data analysis of good case studies.

Table 3-1 : List of registered buildings in GreenPass per usage

| Building usage | Registered |
|---|---|
| Hospital | 39 |
| Commercial buildings | 14 |
| Residence (bungalow) | 0 |
| Residence (terrace) | 1 |
| Office | 77 |
| Schools | 20 |
| Residence (high risers) | 13 |
| Others | 23 |
| Total | 187 |

Source : SEDA

The Malaysia green building confederation (MGBC) together with other NGOs' negotiations with the construction industry led to the development and use of sustainable construction methods and materials. Unfortunately, there are as yet, no regulator in Malaysia with the authority to regulate building energy use. The guidelines for building energy efficiency by building envelope and facility equipment MS1525 (non-residential buildings) was only approved as a building code enforcement ordinance in a couple of states (three out of 13 states) and for specifically the section of building envelopes. There is little sign for the 154 municipalities to adopt it. MS1525 is suitable for new construction and a lot of the specifications are difficult to apply in existing construction. If the enforcement ordinance is eventually accepted, the specification only regulates buildings with gross

floor area larger than 4000m2 and using central cooling which make a large number of commercial outside its scope.

The MS1525 is being applied to Putrajaya city's public buildings to analyze their effects to sort out this issue. The BEI (Building Energy Intensity) which is the energy consumption per square meter (kWh/m2/year) was reduced by 25 % to 146 kWh/m2/year from the base year of 2009 in ten years by 2019. This is one case study that shows the MS1525 does work to increase energy efficiency as generally BEI commercial buildings are an average 200～300 kWh/m2/year.

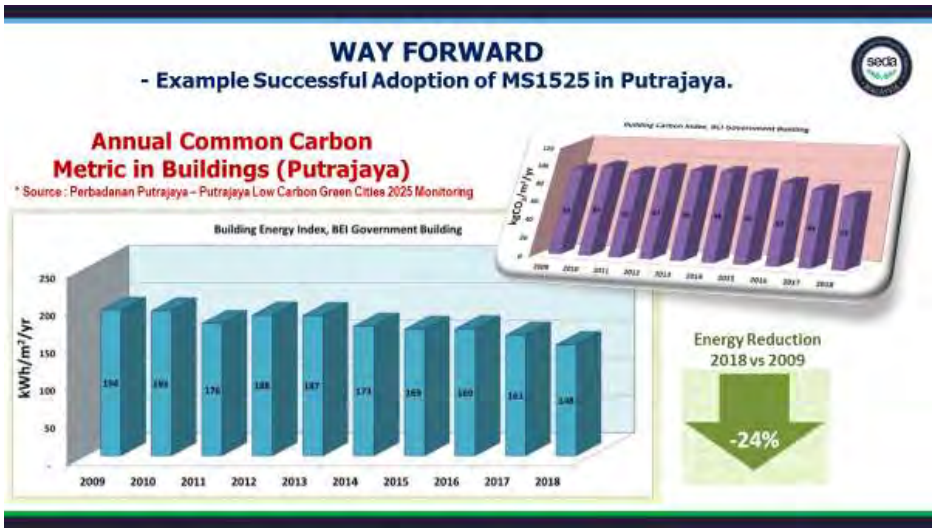



Figure 3-2: The reduction of BEI in government buildings (the case of Putrajaya)
Source: SEDA

Lastly, Zero Energy Building（ZEB）are being discussed globally. In the case of Malaysia, SEDA with the support of Japan's ECCJ (Energy Conservation Center, Japan) is working on adapting the Japanese ZEB definition and there will continue to be policy efforts to enhance energy efficiency and use of renewable energy in buildings

## 4 Kuala Lumpur's Low Carbon System

### 4.1 Project objective

In the previous year, Tokyo Metropolitan Government's countermeasures to increase energy efficiency and reduce $CO_2$ emission in the government's building, as well as those designed to reduce $CO_2$ emission in private buildings were used as reference to promote low carbon policies in Kuala Lumpur. As a result, the development of a low carbon system by Tokyo Metropolitan Government and Kuala Lumpur (T2KLLCS) began. Kuala Lumpur's 1955 buildings were analyzed for their electricity consumption, and reduction potential, which simultaneously led to the replacement with energy efficient appliances using the government budget.

As previously mentioned, energy efficiency and conservation initiatives and policy implementation are deployed in multiple sectors throughout Malaysia. The Malaysian standard MS1525, energy auditing of government buildings, rating mechanisms such as the GBI, and the construction industries development and use of sustainable construction methods and material. Malaysia has taken steps for a solid foundation but each policy needs to be consolidated into a single system for which there is little incentive and neither are their compliance mechanisms. Tokyo Metropolitan Government's technical knowledge to promote environmental sustainability in buildings are suitable for the needs of Kuala Lumpur. The project objective is therefore to enhance energy efficiency by developing a system for Kuala Lumpur's government buildings.

### 4.2 Project procedures

Last year, Tokyo Metropolitan Governments' system to ensure new and existing government owned buildings' energy efficiency was introduced at a workshop. At the workshop, Tokyo introduced to Kuala Lumpur City the technical points that need to be considered when introducing or replacing appliances based on Tokyo's energy efficiency and renewable energy guidelines for government buildings owned by Tokyo Metropolitan Government and their effective operation and maintenance procedures. The guidelines were developed to aspire government buildings to attain "Grade

3", the highest level under Tokyo's Green Building Program. A rough estimation technique to calculate the reduction potential of $CO_2$ emissions and energy consumption was introduced for four model buildings. An inventory of the energy consumption for 1955 government owned buildings was also developed.

This year, project proponents tried to localize the system introduced by Tokyo to Kuala Lumpur. Online meetings were held every month and the priority for replacing building appliances was made clear for the Kuala Lumpur City Hall buildings and training facility.


Figure 4 -1：Four model government buildings

4.3 Understanding Kuala Lumpur's challenges (spec 4-1(1), 4-2(1))

A total of ten online meetings were held between August and January at least once a month to design an effective system for energy efficiency in Kuala Lumpur's approximately 2000 government buildings.

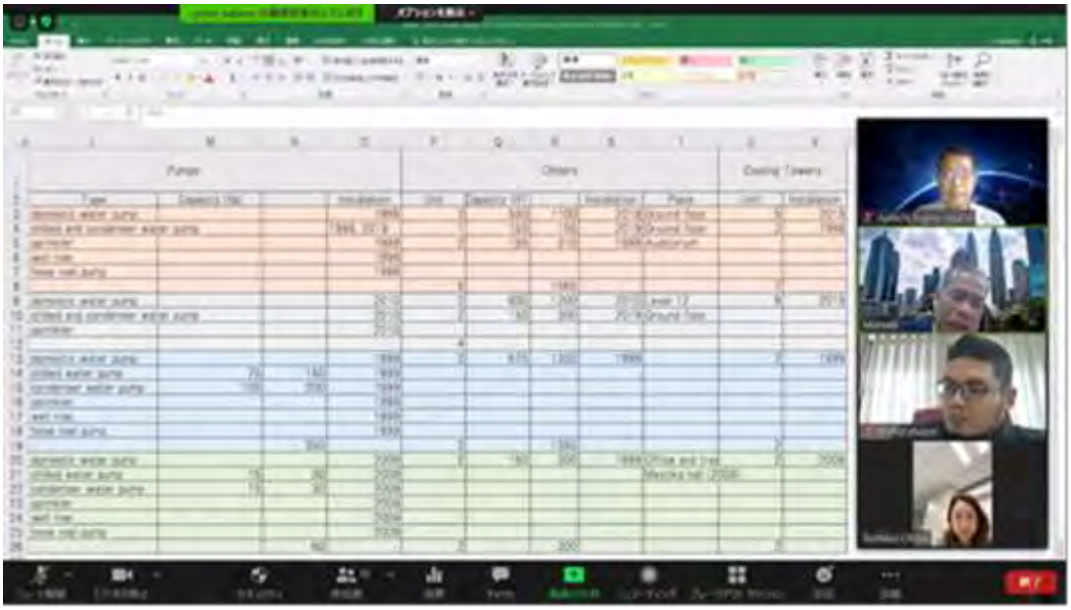


Figure 4-2：Online meeting

4.4 Support offered to develop and budget a replacement plan（spec 4-1(2)）

As a result of the succession of meetings, the three model buildings with particularly large energy consumption were identified, as well as the appliances to be replaced, the budget amount, and the timeline. The HVAC (heating, ventilation, air-conditioning and cooling) for the remaining model building had already been renovated and was removed from discussions on the budget plan.

Table 4-1：List of HVAC appliances to be replace in the model buildings

| Model building | Appliance replaced | Budget | Replacement in |
|---|---|---|---|
| Menara 1-tower | AHU | 4,000,000 RM | 2021 |
| Menara 1-auditorium | Heat source, cooling tower, pumps, AHU | 3,500,000 RM | 2021 |
| Menara 3 | Heat source, cooling tower, pumps, AHU | 10,000,000 RM | 2022 |
| IDB training center | VRF to be introduced | 2,500,000 RM | 2021 |

Figure 4-3：Appliances for replacement

## 4.5 Prioritizing building appliance replacement and work on guidelines for energy efficiency and use of renewable generated energy in buildings (spec 4-1(3))

During the budgeting process, project proponents defined the sequence for replacing building appliance and worked on the guidelines for energy efficiency and use of renewable generated energy in buildings

### 4.5.1 Defining the sequence for replacing with energy efficient appliance

Just about all the buildings in Kuala Lumpur are all-electric. Offices for Kuala Lumpur's government buildings use 63 % of their energy consumption on HVAC, and it was confirmed that these appliances should be prioritized compared to lightings, elevators or water pumps. Of the HVAC, heat sources were assumed to have a higher reduction potential for $CO_2$ emissions and energy consumption, which was why heat sources were recommended for due consideration to the Malaysia project proponents. A rough estimation technique to calculate the impact of a replacement to high efficiency appliances was shared with the Malaysia project proponents. It uses the number of installed alliances, technical specification, and the installation year among others to calculate the reduction potential of CO2 emissions and energy consumption. Tokyo Metropolitan Government responded to the Malaysian project proponents' inquiry on how to prorate the energy consumption for one building when it consists both an office and cultural facility; and when to consider for replacement.

Heat source equipment

| No | Appliance targeted for repair | Installation Year | Appliance Symbol | Heat Source Appliance Model | Cooling capacity [RT] | Power input [kW] (rated value) | unit | COP Boiler efficiency (rated value) | High efficiency appliance [kW] |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| Degree of Implementation | | | | | — | — | — | — | |
| Sum | | | | The entirety | 1,465RT | — | 5 | — | |
| | | | | Appliance for repair | 310RT | — | 2 | — | — |
| | | | | Energy-savings | — | — | — | — | 1,085kW |
| 1 | ○ | 1998 | Audi (Dunham Bush), Auditorium) | Water cooled Centrifugal (turbo) size <300RT | 155 | 109 | 1 | 5.00 | |
| 2 | ○ | 1998 | Audi (Trane), Auditorium | Water cooled Centrifugal (turbo) size <300RT | 155 | 109 | 1 | 5.00 | |
| 3 | | 2017 | Dunham Bush, Tower | Water cooled Centrifugal (turbo) size >300RT, <600RT | 500 | 350 | 1 | 5.00 | |
| 4 | | 2017 | Dunham Bush, | Water cooled Centrifugal (turbo) size >300RT, <600RT | 500 | 350 | 1 | 5.00 | |

Figure 4-4 : Sheet used for data input and available for each equipment (heat source sheet)

Data was collected by the Kuala Lumpur officials and others for heat source, cooling towers, pumps, central air conditioning, packed air-conditioning, and for their number of units, year of installation, manufacturer, COP, cooling capacity to develop an inventory for each of the four model buildings. The data collection was conducted during the lockdown in Malaysia's major cities caused by COVID-19 and met severe challenges. The appliances which should be replaced were clarified, however, and reflected in the 2021-2022 budget plan. Once the project is implemented the effect of the replacement should be monitored and recorded for the four model buildings but also for as many government buildings as possible which are renovated after them.

### 4.5.2 Factors to consider when selecting a site for solar power generation

As per the simulation of the zero carbon scenario, Kuala Lumpur will be generating 2 % of the electricity from solar generation on buildings. Tokyo Metropolitan Government shared the selection criteria and other points they took note of, together with the relative case studies in response to Kuala Lumpur's request.

Kuala Lumpur's location selection criteria was defined once receiving Tokyo Metropolitan Government's suggestions and ten candidate buildings

were considered.

【Kuala Lumpur's location selection criteria】

| | | |
|---|---|---|
| ■ Energy consumption | ■ Roof size | ■ Roof slope, carrying load |
| ■ Access | ■ Social impact (symbolic building, opportunity for citizens to touch and experience) | ■ vandalism |
| ■ National policy | ■ $CO_2$ emission reduction | |

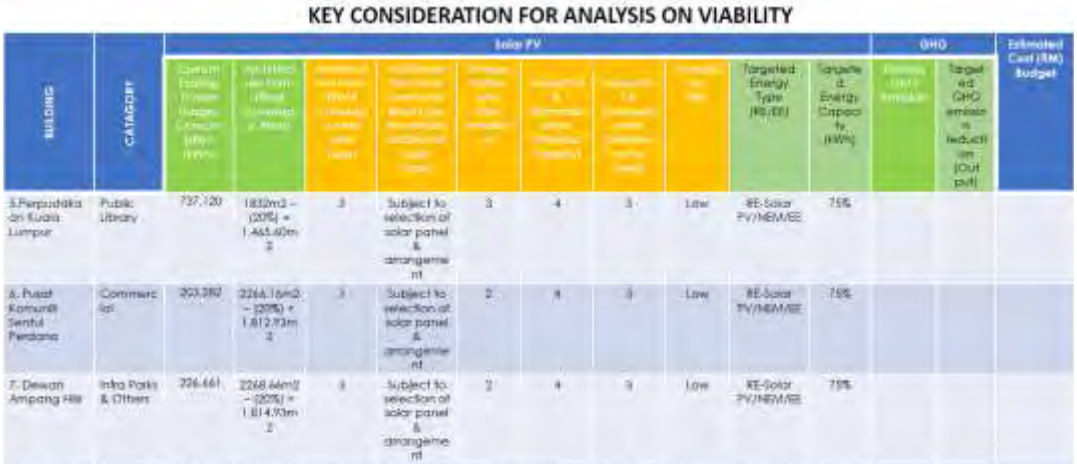



Figure4-5：Comparison chart for candidate buildings of solar power generation


Figure 4-6：Candidate private buildings, clockwise from upper left: Commercial complex (IKEA, Ken Tower) University campus (UTM), Commercial complex (Duke)

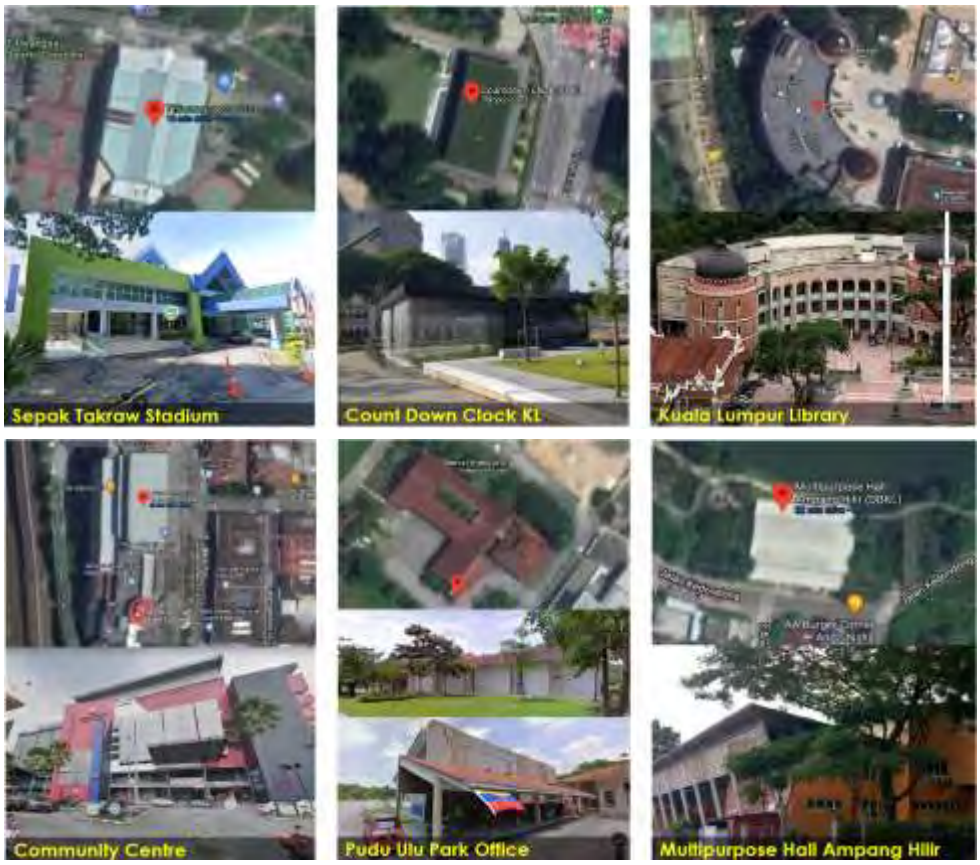



Figure 4-7 : Candidate government owned building , clockwise from upper left: stadium, countdown clock, library, multipurpose hall, park office, community center

### 4.5.3 Consideration of energy efficiency and renewable energy generation guidelines from several municipalities in Japan

Tokyo Metropolitan Government has developed energy efficiency and renewable energy generation guidelines to aspire buildings owned by the Tokyo Metropolitan Government to achieve “Grade 3”, the highest level under Tokyo’s Green Building Program. The guidelines define how to replace existing appliances with those with high efficiency and introduce renewable energy.

The Tokyo Metropolitan Government’s guidelines and similar documents for Kyoto city, Takarazuka city and Sapporo city were shared with Kuala Lumpur as elements to refer to when considering Kuala Lumpur’s guidelines and efforts were made to introduce them. The municipalities differ in population size, gross floor size, which is why the number and type of technical indicators also differ.

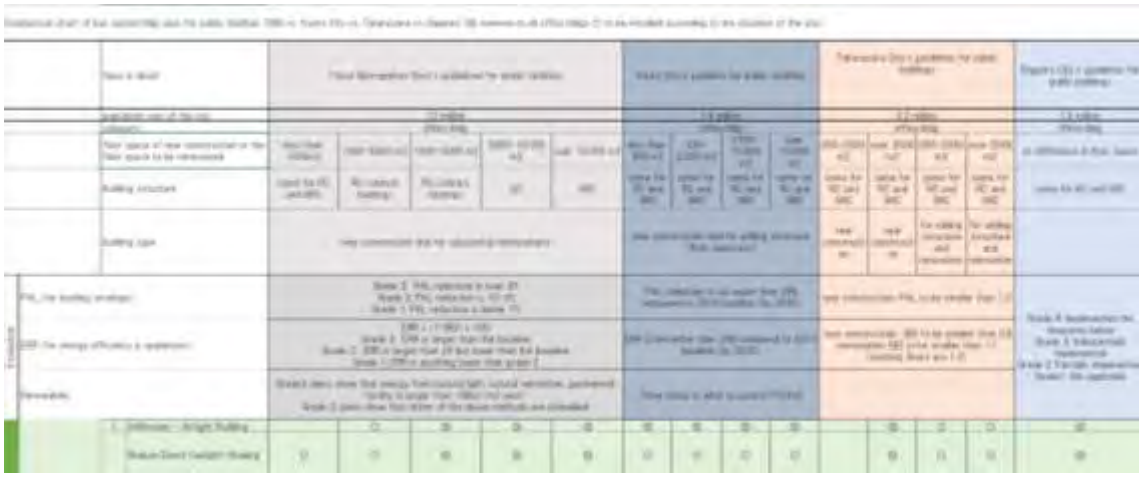


Figure 4-8: Building guidelines for government buildings in several Japanese municipalities

4.6 Preparations for the private building's T2KLLC (spec 4-1(4))

Kuala Lumpur is Malaysia's largest city which accounts for 16 % of the national GDP. It supported the recent national economic growth of 6 - 7 % (2011-2018) and is particularly strong in tourism, finance, manufacturing of electronic devices, and construction. The city has attracted migration from outside leading to a high population density.

The development of the highway between Shah Alam and Kuala Lumpur, as well as the LRT and MRT for domestic transport offered better access and led to many real estate development in 2001-2018. Out of the 4792 projects during the period 43% were for housing and 23 % for commercial facilities. Kuala Lumpur predicts the population will increase to 2.25 million by 2040 from 1.8 million in 2018, although the trend will relax along the way. The city governments' development plans are to have high risers for housing since the amount of undeveloped land is limited.

The amount of $CO_2$ emissions of 2019 were the largest for commercial and residential sector building amounting to 49 % of the total, and the simulation in chapter 5 indicates with no mitigation actions it will increase by 650 %.

The low carbon green building policies of Malaysia were introduced as a means to increase the number of green buildings. Project proponents sought to develop a typology by building usage, and identify which has the largest $CO_2$ emissions and energy consumption.

Project proponents did not have access to building data for Kuala Lumpur's inner city, and utilized the 2010 data from Putrajaya located in greater Kuala Lumpur. It shows hotels in the commercial sector are the largest in terms of energy and carbon intensity and might require countermeasures. The low intensity found in residential high risers show the city's plan are rational for limiting both energy consumption and low carbon emissions.

Table 4-2: Energy and carbon intensity per building usage in Putrajaya's model buildings (2010)

| Rating | Building usage | Energy intensity (kWh/m2/yr) | Carbon intensity ($kgCO_2$/m2/yr) |
|---|---|---|---|
| 1 | Hotel | 521 | 354 |
| 2 | Hospital | 357 | 242 |
| 3 | Office | 202 | 137 |
| 4 | Residential (bungalow) | 87 | 59 |
| 5 | Residential (semi-detached) | 58 | 39 |
| 6 | School | 43 | 29 |
| 7 | Residential (high riser) | 33 | 23 |

## 5 Becoming carbon neutral in Kuala Lumpur (spec 4-1 (5))

### 5.1 Project objective

As a component of the overall project for introducing a decarbonizing system with a focus in energy efficiency in Kuala Lumpur's buildings, this chapter aims to outline the development process of Kuala Lumpur's zero carbon scenario for 2050, and how Japanese case studies and their policies were shared.

### 5.2 Project procedure

#### 5.2.1 The basic principles

Kuala Lumpur's 2040 low carbon scenario's simulation data was used and updated to create a zero-carbon scenario for 2050. The case studies used in the "Kuala Lumpur Low-Carbon Society Blue Print 2030" and the "Kyoto 2050 Zero Carbon Scenario" was used as reference to create multiple options that would serve when discussing the first zero-carbon scenario in Asia's metropolitan city. The Universiti of Teknologi Malaysia and other stakeholders from Malaysia were consulted for their input and the scenario was developed.

#### 5.2.2 The methodology for creating a zero-carbon scenario

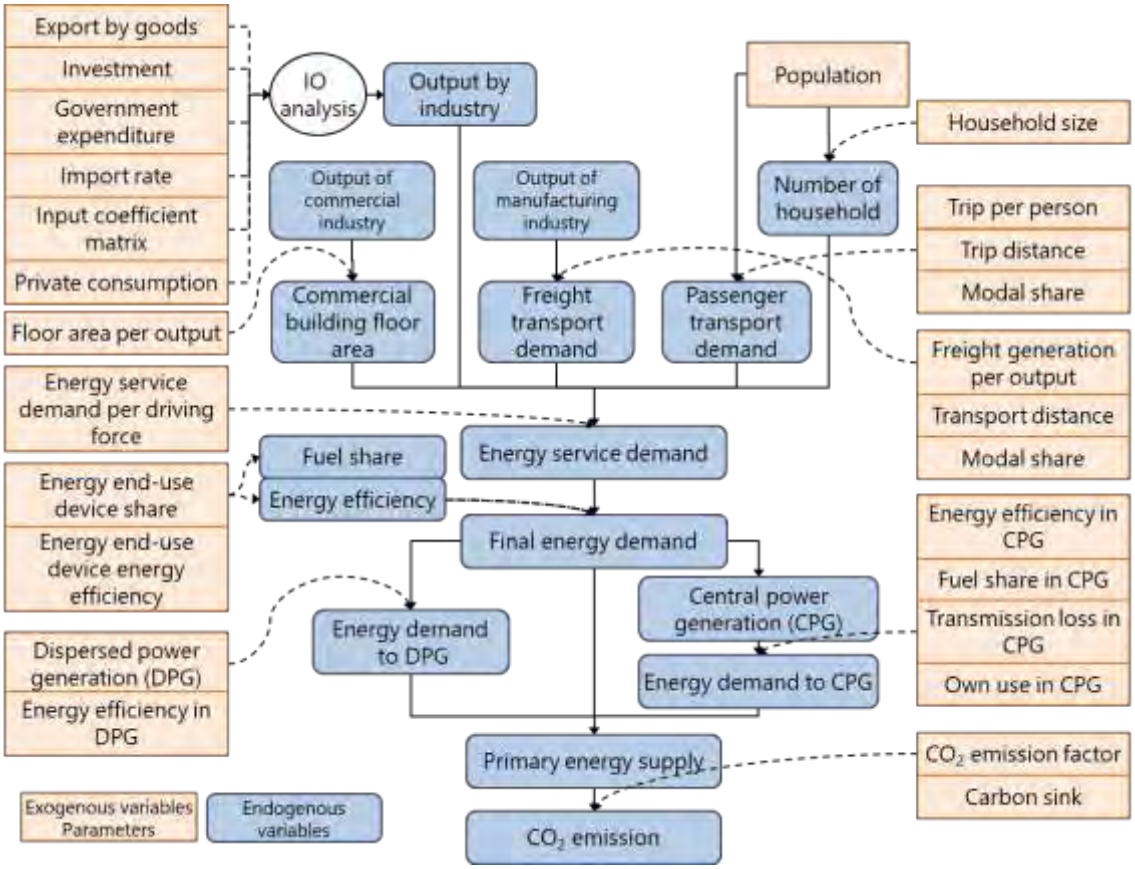
The project proponents first set out to create the shell of the scenario by deciding on the target year, the base year, subject sectors, different types of scenarios. The target year should be as far off as possible to allow for a large reduction in GHG emissions to occur, but it should also be in enough proximity to allow policy makers and citizens to imagine the output. On the other hand, the base year needs to be the nearest point in time where all the major statistical data of the city is available, as the existing datasets are used to prepare for a solid foundation from which the predictions will be made.

Next, project proponents gathered: statistical data for the base year which will serve as the basis for the predictions; future development plans which will serve as reference when imagining the scenarios; and information on low carbon countermeasures. The statistical data for the base year consisted of: socio-economic indicators such as population, the number of

households, production value, GDP, and transport volume; as well as energy supply and demand and GHG emissions. Such data were drawn from local statistical reports and national economic accounting data. When the required data was not found in either source, reports published by international organizations were used as reference.

For coming up with possible scenarios, project proponents gathered: future development plans and visions for each sector, their targets, visions, energy policies, and environmental policies. It was taken into account that information for measures should be limited to those that could be implemented by the target year. When gathering information on policies promoting energy related technology, project proponents decided to reference those that would create a transformation of the traffic structure, and those that utilize renewable energy.

Future lifestyles, the future state of industries, transitions of the city structure by the target year, and planned countermeasures which should be effective by the target year were considered, and applied to the ExSS (extended snapshot) tool as indicators. The GHG emissions were estimated by using socio-economic data with particularly large impacts such as: economic growth, export volume per each sector, and population growth by age group. The figures were reflected to the ExSS tool which calculated the future socio-economic indicators, energy consumption, and GHG emissions for each scenario.




Figures 5-1 ： The structure of the ExSS tool

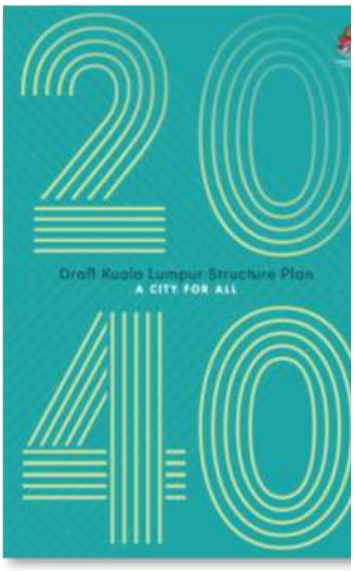
## 5.3 Kuala Lumpur's zero-carbon scenario

### 5.3.1 The value created for Kuala Lumpur's climate change policies by developing the zero-carbon scenario

The University of Teknologi Malaysia was the main actor for developing Kuala Lumpur's low carbon scenario for 2030 "Kuala Lumpur Low Carbon Society Blueprint 2030" in 2016. The blueprint was developed with the key slogan being "a greener better Kuala Lumpur" and used three driving forces and twelve key actions that would reduce $CO_2$ emissions for 2030 by 70 % from BaU and propel Kuala Lumpur into a low carbon world class city. Kuala Lumpur adopted the "Kuala Lumpur Low Carbon Society Blueprint 2030" and began immediately to work on climate change policies suitable for cities. Two statutory development plans were developed to guide Kuala Lumpur's growth; the "Kuala Lumpur Structure Plan 2040" and the "Kuala Lumpur Local Plan 2040". The "Kuala Lumpur Structure Plan 2040" includes as one of its targets, the development of a "climate smart and low

carbon city", and the "Kuala Lumpur Local Plan 2040" added as a new area to promote "green technology, low carbon and renewable energy", and are mainstreaming low carbon policies within the city's plans.


Kuala Lumpur Low Carbon Society Blueprint 2030




Kuala Lumpur Structure Plan 2040


Kuala Lumpur Local Plan 2040

Figure 5-2: Kuala Lumpur's actions for low carbon city development

Meanwhile, climate change is causing hazards in not only Malaysia but all over the world in the form of droughts, heat waves, intense rainfalls, flood and landslide disasters. The Paris Agreement concluded at COP21 in 2015 set the target to reduce human-caused GHG emissions to "net zero" within the latter half of this century. The IPCC's Special Report on Global Warming of 1.5 °C published in 2018 finds that to limit global warming to 1.5 degrees Celsius from pre-industrial levels, $CO_2$ emissions would need to fall and reach "net zero" by around 2050.

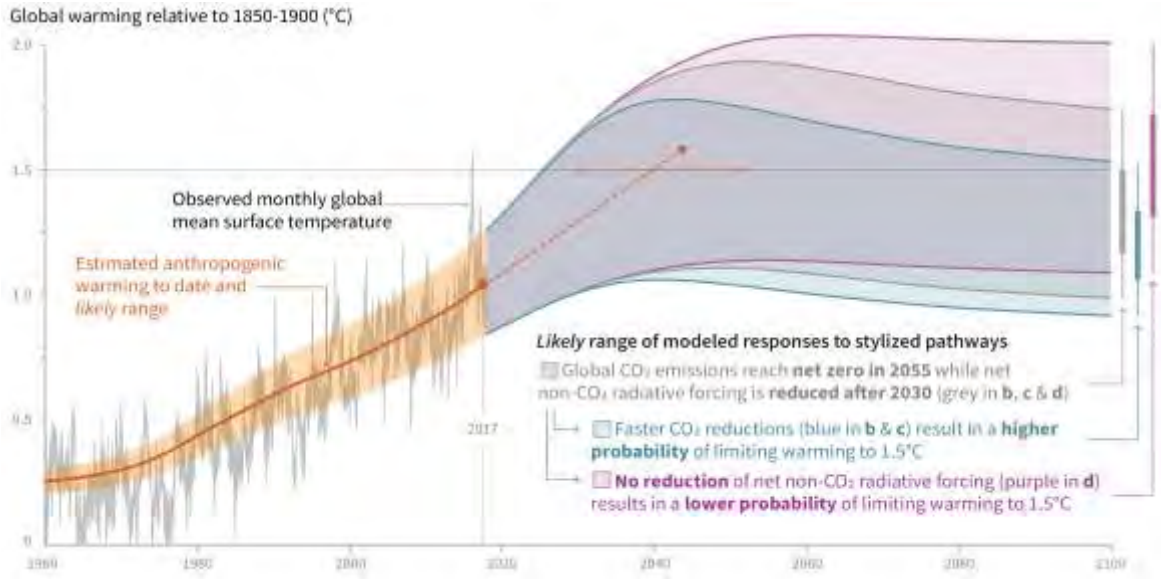



Figure 5-3: Observed global temperature change and modeled responses to stylized anthropogenic emission and forcing pathways, (source) IPCC (2018) The summary for policy makers of the Special Report on Global Warming of 1.5 °C

Given this background, Kuala Lumpur's 2050 zero-carbon scenario was developed for three reasons: first explore the possibility of Kuala Lumpur towards a zero carbon city 2050 scenario; second to enhance understanding of the implications and opportunities of moving to zero carbon; and lastly to identify the key direction and actions needed to reach this goal.

### 5.3.2 Framework of scenarios

The framework for Kuala Lumpur's zero-carbon scenarios is shown in Table 5-1. The base year is set as 2010, and the target year 2050. Two scenarios, one a business as usual (BaU) scenario and the other reflecting possible countermeasures (CM), were developed to calculate $CO_2$ emissions for the residential, commercial, industrial and transport sectors. Kuala Lumpur's energy consumption and $CO_2$ emissions for the 2010 base year is as shown in Figure 5-4. Oil accounts for nearly 70 % of the energy consumption, and the commercial sector is the largest emitter of $CO_2$ emissions.

Table 5-1: Framework of Kuala Lumpur's zero-carbon scenario

| | |
|---|---|
| Base year | 2010 |
| Target year | 2050 |
| Focused GHG | $CO_2$ |
| Focused activities | ■ Residential<br>■ Commercial<br>■ Industry<br>■ Transport (Passenger and Freight) |
| No. of scenarios | ■ BAU (Business as Usual) Scenario<br>➢ Socioeconomic development (Population and economic growth)<br>➢ Without implementation of mitigation policy in future<br>■ CM (Countermeasure) Scenario<br>➢ Same socioeconomic development as BAU scenario<br>➢ With implementation of mitigation policy in future |

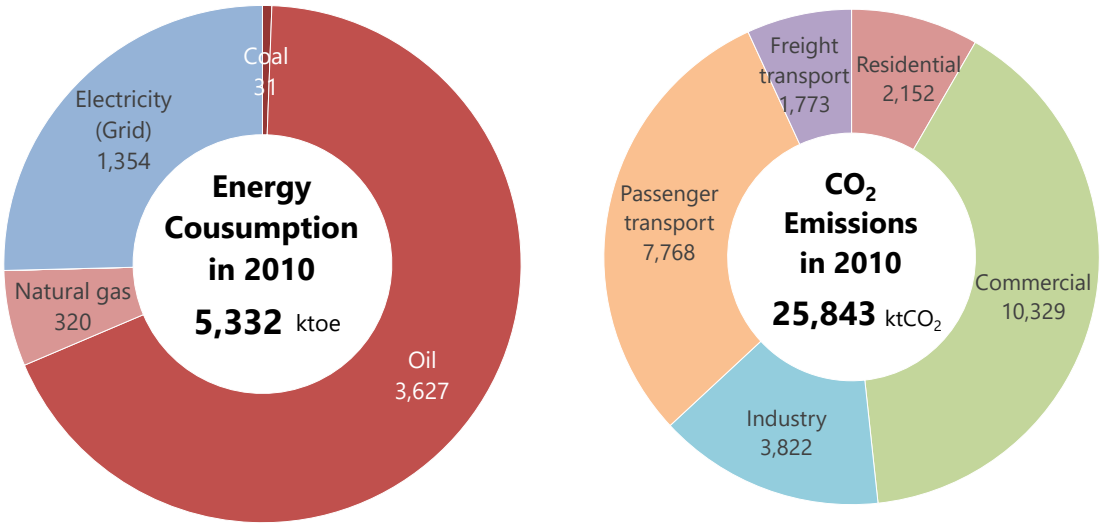



Figure 5-4: Kuala Lumpur's energy consumption and CO2 emissions (2010)

### 5.3.3 Socio-economic development

The predictions for socio-economic development are shown in Table 5-2. Population increases by 46% from 2010 to 2050. GDP per capita in 2050

becomes 4.8 times as large as that in 2010. Tertiary industry accounts for 98% of GRDP in 2050. (91% in 2010)　Transport demand also increases due to population and economic growth.

Table 5-2: Estimate of Kuala Lumpur's major socio-economic indicators

| | | 2010 年 | 2050 BaU | 2050 CM | 2050/2010 | |
|---|---|---|---|---|---|---|
| | | | | | BaU | CM |
| Population | Persons | 1,674,621 | 2,444,384 | 2,444,384 | 1.46 | |
| No. of Household | households | 440,690 | 814,795 | 814,795 | 1.85 | |
| GDP | Mill RM | 84,852 | 594,632 | 594,632 | 7.01 | |
| Primary Industry | | 54 | 378 | 378 | 7.01 | |
| Secondary Industry | | 7,815 | 11,953 | 11,953 | 1.53 | |
| Tertiary Industry | | 76,983 | 582,301 | 582,301 | 7.56 | |
| GDP per capita | 1000 RM | 51 | 243 | 243 | 4.80 | |
| Passenger transport demand | Mill.pass.km | 49,204 | 149,975 | 121,482 | 3.05 | 2.47 |
| Freight transport demand | Mill.pass.km | 1,426 | 11,588 | 10,487 | 8.13 | 7.36 |

### 5.3.4　Energy demand

Estimates for energy consumption are as shown in Table 5-3, Table 5-4, Figure 5-5. Energy consumption in BAU scenario increases to 4.4 times as large as that in 2010. Energy consumption in CM scenario can be reduced by 68% compared with BAU scenario in 2050. The commercial sector is the largest energy consumer in the both scenarios.　Oil is main energy source in 2010 and BAU scenario, but electricity is main in CM scenario.

Table 5-3: Energy consumption by sector (unit: ktoe)

| | 2010 | 2050 BaU | 2050 CM |
|---|---|---|---|
| Residential | 223 | 618 | 279 |
| Commercial | 1,144 | 9,670 | 4,361 |
| Industry | 650 | 119 | 98 |
| Passenger Transport | 2,698 | 7,799 | 1,155 |
| Freight transport | 617 | 5,019 | 1,578 |
| Total | 5,332 | 23,226 | 7,471 |

Table 5-4: Energy consumption by energy source (unit: ktoe)

| | 2010 | 2050 BaU | 2050 CM |
|---|---|---|---|
| Coal | 31 | 6 | 0 |
| Oil | 3,627 | 14,728 | 996 |
| Natural gas | 320 | 314 | 19 |
| Biomass | 0 | 0 | 562 |
| Solar heat | 0 | 0 | 293 |
| Electricity (RE) | 0 | 0 | 158 |
| Electricity (Grid) | 1,354 | 8,178 | 5,443 |
| Total | 5,332 | 23,226 | 7,471 |

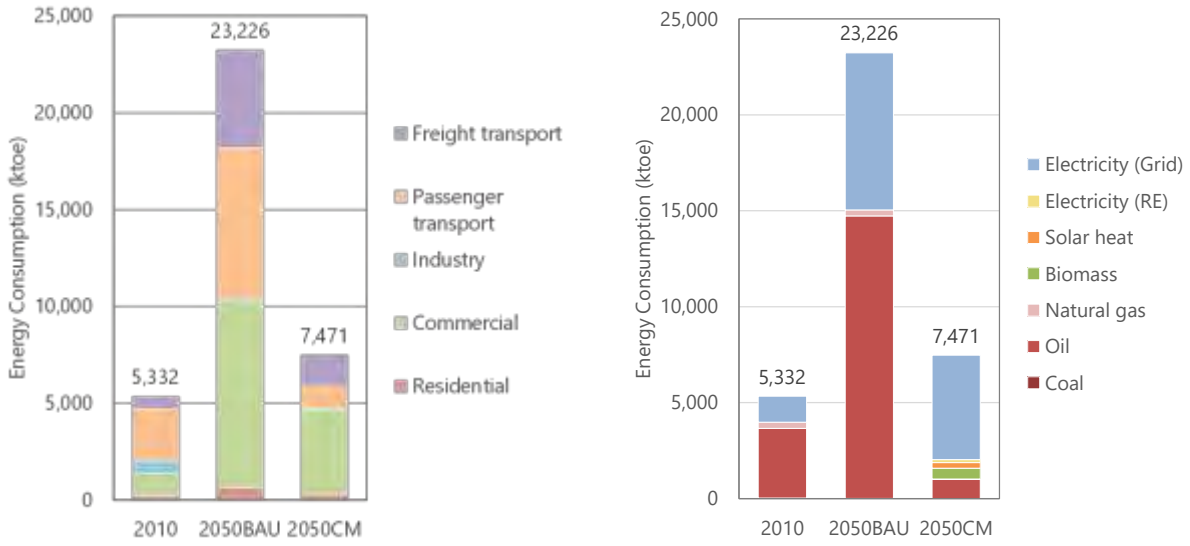



Figure 5-5: Estimates for energy consumption

### 5.3.5 $CO_2$ emissions

Estimate for $CO_2$ emissions were as shown in Table 5-5 and Table 5-6. The commercial sector is the largest emission source in 2010 and BAU scenarios. Energy-related $CO_2$ emissions in BAU scenario increases to 5.2 times as large as that in 2010. Energy-related $CO_2$ emissions in CM scenario can be reduced by 98% compared with BAU scenario in 2050. Net zero is possible if the carbon sink from preserving forests and managing them appropriately can reach approximately 3,000kt.

Table 5-5 $CO_2$ emissions by sector (unit: kt $CO_2$)

| | 2010 | 2050 BaU | 2050 CM |
|---|---|---|---|
| Residential | 2,152 | 6,176 | 0 |
| Commercial | 10,329 | 90,266 | 0 |
| Industry | 3,822 | 727 | 73 |
| Passenger Transport | 7,768 | 22,553 | 767 |
| Freight transport | 1,773 | 14,420 | 2,067 |
| Total | 25,843 | 134,143 | 2,907 |


Table 5-6: Estimate for $CO_2$ emissions

## 5.4 Results by sector

### 5.4.1 Residential sector

Under the CM scenario, electrification is promoted and electricity accounts for the largest proportion of energy use in households. Electricity is supplied from the grid, and also from self-consumption of those generated from roof-top PVs and solar heat. Meanwhile, no fossil fuels such as oil are used. Energy demand in the CM scenario can be reduced by 55% compared with the BAU scenario.

【Main countermeasures】

- Home PV installation: 29% of electricity are supplied from roof-top PV in CM scenario.
- 100% renewable electricity: Rest of electricity is supplied through grid. It will be 100% renewable in CM scenario. Deregulation of the electricity market and suppliers of RE100 electricity are required.
- Efficient home appliance: Energy efficient air conditioner, heat pump water heater, LED lighting are diffused.
- Solar heat: 10% of households use solar water heater.

Table 5-6: Energy consumption for the residential sector (unit: ktoe)

| | 2010 | 2050 BaU | 2050 CM |
|---|---|---|---|
| Coal | 0 | 0 | 0 |
| Oil | 31 | 86 | 0 |
| Natural gas | 0 | 0 | 0 |
| Biogas | 0 | 0 | 0 |
| Solar heat | 0 | 0 | 13 |
| Electricity (RE) | 0 | 0 | 78 |
| Electricity (grid) | 192 | 532 | 188 |
| Total | 223 | 618 | 279 |

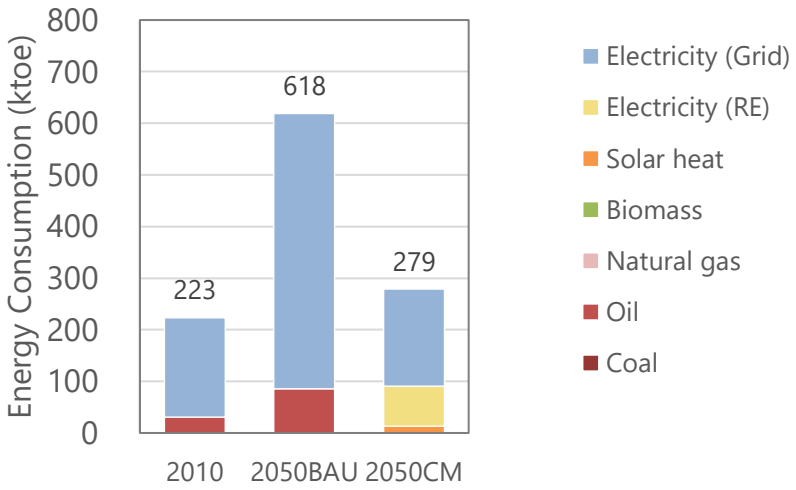



Figure 5-7: Estimate for energy consumption in the residential sector

### 5.4.2 Commercial sector

Similar to the residential sector, the commercial sector also promotes electrification and electricity is the largest energy source. In the CM scenario, roof-top PV and solar heat are utilized by 2050. No fossil fuels are used. Energy demand in CM scenario can be reduced by 55% by 2050 compared with BAU scenario.

【Main countermeasures】

- Building PV installation: 2% of electricity are supplied from roof-top PV in CM scenario.
- 100% renewable electricity: Rest of electricity is supplied through grid. It will be 100% renewable in CM scenario. Deregulation of the electricity market and suppliers of RE100 electricity are required.
- Efficient devices: Energy efficient air conditioner, heat pump water heater, LED lighting are diffused.
- Solar heat: 20% of commercial use solar water heater.

Table 5-7: Energy consumption in the commercial sector (unit: ktoe)

| | 2010 | 2050 BaU | 2050 CM |
|---|---|---|---|
| Coal | 0 | 0 | 0 |
| Oil | 244 | 2,062 | 0 |
| Natural gas | 5 | 42 | 0 |
| Biogas | 0 | 0 | 0 |
| Solar heat | 0 | 0 | 280 |
| Electricity (RE) | 0 | 0 | 80 |
| Electricity (grid) | 895 | 7,565 | 4,001 |
| Total | 1,144 | 9,670 | 4,361 |

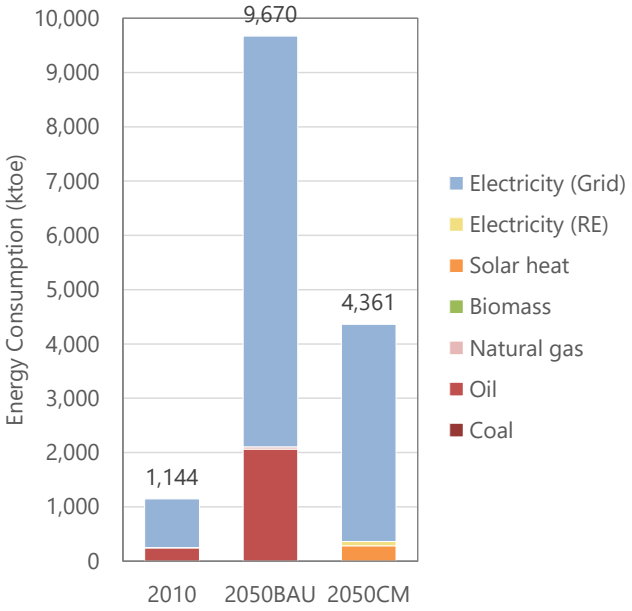



Figure 5-8: Estimate for energy consumption in the commercial sector

### 5.4.3 Industrial sector

Natural gas and electricity are main energy source in 2010. In the CM scenario, the share of fossil fuels in energy use are reduced from 60% to 30%.

【Main countermeasures】

- 100% renewable electricity: Electricity is supplied through grid.
  It will be 100% renewable in the CM scenario. Deregulation of the electricity market and suppliers of RE100 electricity are required.
- Efficient equipment: Energy efficiency are improved by 0.5% per year.

Table 5-8: Energy consumption in the industrial sector (unit: ktoe)

| | 2010 | 2050 BaU | 2050 CM |
|---|---|---|---|
| Coal | 31 | 6 | 0 |
| Oil | 135 | 25 | 10 |
| Natural gas | 225 | 41 | 19 |
| Biogas | 0 | 0 | 0 |
| Solar heat | 0 | 0 | 0 |
| Electricity (RE) | 0 | 0 | 0 |
| Electricity (grid) | 259 | 48 | 69 |
| Total | 650 | 119 | 98 |

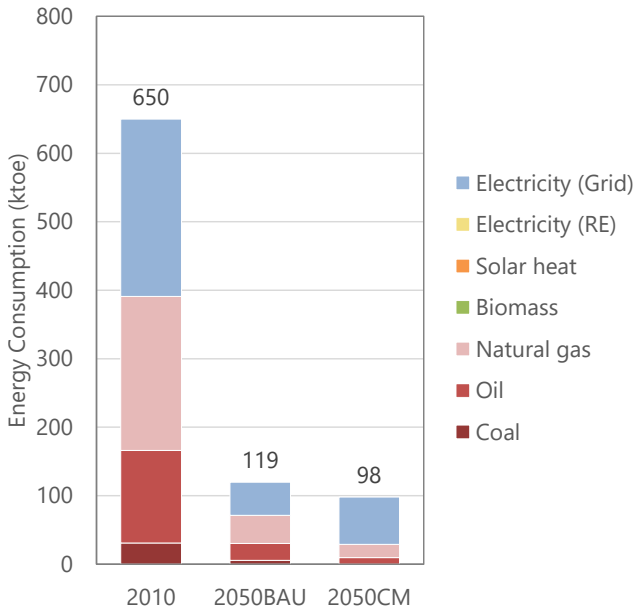



Figure 5-9: Estimate of energy consumption in the industrial sector

### 5.4.4 Passenger transport sector

Almost all energy source was oil (gasoline and diesel) in 2010. In the CM scenario, electricity accounts for 61% of energy demand and the share of fossil fuels in energy use are reduced to 23%. Energy demand in the CM scenario can be reduced by 85% in 2050 compared with the BAU scenario.

【Main countermeasures】

- Electric vehicle: All passenger cars and 75% of buses will be EV in the CM scenario.
- Transport infrastructure change and modal shift: Share of passenger car will be reduced from 70% to 30%. More people use non-motorized transportation (walk and bicycle) and public transportation (bus and railway). Trip distance by passenger car will be reduced by 30%.

Table 5-9: Energy consumption in the passenger transport sector (unit: ktoe)

| | 2010 | 2050 BaU | 2050 CM |
|---|---|---|---|
| Coal | 0 | 0 | 0 |
| Oil | 2,600 | 7,536 | 267 |
| Natural gas | 90 | 231 | 0 |
| Biogas | 0 | 0 | 178 |
| Solar heat | 0 | 0 | 0 |
| Electricity (RE) | 0 | 0 | 0 |
| Electricity (grid) | 8 | 32 | 710 |
| Total | 2,698 | 7,799 | 1,155 |

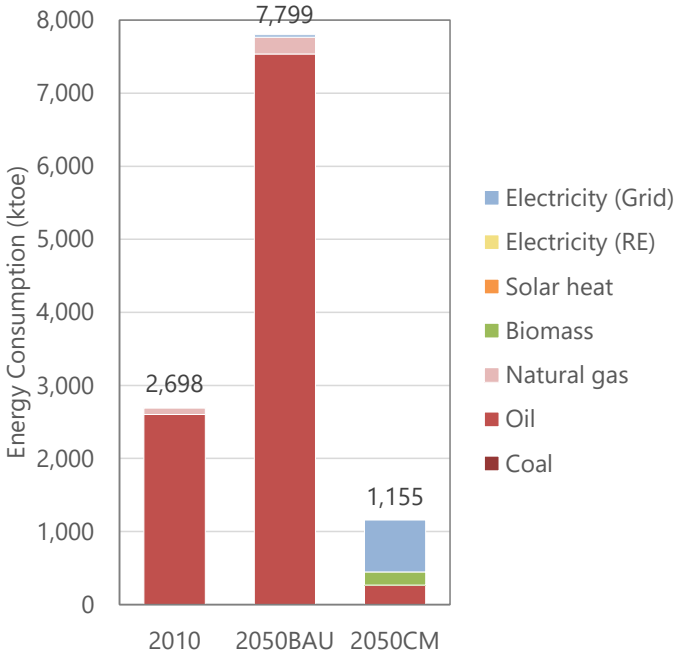



Figure 5-10: Estimates for the passenger transport sector

### 5.4.5 Freight transport sector

All energy source is oil (gasoline and diesel) in 2010. In the CM scenario, electricity and biomass accounts for 30% and 24% of energy demand. Share of fossil fuels in energy use are reduced to 46%. Energy demand in the CM scenario can be reduced by 69% compared with the BAU scenario.

【Main countermeasures】

- Electric vehicle: 55% of trucks will be EV
- Biofuel: 20% of trucks run on biofuels in CM scenario.
- Transport infrastructure change and modal shift: Share of trucks will be reduced from 99% to 95% and share of railway will be 5%. Trip distance by truck will be reduced by 10%.

Table 5-10: Energy consumption in the freight transport sector (unit: ktoe)

| | 2010 | 2050 BaU | 2050 CM |
|---|---|---|---|
| Coal | 0 | 0 | 0 |
| Oil | 617 | 5,019 | 863 |
| Natural gas | 0 | 0 | 0 |
| Biogas | 0 | 0 | 384 |
| Solar heat | 0 | 0 | 0 |
| Electricity (RE) | 0 | 0 | 0 |
| Electricity (grid) | 0 | 0 | 432 |
| Total | 617 | 5,019 | 1,678 |

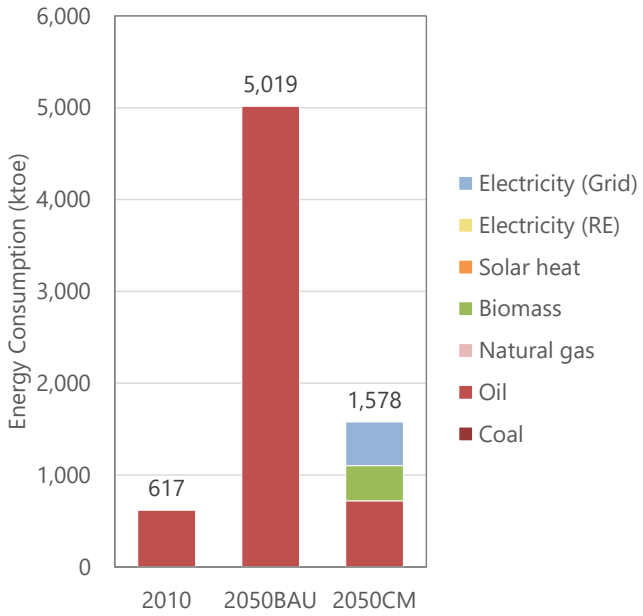



Figure 5-11: Estimates for energy consumption for the freight transport sector

## 5.5 Key findings

The scenario result shows that it is possible for Kuala Lumpur to achieve zero carbon by the year of 2050 by disseminating energy efficient technology, reducing $CO_2$ emissions through major electrification and generation by renewable energy, and appropriate management of the forests. Electricity will be the key energy resources for Kuala Lumpur in

2050. Shifting from carbon intensive fossil fuel energy resources to electricity important (and such electricity is largely from renewable energy / low emission factor). Energy efficiency alone in insufficient, Zero Carbon Scenario Kuala Lumpur needs renewable energy . Both energy efficiency & renewable energy is needed in 2050 Zero Carbon Scenario. The commercial and transportation sectors are the key potential areas for GHG emissions reduction. Key countermeasures of commercial sector are: energy efficient device (such as heat pump water heaters) and solar renewable energy. Key countermeasures of transportation sector are: dissemination of electric and hybrid vehicle, modal shift to public transportation, and shorter trip distance.

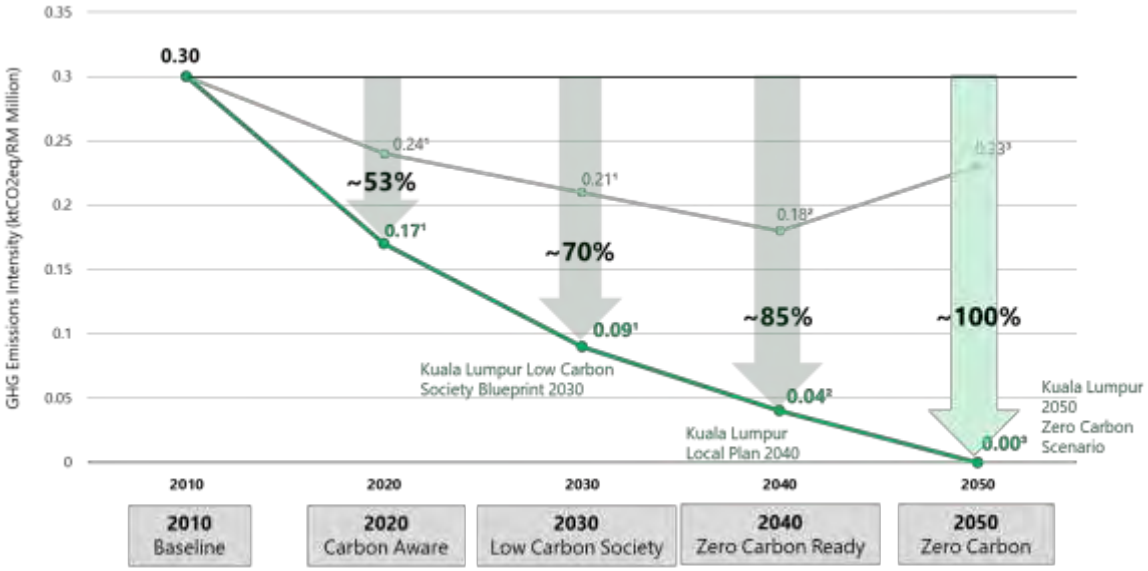



Figure 5-12: Estimate for GHG emission intensity

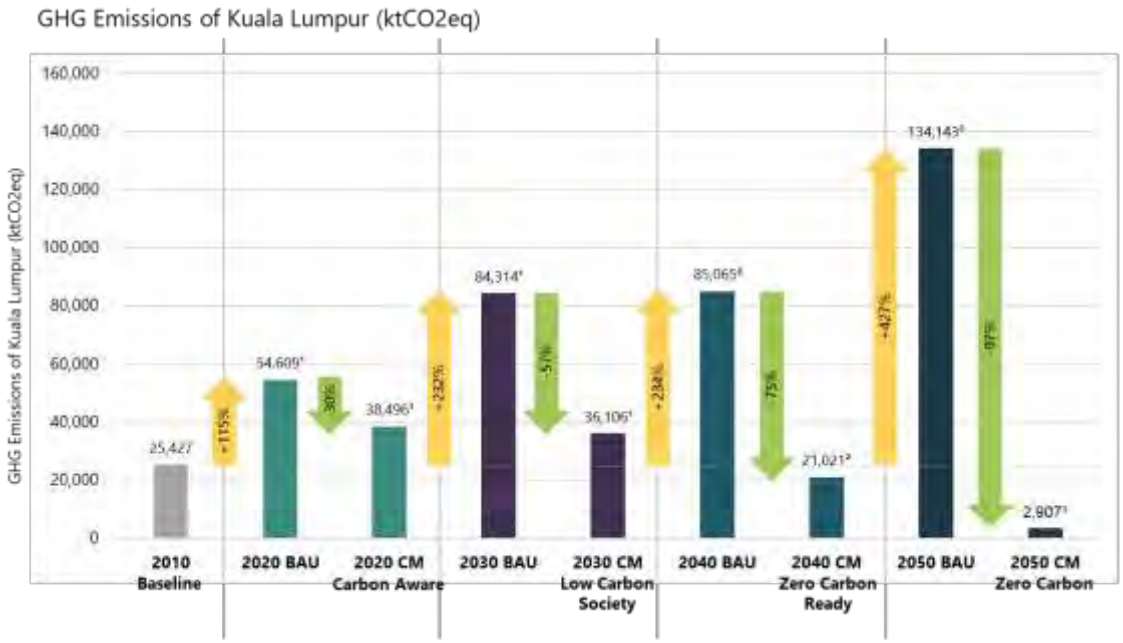



Figure 5-13: Estimates for GHG emissions

6　Final workshop　(spec4-2(2))

Project proponents presented the achievements and discussions were held on the future direction of the project.　To enrich the discussions, ICLEI, Kuala Lumpur City Government officials, other Malaysian cities, Jakarta, Ho Chi Minh, Japanese private companies were invited.　It was held as a Webinar open to the public.

Name of event　: T2KLLCS 2021 Webinar
Date : February 5th 2021
Number of participants : approximately 150

Agenda

- Keynote address
  Datuk Seri Haji Mahadi Bin C. Ngah, Mayor of Kuala Lumpur

- Speech
  Kenzo Ryuzo (Mr.) Director, International Cooperation and Sustainable Infrastructure Office, Ministry of the Environment, Government of Japan

- Speech
  Kenji OGAWA (Mr.) Senior Director, Climate Change and Energy Division, Bureau of Environment, Tokyo Metropolitan Government

- In response to the Keynote address and speech
  Yunus Arikan (Mr.) Head of Global Policy and Advocacy, ICLEI World Secretariat

- Project framework
  Junichi Fujino (Dr.) Program Director, City Taskforce, Institute for Global Environmental Strategies

- Tokyo Metropolitan Government's actions
  Toshiko Chiba (Ms.) Deputy Director of Carbon Policy Planning section, Bureau of Environment, Tokyo Metropolitan Government

- What was achieved from the knowledge transfer
  Nik Mohammed Faizal Nik Ali (Mr.) Deputy Director of Project Implementation and Building Maintenance Department, Kuala Lumpur City Hall

- Updates on energy efficiency and renewable energy in Malaysia
  Steve Anthony Lojuntin (Ts.) Acting CEO Sustainable Energy Development Agency, Malaysia

- 2050 Decarbonization scenario for KL
  Ho Chin Siong (Prof. TPr. Dr.) Director, UTM-Low Carbon Asia Research Centre, Universiti Teknologi Malaysia

- Recommendations for the project
  Yunus Arikan (Mr.) Head of Global Policy and Advocacy, ICLEI World Secretariat

- Closing remarks
  Datuk Seri Haji Mahadi Bin C. Ngah, Mayor of Kuala Lumpur

Summary of speech and presentations

**IGES Dr. Fujino who served as the moderator for the event offered an outline for the webinar**

- The objective for this webinar is to share the learnings from the collaboration between Kuala Lumpur and Tokyo Metropolitan Government on introducing energy efficiency in buildings. We hope the webinar will serve as an opportunity to raise enthusiasm to achieve zero-carbon.

Photo 6-1 : Dr. Fujino, IGES Program Director

**Keynote address from the Mayor Datuk Seri Mahadi**

- First of all, I would like to thank the Institute for Building Environment and Energy for their participation.
- Kuala Lumpur developed an action plan in 2017 to become a low carbon society by 2030. We are now aiming to become carbon neutral ready by 2040, and carbon neutral by 2050.
- Kuala Lumpur became the largest city in Asia in the 19th and 20th century. GDP growth is constantly growing these couple of year at an annual rate of 7.1 %.
- Our memorandum of understanding with Tokyo Metropolitan Government was signed in May 2050, and we are striving to become a zero-carbon society also with the support of IGES and the Ministry of Environment Japan.
- We first of all, started to profile buildings owned by the city government. Menara 1 had the largest electricity consumption, of which air conditioning accounted for 63%. The next largest was lighting accounting for 14 %, and the remaining appliances were not substantial. With Tokyo Metropolitan Government's suggestions, we decided to replace Menara 1's large $CO_2$ emitting appliances for air-conditioning with those of high efficiency. In 2021, we will replace the cooling tower, and the location of the fans. For Menara 3, we aim to replace the air-conditioning in 2022. We would like other building owners to recognize the impact from these model buildings, and also to utilize the outcome. We aim to use the experience for drafting strategies for Kuala Lumpur's buildings. This strategy can be applied to private buildings, and if due consideration is given for

building material it could reduce the carbon footprint. This was the first stage for our actions. In the second stage we will install solar photovoltaic panels in several of the city government's buildings and monitor them. The energy efficiency and renewable energy levels will be reflected to the KPI of the relevant government offices.

- In the third stage, we will revise our legislation and make it mandatory for real estate developers to use solar generated electricity for at least 30% of their projects. We want to develop an inventory of our commercial buildings. All of this will be concluded by October 2021.
- We shall expand our focus from buildings and add transport to aim for carbon-neutral. Budget has been allocated in 2021 to replace public buses from fossil fuel emitters to EVs.
- Collaboration with the Tokyo Metropolitan Government has been very valuable, and through this project I would first like to realize a low carbon society by 2030.

Photo 6-2 : Datuk Seri Mahadi, Mayor of Kuala Lumpur

**Speech from Mr. Sugimoto, Director, Ministry of Environment, Japan**

- Prime Minister Suga has officially announced Japan's target to become carbon-neutral by 2050. Over 250 municipalities in Japan have already announced their intentions to become a zero-carbon city. The total population within these municipalities add up to over 90 million.
- The national government has started to offer municipalities support in becoming zero-carbon and achieving their roadmap. This city-to-

city collaboration scheme is especially important from that perspective. There are already over 20 such partnerships.

- Kuala Lumpur and Tokyo Metropolitan Government's collaborative efforts are unique because it has helped transform Kuala Lumpur's policy, and actually led to the implementation of required technology. Once an inclusive foundation is developed for the relative policies, I see there will be more results. I am hoping to see major achievements from this project, which will make it a model for others.
- The ministry is planning to convene an international forum for zero-carbon cities this March. I hope to introduce this partnership as a good case study.

Photo 6-3 : Mr. Sugimoto, Director, Ministry of Environment, Government of Japan

**Speech from Mr. Ogawa, Senior Director, Tokyo Metropolitan Government**

- I am Ogawa of the Tokyo Metropolitan Government in charge of climate change. Mayor Mahadi, I would first like to congratulate you on receiving the honorary title "datuk seri". I would like to pay my respects to Kuala Lumpur's very aggressive actions since .August 2019, when the start of the Tokyo to KL Low Carbon System was announced.
- Tokyo is a megacity with a population of 13 million, gathering many offices and commercial buildings. The energy consumption is equivalent to that of one Nordic country. This is why, Tokyo has been making efforts particularly in buildings' energy efficiency since 2000.

- The mandatory targets for reduction in overall greenhouse gas emissions for large-scale emitters introduced under Tokyo Metropolitan's code in 2010, the Tokyo Cap & Trade program is a prominent example of our efforts, and has achieved a 27 % reduction from the base year for $CO_2$ missions from large buildings. For the world to achieve the 1.5 degrees target, countries and cities around the world, must aggressively act towards a zero-carbon society.
- Tokyo Metropolitan Government aims to contribute to the world's target for achieving net zero emissions by 2050 by realizing the "Zero Emission Strategy Tokyo". The Governor of Tokyo Metropolitan Government attended the "Davos Agenda" hosted by the World Economic Forum last month, and declared Tokyo would reduce GHG emissions by 50% by 2030. The perspective behind the declaration was that "actions taken during the coming ten years" would be very critical in terms of realizing a zero-carbon society. This is no easy path, since it means Tokyo should also expand efforts for further energy efficiency, and renewable energy. We see that Tokyo is in the same situation as Kuala Lumpur.
- Tokyo Metropolitan Government will continue to share with Kuala Lumpur our successes and failures in terms of primarily zero-carbon in buildings, and what we see are the challenges.
- As members of the C40 Cities Climate Leadership Group, we hope to inspire each other, become leading model cities in Asia, and scale up our actions.
- I hope the workshop of today that shares our results for the two year partnership is productive for many people. Thank you.


Photo 6-4 : Mr. Ogawa, Senior Director, Tokyo Metropolitan Government

**Mr. Arikan, ICLEI World Secretariat**

- I was happy to listen to the high-toned speech by the Mayor of Kuala Lumpur. ICEI is happy to support Kuala Lumpur together with Tokyo Metropolitan Government, IGES and ICLEI Japan.
- To aim for carbon-neutral, the level of ambition of the national government must be reflected in the actions by the local governments. I hope Kuala Lumpur and Tokyo Metropolitan Governments' partnership is replicated by others.
- This kind of collaboration which consists of learning from each other, could be the first of its kind in Asia. I welcome this whole heartedly.


Photo 6-5: Mr. Arikan, ICLEI World Secretariat

**Dr. Fujino, IGES Program Director**

- Kuala Lumpur announced its aim to realize a low carbon society by reducing carbon emissions intensity of GDP by 70% by 2030 at COP23 (Bonn) and asked Professor Ho of the Universiti of Teknologi Malaysia and Tokyo Metropolitan Government for support. In August 2019, there was a ceremony to launch the collaboration.
- Tokyo Metropolitan Government is experienced in promoting energy management in public and private buildings. It was, therefore, decided that Kuala Lumpur would develop an energy management system for their approximately 2000 public buildings, and then promote the knowledge to private buildings. Kuala Lumpur will replace major appliances using the city government's budget and develop a system and a framework for building energy management.
- E-konzal supported the development of Kuala Lumpur's zero-carbon

scenario to explore the possibility of Kuala Lumpur for reducing energy based carbon emissions.

**Ms. Chiba, Deputy Director of Tokyo Metropolitan Government**

- Tokyo Metropolitan Government has been promoting climate change related policies for buildings since 2000. The "Zero Emission Tokyo Strategy" developed in December 2019 aims to contribute to the global target to limit global warming to 1.5 degrees Celsius, and recommends actions in many areas including sustainable resource consumption (plastics etc.) in addition to buildings.
- Buildings are the source 70 % of Tokyo's energy based $CO_2$ emissions and this is why the government's major policy is in this area. Tokyo Metropolitan Government has shared concrete measures and practical programs for buildings.
- Tokyo Metropolitan Government's framework for countermeasures in buildings starts from the buildings' design and extends to its operations. Tokyo Metropolitan Government's own buildings are also subject to the same measures. We have responded to Kuala Lumpur's inquiries of how we have reduced carbon emissions from our public and private buildings by sharing the concrete measures deployed, policies and how we estimate reduction potential.
- The Tokyo Cap & Trade program introduced under Tokyo Metropolitan's code in 2010 has addressed large buildings. It covers large buildings in Tokyo such as the city hall, office buildings, data centers, hotels, and hospitals. It is mandatory for building owners to reduce their total $CO_2$ emissions for a certain level within five years. Building owners must also submit their action plans under the program, which includes a schedule for replacing their heat source and lightings with high efficiency appliances. The program succeeded in reducing carbon emissions by 27% from the base year.
- A guideline defining the required technical specification for promoting energy efficiency and renewable energy in Tokyo Metropolitan Government's own buildings exists. Each department must comply with the guidelines when they renovate buildings under their authority.
- $CO_2$ emissions cannot be reduced by replacing building appliances alone. It is also important to streamline operations. For example, after the

Great East Japan Earthquake of March 11th 2011, we urgently needed to reduce our total energy demand. Tokyo Metropolitan Government asked building owners in Tokyo to remove the number of lightings, and reduce the light luminance from 750 to 500 lux. This resulted with some buildings reducing their electricity consumption by 25%. It is also important to continue low-key efforts such as maintaining ambient room temperature through the introduction of COOLBIZ, and cleaning filters for outdoor units regularly. In other words, building managers and employees both need to collaborate. Tokyo Metropolitan Government's city hall also succeeded in 2017 to reduce carbon emissions by 30% from the base year of 2000. It is moving to 100% renewable energy procurement for electricity from August 2019.

- The Governor of Tokyo Metropolitan Government attended the "Davos Agenda" on January 27th this year, and declared Tokyo will reduce CO2 emissions by 50% from the base year of 2000 by 2030, and increase the use of electricity generated from renewable sources to 50%. Tokyo understands our actions must be enhanced, and we believe that such efforts will allow Tokyo to continue to be a city that protects the lives and assets of Tokyo citizens, and attract companies and investors around the world.
- Kuala Lumpur and Tokyo Metropolitan Government are in the same situation in terms of realizing a zero-carbon society, and I would like for us to enrich each of our actions to achieve this goal.


Photo 6-6 : Ms. Chiba, Deputy Director, Tokyo Metropolitan Government

**Mr. Faizal, Deputy Director, Kuala Lumpur**

- Kuala Lumpur city hopes to improve the energy management of government owned buildings, and then have the private buildings also take the same measures.
- First of all, we gathered electricity bills from our utility Tenaga National, and identified 112 buildings with the largest emissions for the purpose of understanding the impact of energy efficiency and renewable energy procurement.
- Next, we decided to concentrate on analyzing data for HVAC which account for 63% of our major government owned buildings.
- The largest electricity consumer Menara 1, had a cooling tower installed in 1998, and WCPU, AHU that we saw should be replaced. The air-conditioning equipment is also 20 years old at Menara 3 and will be replaced. The tower at the IDB training center will install a VAV system.
- We see more and more solar photovoltaic panels on the rooftops of our city, and the city government also intends to do the same. We will choose buildings with large roof space from the 112 large emitters to install solar photovoltaic panels.
- As the mayor announced, Kuala Lumpur will become famous for its low carbon districts.

Photo 6-7 : Mr. Faizal, Deputy Director, Kuala Lumpur City

**Mr. Lojuntin (Ts.) Acting CEO Sustainable Energy Development Agency**

- SEDA is a development agency under the jurisdiction of the Ministry of Energy. It is in charge of advising ministries and agencies on sustainable energy. It is a specialist for renewable energy but is also in charge of measures related to carbon emissions.
- Malaysia enacted the Renewable Energy Act in 2016. What started from a small renewable program gradually expanded to include a feed-in-tariff program, net-energy metering program (NEM) and a self-consumption program (SELCO).
- The main ways to finance solar power generation is through the NEM, the SELCO and by borrowing from banks. Another option is solar leasing: to lease rooftop space to generators and have them install and operate solar PV for a certain timeline.
- The NEM3.0 which the national government plans to introduce this year consists of three programs: those for housing, those for government buildings, and those for commercial buildings. 26 government buildings have already been accepted under the new program.
- In terms of energy efficiency, the relevant government ministries and agencies are discussing the details of the Efficiency Conservation Act. The act will regulate thermal power in addition to electricity.
- A low carbon city can only be introduced by having municipalities and the private sector comply with rules. Malaysia has the MS1525 for non-residential buildings, the MS1837 for grid connection and safety, and the MS2680 for renewable energy and efficiency of residential buildings.
- Many municipalities are participating in green building programs, but require further aggressive reductions of their energy consumption. Kuala Lumpur might need to introduce ZEB to realize their target of reducing carbon emissions intensity of GDP by 70%.
- SEDA is working with the Energy Conservation Center, Japan（ECCJ）and a business alliance of Japanese companies to apply the Japanese definition of ZEB in Malaysia. SEDA thinks zero-carbon is possible.
- The GreenPass building rating program which SEDA promotes is not used by many municipalities at this moment. We welcome Kuala Lumpur and others to do so in the future.


Photo 6-8 : Mr. Lojuntin, Acting CEO, Sustainable Energy Development Agency

**Professor Ho, University of Teknologi Malaysia**

- I would like to present the roadmap for Kuala Lumpur's zero-carbon scenario by 2050 using the presentation material developed by E-konzal and the Universiti of Teknologi Malaysia.
- Kuala Lumpur announced the "Kuala Lumpur Low Carbon Society Blueprint 2030" in 2017. The contents of the blueprint was reflected to both the statutory development plan and the local plan. The urgent goal is to limit global warming to 1.5 degrees Celsius in response to the 2015 Paris Agreement's goals and reduce the impact from extreme weather conditions.
- We used 2010 as the base year, and compared two scenarios: one when we took countermeasures for energy related activity (CM scenario) and the BAU (business as usual) scenario in which no countermeasures were taken.
- The socio-economic preconditions were that, the population would grow by 46% in 2010-2050, GDP would grow 4.8 times. The tertiary industry and transport industry would become the major sector to consume energy. Energy demand would rise 4.4 times, reaching 2.4 million toe under the BAU scenario, but can be reduced by 67% under the CM scenario. Oil which was the major energy source in 2010 will be replaced by electricity in 2050. The $CO_2$ emissions which were 2.583 million $ktCO_2$ in 2010, will reach 135 million $ktCO_2$ under the BAU scenario but can be reduced by 97% given that emissions from the commercial and transport sectors fall substantially.
- Electricity accounts for the largest proportion of energy use in the

residential sector. If roof-top PV and solar heat are utilized, and no fossil fuels are used, energy demand can be reduced by 55% compared with the BAU scenario. It is, however, important to have roof-top PV and the rest provided from the grid is 100% renewable electricity in 2050. Deregulation of the electricity market is key. Energy efficient home appliances such as air-conditioners, heat pumps, solar powered water heaters are used.

- The commercial sector will be sector with the largest energy demand because multinational corporations locate their offices in Kuala Lumpur. Energy demand in CM scenario can be reduced by 55% compared with BAU scenario. Solar PVs can provide 2% of the electricity required. Energy efficient air-conditioning, heat pumps and LED lighting will be installed, and 20% of the buildings will install solar powered water heaters.
- The industrial sector's energy demand is not that substantial with only 650 ktoe in 2010. In the CM scenario, share of fossil fuels in energy use are reduced from 60% to 30%. Energy demand in CM scenario can be reduced by 18% compared with BAU scenario.
- In the passenger transport sector, almost all energy source is oil in 2010. In CM scenario, electricity accounts for 56% of energy demand and share of fossil fuels in energy use are reduced from to 29%. Energy demand in CM scenario can be reduced by 84% compared with BAU scenario. To do so, public transportation would account for 70% of the passenger transport. The share of passenger cars would be reduced from 70% to 30% because more buses will be EVs. More people use non-motorized transportation (walk and bicycle) and public transportation (bus and railway). In the freight transport sector, biofuel and electricity will become the main energy source. As a result energy demand in the CM scenario can be reduced by 67% compared with the BAU scenario.
- The scenario result shows that it is possible for Kuala Lumpur to achieve zero carbon by the year of 2050. Electricity will be the key energy resource. Shifting from carbon intensive fossil fuel energy resources to electricity is important. Both energy efficiency and renewable energy is needed. The commercial sector is a key area for GHG emissions reduction and we need to act on cooling, heating, and lighting. Next, we need to focus on the transport sector, and work on a modal shift to public transportation,

electric and hybrid vehicles.

- I think if the carbon emission intensity drops Kuala Lumpur can achieve zero-carbon ready by 2050, and low carbon by 2030. We would like to see Kuala Lumpur achieve a 53% reduction by 2030 compared to 2010, 75% by 2040, and 97% by 2050.


Photo 6-9 : Prof Ho, Universiti of Teknologi Malaysia

Questions from the floor

- Are solar tiles used in Tokyo?

（Tokyo Metropolitan Government's answer）The solar tiles built into roof material are used in many roof-tops including those of our government buildings. We see them frequently on residential housing.

- What is the difference between NEM3.0 and 2.0?

（SEDA's answer）Information for the NEM2.0 is publically available since we had a public hearing. NEM3.0 is to be introduced this year and will introduce three building categories: residential, government buildings, and commercial buildings. Under the NEM2.0, the three categories were competing for the same quota, but once 3.0 is introduced they will each have a separate quota. The rate of selling to and purchasing from the grid will be the same in terms of government buildings and residential housing: a 1:1 ratio. The rate of selling to the grid for the NOVA program for commercial buildings and due to start in April will be determined by the market or by the system marginal price (SMP) decided by the regulator.

Generators with solar PVs distributed in multiple locations will be able to use excess electricity from one facility at another.

- Will the JCM be introduced in Malaysia?

（IGES's response）The governments of Malaysia and Japan have not reached an agreement for the JCM. I hope the government of Malaysia will show interests by seeing the example of Kuala Lumpur.

**Comments from ICLEI Mr. Arikan**

- I thought it was remarkable that Mayor Mahadi was present for the whole event. Might I ask who will fund the replacement of the cooling towers? If other cities in Malaysia are interested in a partnership with a Japanese city, I think ICLEI together with the Ministry of Environment, Japan will be able to support. It will be a good opportunity to share Japanese case studies for urban planning.

  （IGES's response）Kuala Lumpur intends to recover the investment from the reduction in their electricity bills. This partnership can be conducted elsewhere in Malaysia.

**Closing remarks from Mayor Mahadi**

- Kuala Lumpur will develop a task force to study $CO_2$ emission reduction. Tokyo Metropolitan Government succeeded in creating innovation from within, I would like to think how it can be done in Kuala Lumpur.
- In 1984, Kuala Lumpur was acknowledged as a new city, a growth center. In those days carbon emission reduction was just a vision, but we are now in the stage of implementing this, and we are working on an action plan.
- Discussions on how we implement this have started, and I think our action plan will be completed in three to six months. In the near future, a new low carbon initiative will be born.
- Dr. Fujino, Mr. Yunus, allow me to show you the solar farms when you visit us next year. By that time, solar PVs will be installed around the city, and EV buses will be transporting passengers. We wish to transform into a carbon-neutral city by 2050.
- I am looking forward to seeing which will be first to become a zero-carbon city, Tokyo or Kuala Lumpur.

Dr. Fujino, IGES
The next challenge is to apply the scheme for renovating buildings to the 112 large emitters. If this can be applied, it will be a good case study for Malaysia and Asia.

7 Training by Tokyo Metropolitan Government (spec 4-2 (2))

As per "4. Kuala Lumpur's Low Carbon System" Tokyo Metropolitan Government addressed the practical questions raised by Kuala Lumpur City Government when they were developing a plan to replace their building appliance. Tokyo Metropolitan Government also shared their selection criteria and case studies for solar photovoltaic panels on their buildings when asked by Kuala Lumpur who aims to realize a zero-carbon scenario for 2050. These comments are useful for introducing energy efficient appliances and renewable energy in Kuala Lumpur.

8 Presentation at the international conference hosted by the Ministry of Environment

A video introducing this project was shown on the website of the Seminar on City-to-City Collaboration for Creating a Zero-carbon Society (January 27th – February 3rd, 2021)

9 Activities

2020/8/5 Team meeting (online)
Participants: Tokyo Metropolitan Government, Kuala Lumpur City, SEDA, UTM, IGES

2020/8/27 Team meeting – working level (online)
Participants: UTM, E-konzal, IGES

2020/9/1 Team meeting (online)
Participants: Tokyo Metropolitan Government, Kuala Lumpur City, SEDA, UTM, IGES

2020/9/7 Team meeting – working level (online)
Participants: SEDA, UTM, IGES

2020/9/17 Kick-off meeting, Interim report
Participants: Ministry of Environment, IGES

2020/10/7 Team meeting (online)
Participants: Tokyo Metropolitan Government, Kuala Lumpur City, SEDA, UTM, IGES, ICLEI Japan

2020/10/27 Team meeting (online)
Participants: Tokyo Metropolitan Government, Kuala Lumpur City, SEDA, UTM, IGES

2020/11/10 Team meeting (online)
Participants: Tokyo Metropolitan Government, Kuala Lumpur City, SEDA, UTM, IGES

2020/12/1 Team meeting (online)
Participants: Tokyo Metropolitan Government, Kuala Lumpur City, SEDA, UTM, IGES

2021/1/6 Team meeting (online)
Participants: Tokyo Metropolitan Government, Kuala Lumpur City, SEDA, UTM, IGES

2021/1/27 Team meeting (online)
Participants: Tokyo Metropolitan Government, Kuala Lumpur City, SEDA, UTM, IGES

2021/1/27-2/3
A video of the project was shown at the “Seminar on City-to-City Collaboration for Creating a Zero-carbon Society” hosted by the Ministry of Environment

2021/2/5 Final workshop
Participants: Tokyo Metropolitan Government, Kuala Lumpur City, Ministry of Environment Japan, SEDA, UTM, IGES, ICLEI world secretariat, ICLEI Japan, Japanese companies in Malaysia, Jakarta, Ho Chi Minh, Surabaya, Iskandar Regional Development Authority (total 156)

2021/3/4 Final report to Ministry of Environment
Participants: Ministry of Environment, IGES

## 10 Reference material

Becoming carbon neutral in Kuala Lumpur
Presentation for final workshop
SEDA's material

Becoming carbon neutral in Kuala Lumpur

# Kuala Lumpur 2050 Zero Carbon Scenario

February 2021

Yuki Ochi
**E-konzal**

Ho Chin Siong
Chau Loon Wai
Teh Bor Tsong
**Universiti Teknologi Malaysia**

## Current Climate Change Effort by Kuala Lumpur

The very first climate change related urban policy of Kuala Lumpur
**Kuala Lumpur Low Carbon Society Blueprint 2030** (2016)

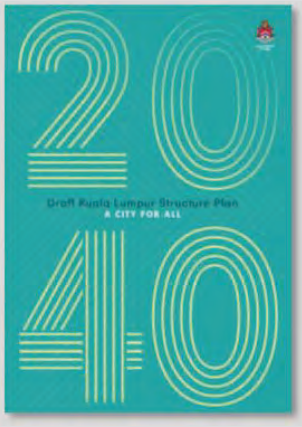
Mainstreaming low carbon policy and strategy in the statutory development plan **Kuala Lumpur Structure Plan 2040** & **Kuala Lumpur Local Plan 2040** to guide and regulate the growth of Kuala Lumpur.


**Kuala Lumpur Low Carbon Society Blueprint 2030**

*World Class City 2030*
*70 by 30: A Greener Better Kuala Lumpur*

*3 Thrust & 12 Key Actions*

Statutory Development Plan: Federal Territory (Planning) Act 1982 (267)
Presently under way and expected to complete by 2021




**Kuala Lumpur Structure Plan 2040**

**Goal 4**
Kuala Lumpur as a Climate Smart and Low Carbon City


**Kuala Lumpur Local Plan 2040**

**New Sector**
Green Technology, Low Carbon and Renewable Energy
(Building, Mobility, Renewable Energy, District Cooling System)

**Kuala Lumpur City Hall adopts KL LCSBP2030 and aimed for further reduction in 2040 and targeting to becomes a carbon neutral city in 2050**

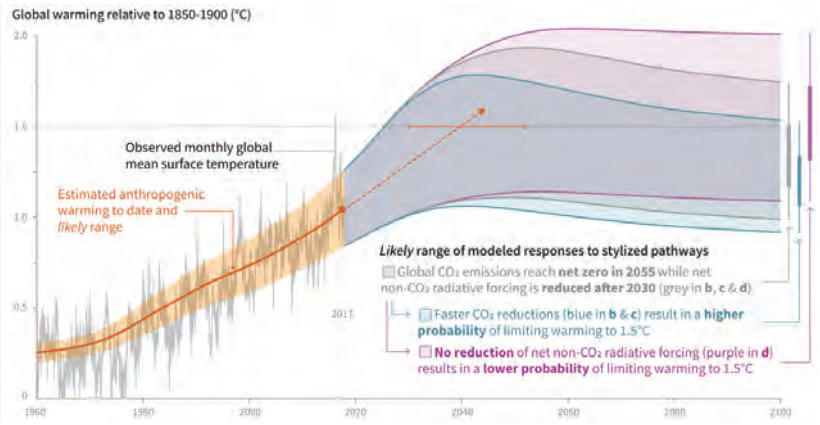
# Why 2050 Zero Carbon?

Climate change is already affecting the entire world, with extreme weather conditions such as drought, heat waves, heavy rain, floods and landslides becoming more frequent, including in Malaysia.

- 2015 Paris Agreement (COP 21) calls for ***Carbon Neutrality by 2050: The World's Most Urgent Mission***

- In order to limit global warming to 1.5 degrees Celsius – a threshold the IPCC suggests is safe – ***carbon neutrality by mid-21st century is essential.***

Observed global temperature change and modeled responses to stylized anthropogenic emission and forcing pathways




Reference:
IPCC (2018) Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty

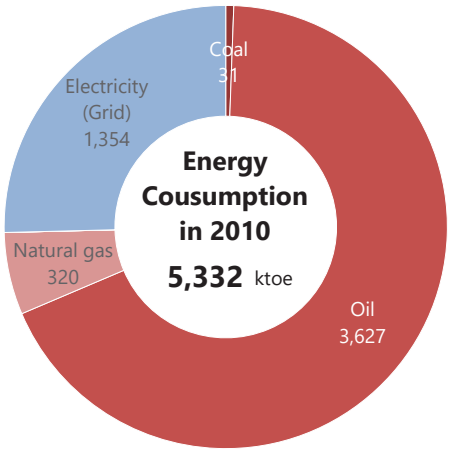
# About Kuala Lumpur 2050 Zero Carbon Scenario

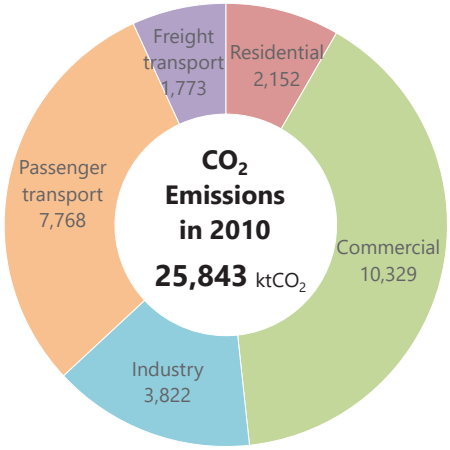
The objectives of Kuala Lumpur 2050 Zero Carbon Scenario are:

- To explore the possibility of Kuala Lumpur towards zero carbon city 2050 scenario;
- To enhance understanding of the implications and opportunities of moving to zero carbon; and
- To identify the key direction and actions needed to reach this goal.

# Framework of Scenarios

| | |
|---|---|
| **Base year** | 2010 |
| **Target year** | 2050 |
| **Focused GHG** | $CO_2$ |
| **Focused activities** | **Energy related activity**<br>Residential, Commercial, Industry, Transport (Passenger and Freight) |
| **No. of scenarios** | **BAU (Business as Usual) Scenario**<br>- Socioeconomic development (Population and economic growth)<br>- Without implementation of mitigation policy in future<br>**CM (Countermeasure) Scenario**<br>- Same socioeconomic development as BAU scenario<br>- With implementation of mitigation policy in future |





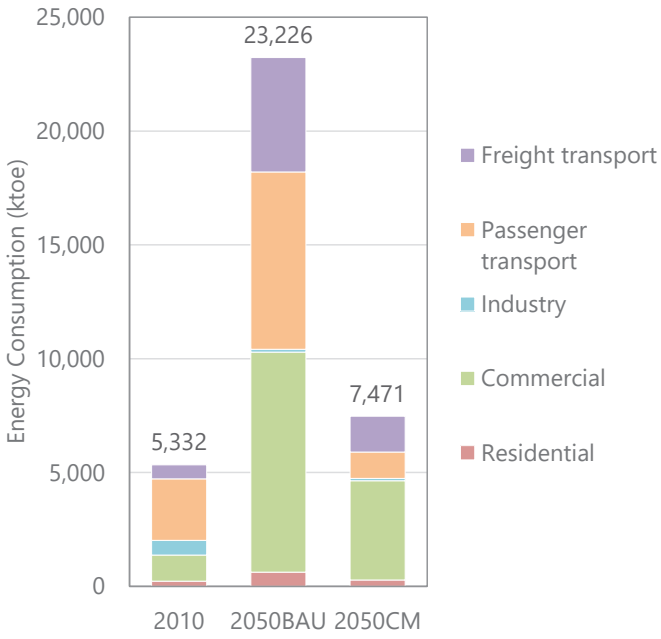

# Socioeconomic Development

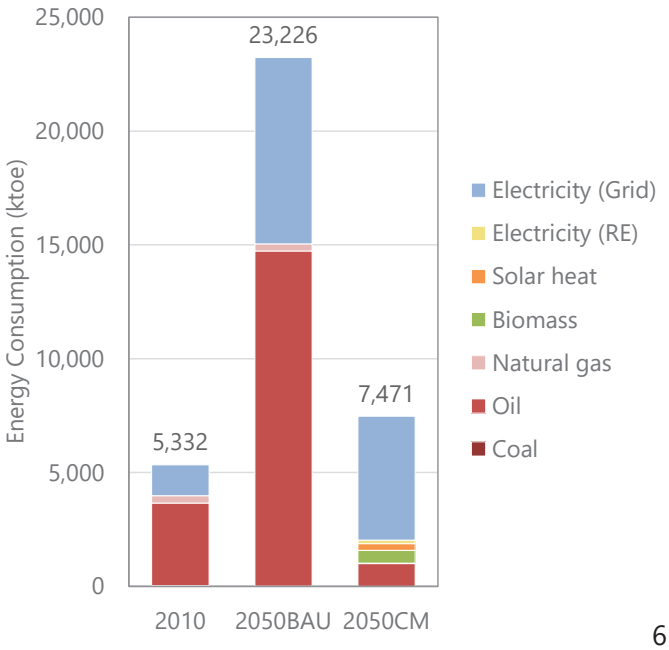
- Population increases by 46% from 2010 to 2050.
- GDP per capita in 2050 becomes 4.8 times as large as that in 2010.
- Tertiary industry accounts for 98% of GRDP in 2050. (91% in 2010)
- Transport demand also increases due to population and economic growth.

| | | 2010 | 2050BAU | 2050CM | 2050/2010 BAU | 2050/2010 CM |
|---|---|---|---|---|---|---|
| Population | persons | 1,674,621 | 2,444,384 | 2,444,384 | 1.46 | |
| No. of households | households | 440,690 | 814,795 | 814,795 | 1.85 | |
| GDP | Mill.RM | 84,852 | 594,632 | 594,632 | 7.01 | |
| Primary industry | | 54 | 378 | 378 | 7.01 | |
| Secondary industry | | 25,521 | 148,522 | 148,522 | 5.82 | |
| Tertiary industry | | 59,277 | 445,732 | 445,732 | 7.52 | |
| GDP per capita | 1000RM | 51 | 243 | 243 | 4.80 | |
| Passenger transport demand | Mill.pass-km | 49,204 | 149,975 | 121,482 | 3.05 | 2.47 |
| Freight transport demand | Mill.t-km | 1,426 | 11,588 | 10,487 | 8.13 | 7.36 |
| Floor area of commercial buildings | $km^2$ | 31 | 175 | 175 | 5.64 | |

# Energy Demand

- Energy consumption in BAU scenario increases to 4.4 times as large as that in 2010. Energy consumption in CM scenario can be reduced by 68% compared with BAU scenario in 2050.
- Commercial sector is the largest energy consumer in the both scenarios.
- Oil is main energy source in 2010 and BAU scenario, but electricity is main in CM scenario.






# $CO_2$ Emissions

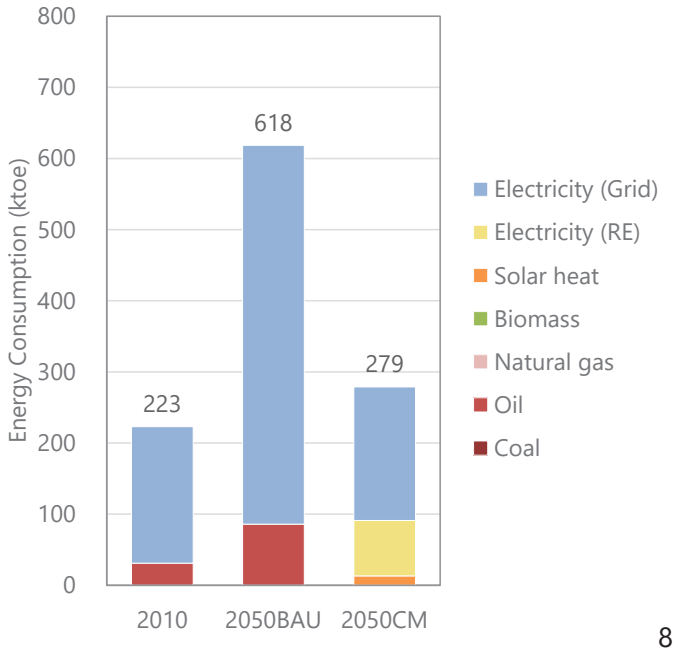
- Commercial sector is the largest emission source in 2010 and BAU scenarios.
- Energy-related $CO_2$ emissions in BAU scenario increases to 5.2 times as large as that in 2010.
- Energy-related $CO_2$ emissions in CM scenario can be reduced by 98% compared with BAU scenario in 2050.

# Residential Sector

- Electricity accounts for the largest proportion of energy use in households.
- In CM scenario, roof-top PV and solar heat are utilized. No fossil fuels are used.
- Energy demand in CM scenario can be reduced by 55% compared with BAU scenario.

**Main countermeasures**

- **Home PV installation**: 29% of electricity are supplied from roof-top PV in CM scenario.
- **100% renewable electricity:** Rest of electricity is supplied through grid. It will be 100% renewable in CM scenario. Deregulation of the electricity market and suppliers of RE100 electricity are required.
- **Efficient home appliance**: Energy efficient air conditioner, heat pump water heater, LED lighting are diffused.
- **Solar heat**: 10% of households use solar water heater.



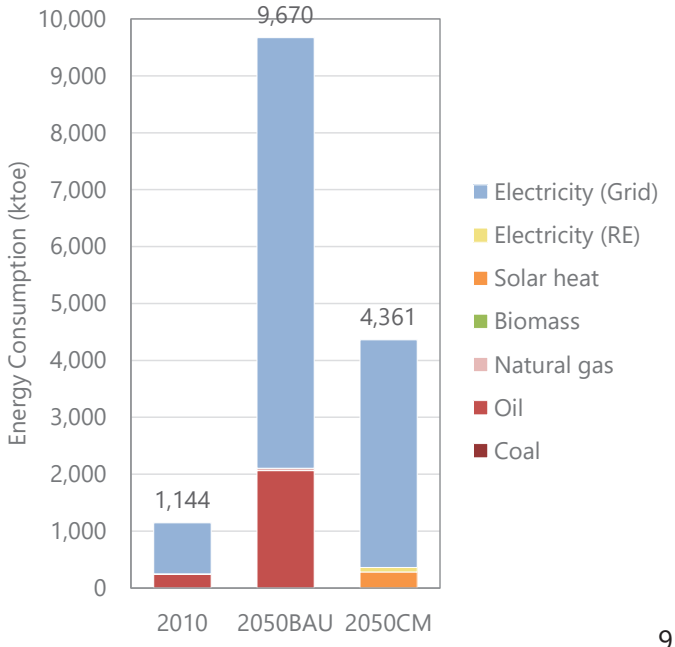



# Commercial Sector

- In commercial sector, electricity is the largest energy source.
- In CM scenario, roof-top PV and solar heat are utilized. No fossil fuels are used.
- Energy demand in CM scenario can be reduced by 55% compared with BAU scenario.

**Main countermeasures**

- **Building PV installation:** 2% of electricity are supplied from roof-top PV in CM scenario.
- **100% renewable electricity:** Rest of electricity is supplied through grid. It will be 100% renewable in CM scenario. Deregulation of the electricity market and suppliers of RE100 electricity are required.
- **Efficient devices**: Energy efficient air conditioner, heat pump water heater, LED lighting are diffused.
- **Solar heat**: 20% of commercial use solar water heater.

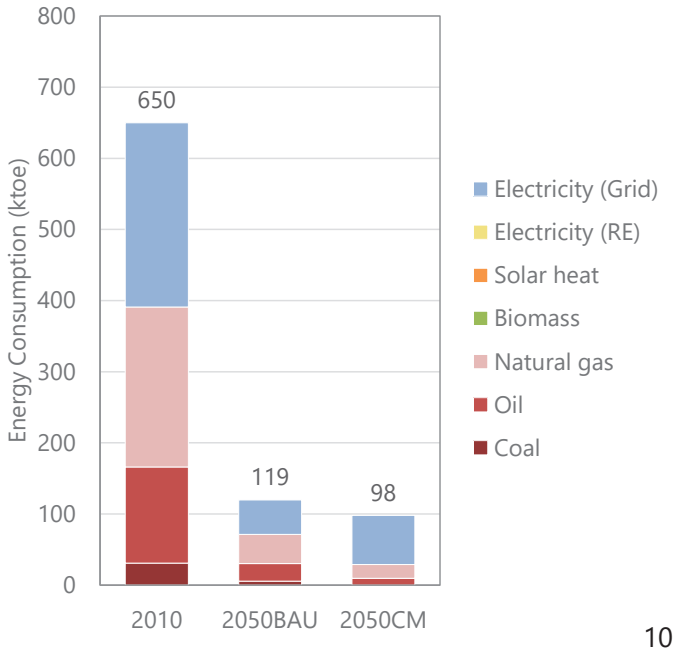


# Industry Sector

- Natural gas and electricity are main energy source in 2010.
- In CM scenario, share of fossil fuels in energy use are reduced from 60% to 30%.
- Energy demand in CM scenario can be reduced by 18% compared with BAU scenario.

## Main countermeasures

- **100% renewable electricity:** Electricity is supplied through grid. It will be 100% renewable in CM scenario. Deregulation of the electricity market and suppliers of RE100 electricity are required.
- **Efficient equipment**: Energy efficiency are improved by 0.5% per year.





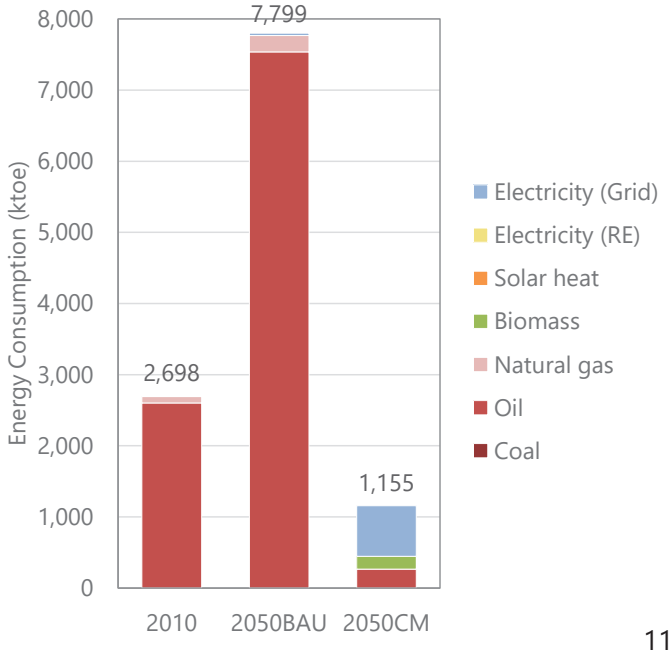

# Transport Sector (Passenger)

- Almost all energy source is oil (gasoline and diesel) in 2010.
- In CM scenario, electricity accounts for 61% of energy demand and share of fossil fuels in energy use are reduced from to 23%.
- Energy demand in CM scenario can be reduced by 85% compared with BAU scenario.

## Main countermeasures

- **Electric vehicle**: All passenger cars and 75% of buses will be EV in CM scenario.
- **Transport infrastructure change and modal shift**: Share of passenger car will be reduced from 70% to 30%. More people use non-motorized transportation (walk and bicycle) and public transportation (bus and railway). Trip distance by passenger car will be reduced by 30%.

NOTE: 2050CM Modal Split assume similar as 2040CM Modal Split (70:30)

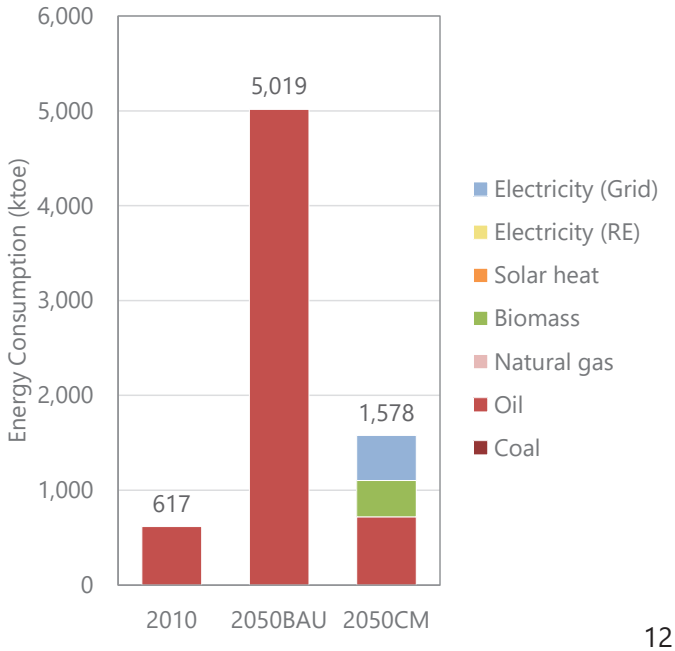


# Transport Sector (Freight)

- All energy source is oil (gasoline and diesel) in 2010.
- In CM scenario, electricity and biomass accounts for 30% and 24% of energy demand. Share of fossil fuels in energy use are reduced from to 46%.
- Energy demand in CM scenario can be reduced by 69% compared with BAU scenario.

**Main countermeasures**

- **Electric vehicle**:
  55% of trucks will be EV and 20% of trucks run on biofuels in CM scenario.
- **Transport infrastructure change and modal shift**:
  Share of trucks will be reduced from 99% to 95% and share of railway will be 5%. Trip distance by truck will be reduced by 10%.





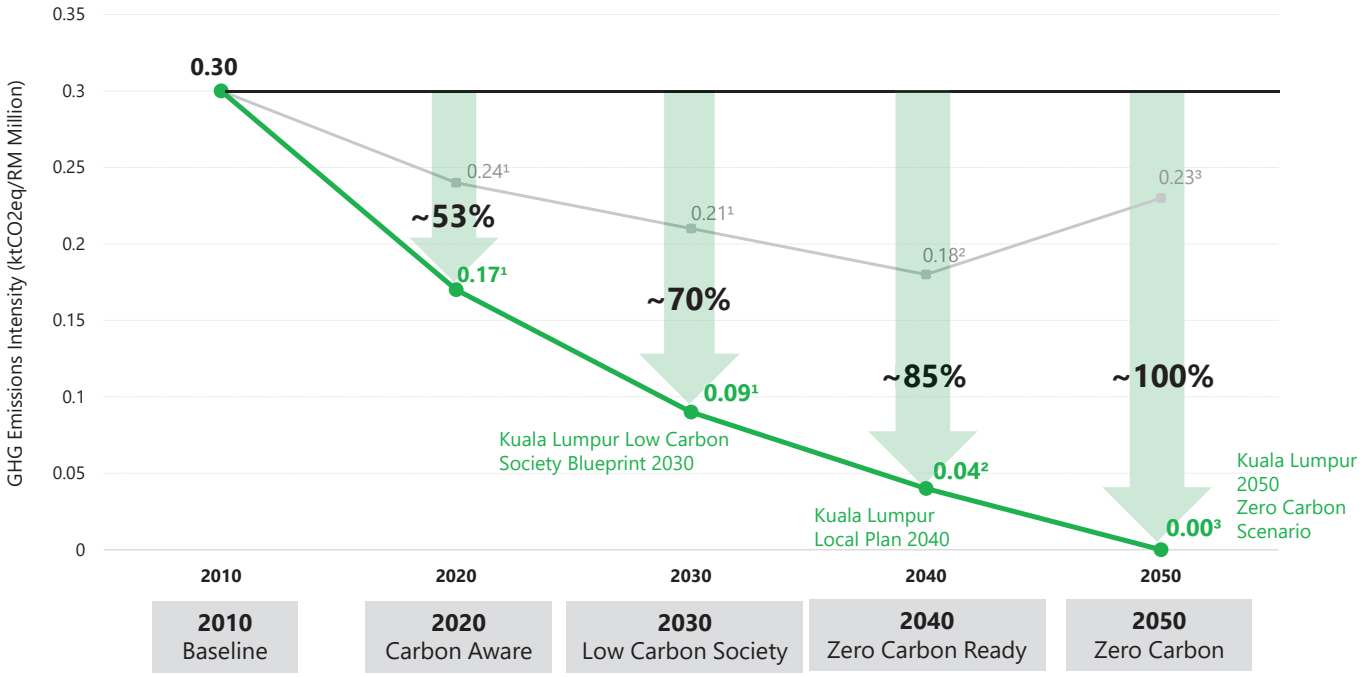

# Key Findings and Way Forward

- The scenario result shows that it is possible for Kuala Lumpur to achieve zero carbon by the year of 2050.
- Electricity will be the key energy resources for Kuala Lumpur in 2050. Shifting from carbon intensive fossil fuel energy resources to electricity important (and such electricity is largely from RE/ low emission factor)
- Energy efficiency (EE) alone in insufficient, Zero Carbon Scenario Kuala Lumpur needs renewable energy (RE). Both EE & RE is needed in 2050 Zero Carbon Scenario
- Commercial and Transportation sector are the key potential areas for GHG emissions reduction.
- Key countermeasures of commercial sector: PV (Solar Renewable Energy) and Energy Efficient Device (Cooling, Heating)
- Key countermeasures of transportation sector: Modal shift to public transportation, electric and hybrid vehicle, shorter trip distance.

# Key Findings and Way Forward

## A Complete Picture: The 50 Years Development Pathway of Kuala Lumpur

GHG Emissions Intensity by GDP of Kuala Lumpur (ktCO2eq/RM Million)



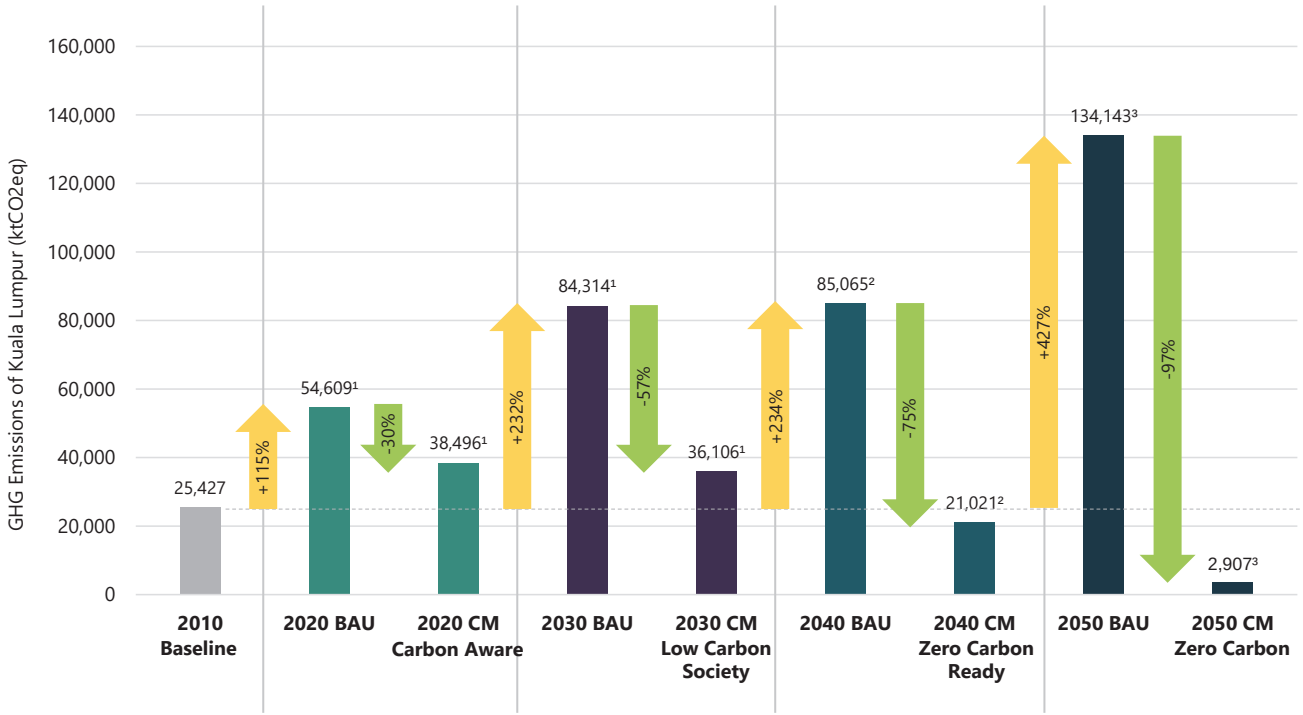

Source:
¹Kuala Lumpur Low Carbon Society Blueprint 2030 (2016) – inclusive of non-energy related GHG emissions (waste and carbon sink)
²Draft Kuala Lumpur Local Plan 2040 (2020) – inclusive of non-energy related GHG emissions (waste and carbon sink)
³Kuala Lumpur 2050 Zero Carbon Scenario (2021) – mainly energy related GHG emissions



# Key Findings and Way Forward

## A Complete Picture: The 50 Years Development Pathway of Kuala Lumpur

GHG Emissions of Kuala Lumpur (ktCO2eq)




Source:
¹Kuala Lumpur Low Carbon Society Blueprint 2030 (2016) – inclusive of non-energy related GHG emissions (waste and carbon sink)
²Draft Kuala Lumpur Local Plan 2040 (2020) – inclusive of non-energy related GHG emissions (waste and carbon sink)
³Kuala Lumpur 2050 Zero Carbon Scenario (2021) – mainly energy related GHG emissions

Presentations for final workshop

# Tokyo to Kuala Lumpur Low Carbon System (T2KLLCS)

Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change: **Carbon Neutral Kuala Lumpur By 2050**

**DATUK SERI MAHADI NGAH**
Mayor, City of Kuala Lumpur

**February 5th, 2021. Friday**





## OVERVIEW

**INTRODUCTION**

**PHASE 1 (2019)**
- City to City Collaboration

**PHASE 2 (2020)**
- Pilot Projects - EE
- Power Consumption
- Air-condition Equipment
- Kuala Lumpur Low Carbon Target
- Kuala Lumpur Solar PV - RE (Private Initiatives)
- New Potentials Solar PV for KLCH Buildings - RE

**PHASE 3 - WAY FORWARD (2021-April)**
- Renewables - RE
- EV & Low Carbon Growth Centre

**CARBON NEUTRAL KUALA LUMPUR BY 2050**

**CONCLUSION**

# INTRODUCTION

19th century :
Kuala Lumpur was a tin mining centre

1963 :
Kuala Lumpur, the Capital City of Malaysia

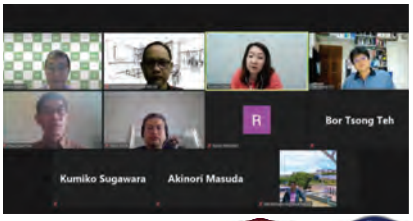
Land Area :
243 sq.km

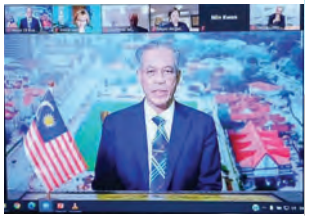
Population Size :
1.8 million




**Tokyo to Kuala Lumpur Low Carbon System (T2KLLCS)**
Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change :
**Carbon Neutral Kuala Lumpur By 2050**

# PHASE 1 – City To City Collaboration

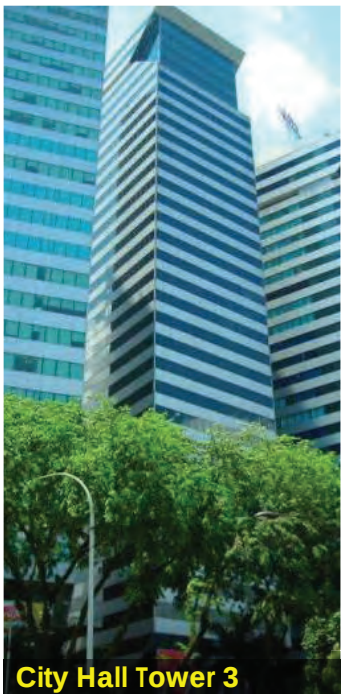
Ministry of the Environment Government of Japan · IGES Institute for Global Environmental Strategies · Tokyo Metropolitan Government · seda Malaysia · Suruhanjaya Tenaga Energy Commission · Tenaga Nasional · Kuala Lumpur City Hall · UCLG United Cities and Local Governments · CITYNET

# PHASE 2 – Pilot Projects (EE)

City Hall Tower 1

City Hall Training Centre

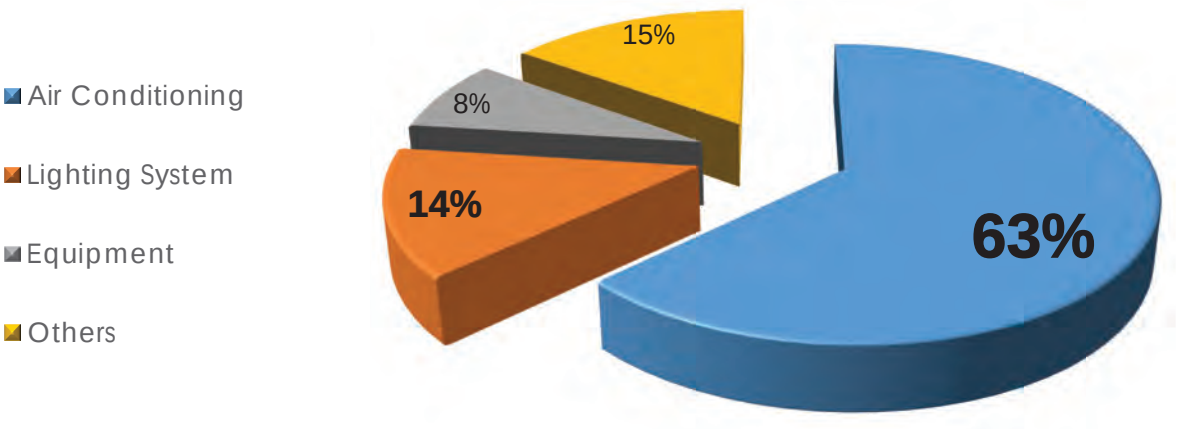

City Hall Tower 2


City Hall Tower 3



**Tokyo to Kuala Lumpur Low Carbon System (T2KLLCS)**
Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change :
**Carbon Neutral Kuala Lumpur By 2050**

# PHASE 2 – Power Consumption




**63%** OF POWER CONSUMPTION BY **KLCH** BUILDINGS IS FROM **AIR CONDITIONING SYSTEM**

**14%** IS FROM **LIGHTING SYSTEM**

# PHASE 2 – Air-condition Equipment

| Buildings & Equipment |
|---|
| City Hall Tower 1 - AHU<br>**(To Be Replaced in 2021)**<br>**budget obtained** |
| City Hall Tower 1 - Auditorium -Chiller, Pump, Cooling Tower & AHU<br>**(To Be Replaced in 2021)**<br>**budget obtained** |
| City Hall Training Centre - Academic Tower Variable Refrigerant Flow(VRF) System<br>**(To Be Replaced in 2021)**<br>**budget obtained** |
| City Hall Tower 3 -Chiller, Pump, Cooling Tower & AHU<br>**(To Be Replaced in 2022)** |

Chillers


Water Pumps


Cooling Tower


AHU



**Tokyo to Kuala Lumpur Low Carbon System (T2KLLCS)**
Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change :
**Carbon Neutral Kuala Lumpur By 2050**

# PHASE 2 – Kuala Lumpur Low Carbon Target

Reduce **70%** carbon emissions by **2030**


# PHASE 2 – Kuala Lumpur Solar PV (Private Initiatives)


IKEA Cheras


DUKE-Plaza Toll

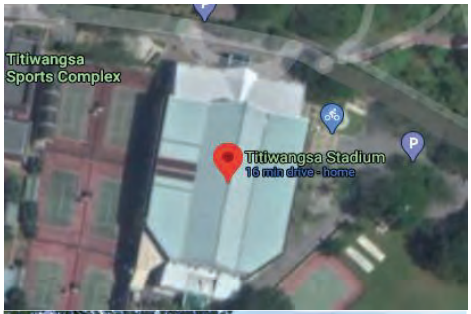
KEN Tower-TTDI


UTM-Semarak



**Tokyo to Kuala Lumpur Low Carbon System (T2KLLCS)**
Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change :
**Carbon Neutral Kuala Lumpur By 2050**

# PHASE 2 – New Potentials Solar PV for KLCH Buildings





Sepak Takraw Stadium



Count Down Clock KL


Kuala Lumpur Library

# PHASE 2 – New Potentials Solar PV for KLCH Buildings

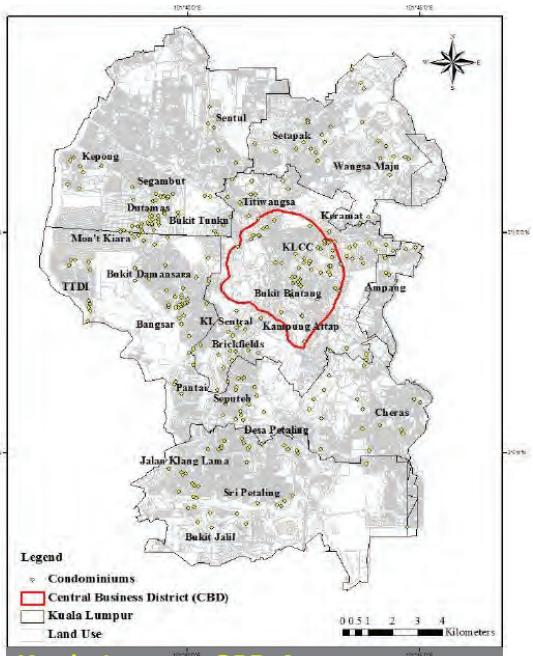





**Tokyo to Kuala Lumpur Low Carbon System (T2KLLCS)**
Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change :
**Carbon Neutral Kuala Lumpur By 2050**

# PHASE 3 – WAY FORWARD (Renewables)

Regulation for real estate developers to utilise at least **30%** of Renewable Energy (RE) in their projects

# PHASE 3 – WAY FORWARD (EV & Low Carbon Growth Centre)


malay mail

COVID-19

HOME MALAYSIA

**DBKL to allocate reduced Budget of RM2.653b for 2021, says mayor**

KUALA LUMPUR, Dec 17 — Kuala Lumpur City Hall (DBKL) is allocating RM2.653 billion for Budget 2021 to implement various initiatives for the well-being and prosperity of city dwellers, says its mayor Datuk Mahadi Che Ngah.

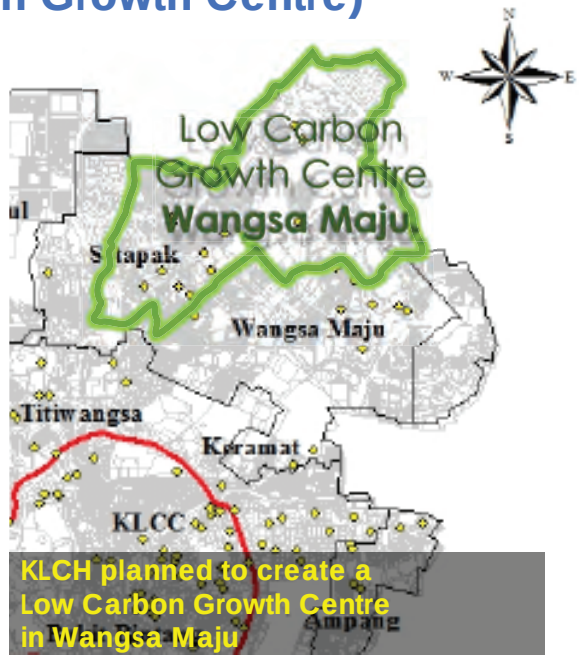
However, the Budget is less than this year's allocation of RM2.972 billion as DBKL is also affected by the Covid-19 pandemic.

Mahadi said the Budget themed, 'Sayangi Kuala Lumpur, Kota Sejahtera', comprised RM1.762 billion (66.4 per cent) for operating expenditure and RM891 million (33.6 per cent) for development expenditure.

Kuala Lumpur EV Buses

**KUALA LUMPUR Dec 17, 2020 :**

"Meanwhile, he said, DBKL aimed to reduce the intensity of greenhouse gas emission up to 70 per cent by 2030 by using solar energy for its buildings starting from the end of next year and **electrical power for the GO KL bus** service."




KLCH planned to create a Low Carbon Growth Centre in Wangsa Maju



**Tokyo to Kuala Lumpur Low Carbon System (T2KLLCS)**
Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change :
**Carbon Neutral Kuala Lumpur By 2050**

# CARBON NEUTRAL KUALA LUMPUR BY 2050

7 AFFORDABLE AND CLEAN ENERGY

11 SUSTAINABLE CITIES AND COMMUNITIES

13 CLIMATE ACTION

70 BY 30 A GREENER BETTER KUALA LUMPUR


## Tokyo Metropolitan Government (TMG)

Tokyo declares that it will seek to become a **Zero Emission Tokyo** by 2050

## Kuala Lumpur City Hall (KLCH)

Kuala Lumpur aims to become **Carbon Neutral Kuala Lumpur** by 2050

# CONCLUSION


- Collaboration with TMG provided beneficial with invaluable input and insights for KLCH.
- Provided KLCH team with greater confidence, the right knowledge and skills-set to make this vision a reality.
- Together, with the support of Tokyo, Kuala Lumpur will be able to achieve its vision to be a Low Carbon Society by 2030!



**Tokyo to Kuala Lumpur Low Carbon System (T2KLLCS)**
Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change :
**Carbon Neutral Kuala Lumpur By 2050**

# T2KLLCS 2021

## Tokyo to Kuala Lumpur Low Carbon System

**- Project Framework-**

**Feb 5th, 2021**

**By:**
**Dr. Junichi Fujino**
**Program Director, City Taskforce**
**Institute for Global Environmental Strategies (IGES)**

## The two cities are collaborating

The two cities signed a memorandum of understanding for collaboration in 2020.

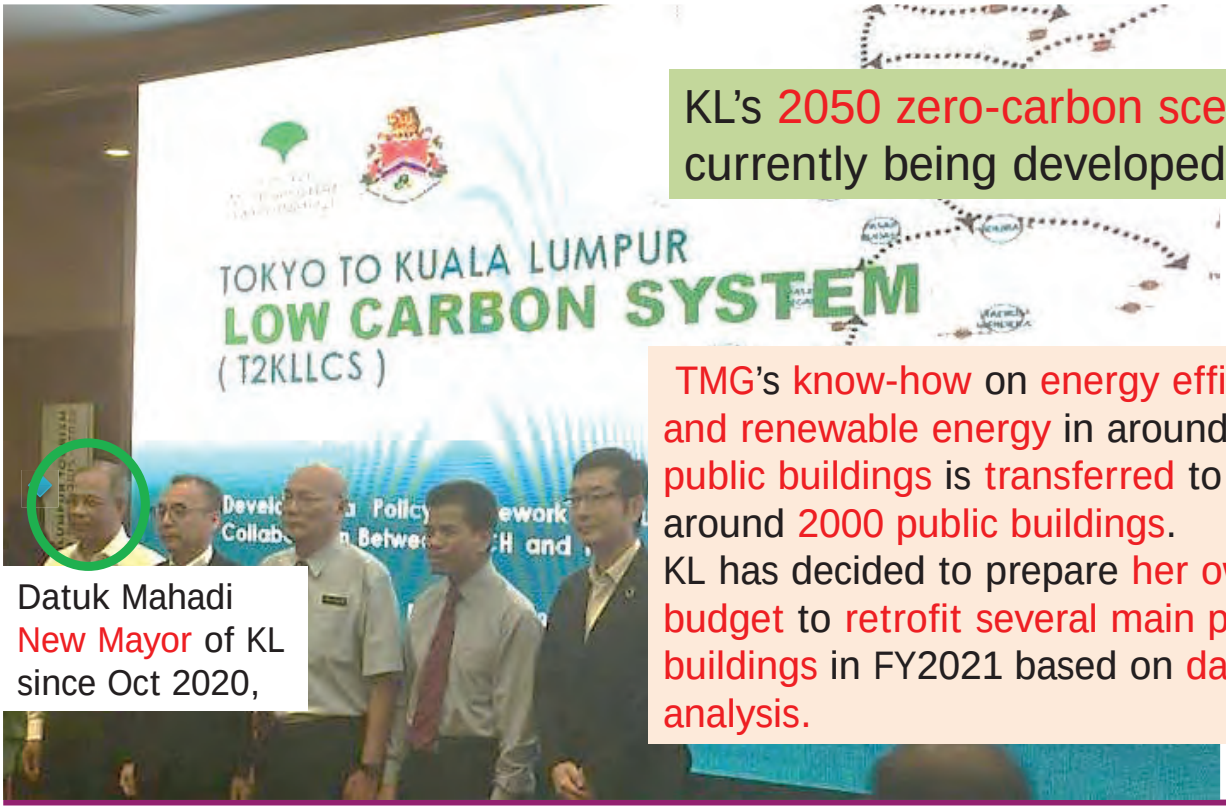
### Tokyo Metropolitan Government

Tokyo declares that it will seek to become a **Zero Emission Tokyo** by 2050

### Kuala Lumpur City Hall

Kuala Lumpur aims, by 2030, to **reduce** carbon emissions intensity of GDP **by 70%**
(KL LCSBP 2030: Kuala Lumpur Low Carbon Society Blueprint 2030)

# Tokyo to Kuala Lumpur T2KLLCS




Datuk Mahadi
New Mayor of KL
since Oct 2020,

KL's 2050 zero-carbon scenario is currently being developed.

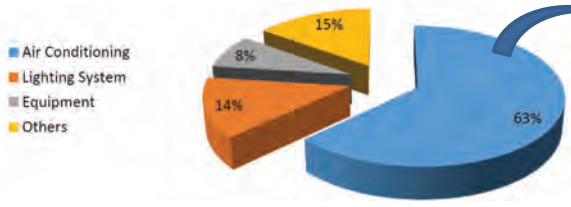
TMG's know-how on energy efficiency and renewable energy in around 4200 public buildings is transferred to KL for around 2000 public buildings.
KL has decided to prepare her own budget to retrofit several main public buildings in FY2021 based on data analysis.



# First year: Introduction of TMG scheme



**Air conditioning** is the largest energy use !




**Reduction potential** based on the solutions !

| | Scenario 1 | Scenario 2 |
|---|---|---|
| $CO_2$ EMISSION IMPROVEMENT | 35% | 47% |
| Approach | Moderate | Aggressive |
| $CO_2$ EMISSION REDUCTION | 12.5 million kgCO2e/year | 16.9 million kgCO2e/year |
| Monetary saving | MYR 7 million/year | MYR 9 million/year |

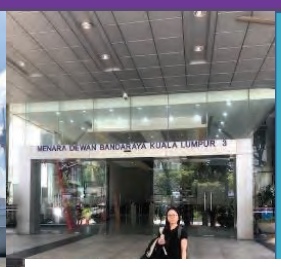
Technological solutions **with TMG suggestion**

| | | |
|---|---|---|
| Building Envelope | 1 | Infiltration - Airtight Building Envelope |
| | 2 | Reduce Direct Sunlight - Shading, Window Blind |
| | 3 | Insulation - Green Roof, Roof Insulation, Wall Insulation, Window Tinted, Window Glass |
| Air-Conditioning System | 4 | Outdoor Air Ventilation Control |
| | 5 | Zoning & Control of Air Distribution System - VAV, Temperature & Humidity Control, Setback & Shut-off Control, Off-hour control |
| | 6 | High Efficiency Fan System |
| | 7 | High Efficiency Air Filtration |
| | 8 | Effective Piping & Ducting Insulation |
| | 9 | High Efficiency Unitary Air Conditioning System - Single Split, Package, Multi Split, VRF |
| | 10 | High Efficiency Centralized Air Conditioning System - Chiller, Hydronic System, Cooling Tower |
| | 11 | Control of Centralized Air Conditioning System - Automation & Optimization |
| Lighting | 12 | Lighting Control - Daylight Control, luminance Control, Zoning Control, Motion Control, Off-hour Control |
| | 13 | High Efficiency Lighting System - Indoor & Outdoor |
| Energy Management Control System | 14 | Control of Equipment, Monitoring of Equipment, Integration of Equipment and Other Sub-systems, Energy related Data Collection and Analyses |
| Renewable Energy | 15 | Solar PV |

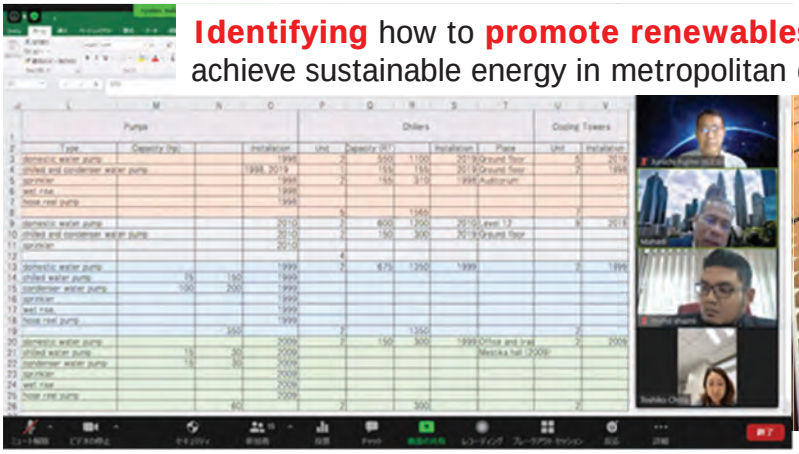
**Mainly TMG's no or low cost solutions !**

# Second year: Budgeting for retrofits



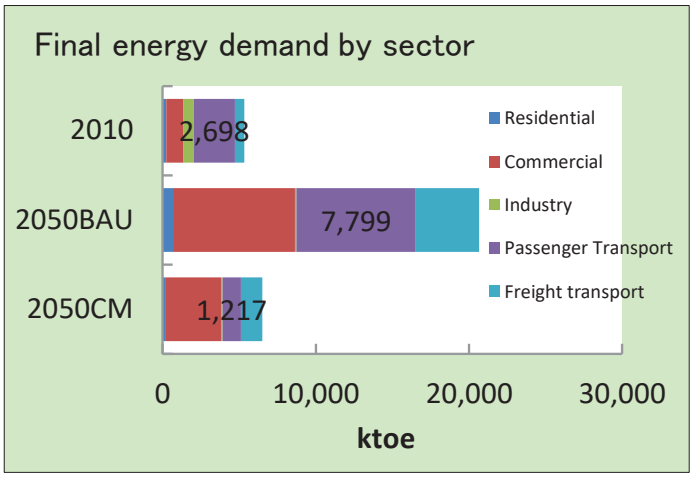



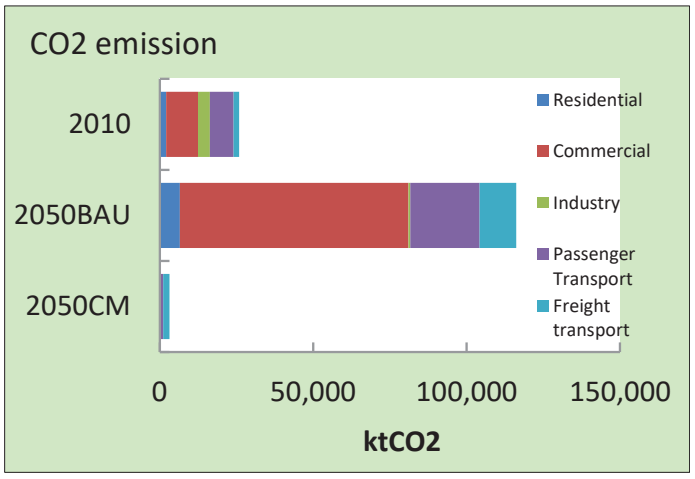
**Budgeting** the retrofits for **energy efficiency** using rough estimation of energy savings, $CO_2$ emission reduction!



**Identifying** how to **promote renewables** to achieve sustainable energy in metropolitan cities

# Second year: Zero Carbon Scenario 2050




# Tentative results

- Energy demand in CM scenario can be reduced **by 67%** compared with BAU scenario in 2050.
- Energy-related $CO_2$ emissions in CM scenario can be reduced **by 97%** compared with BAU scenario in 2050.

# Project proponents

| Tokyo Metropolitan Government (TMG) | | Kuala Lumpur City Hall (KL) |
|---|---|---|
| Support KL city in streamlining their sustainable building policy framework | **Contribute to targets and strategies placed in the Kuala Lumpur Low Carbon Society Blueprint 2030** | Streamline and enhance green building policies |

Climate change measures in buildings developed by TMG + Energy efficient technology diffusion by businesses

① Share experience and knowledge on energy savings through personnel exchange

② Simulate GHG emissions reductions and associated costs

**IGES**:

**Main coordinator**
Already conducted transfer of TMG building scheme to Malaysian cities, several JCM City-City FS projects

**E-konzal**:

**Zero emission scenario development**
Experienced in AIM modelling

**Universiti Teknologi Malaysia:**
**Local coordinator**
Jointly developed KL LCSBP2030, TMG building scheme transfer project

**SEDA (Sustainable Energy Development Authority)**:
**EE RE technical policy support**
Leading organization to conduct energy saving and renewables in Malaysia and in KL buildings



Thank you

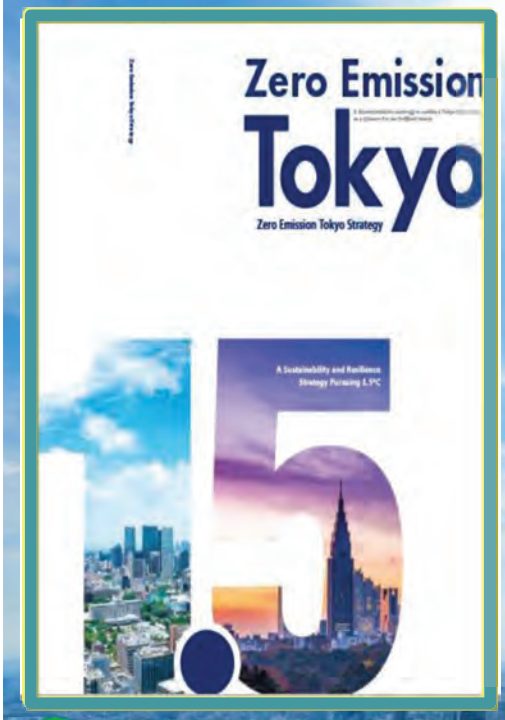
2/5/2021

# Toward a Zero Emission Tokyo

## TOKYO - KUALA LUMPUR LOW CARBON SYSTEM (T2KLLCS)

Toshiko CHIBA
Bureau of Environment
Tokyo Metropolitan Government

## Zero Emission Tokyo Strategy

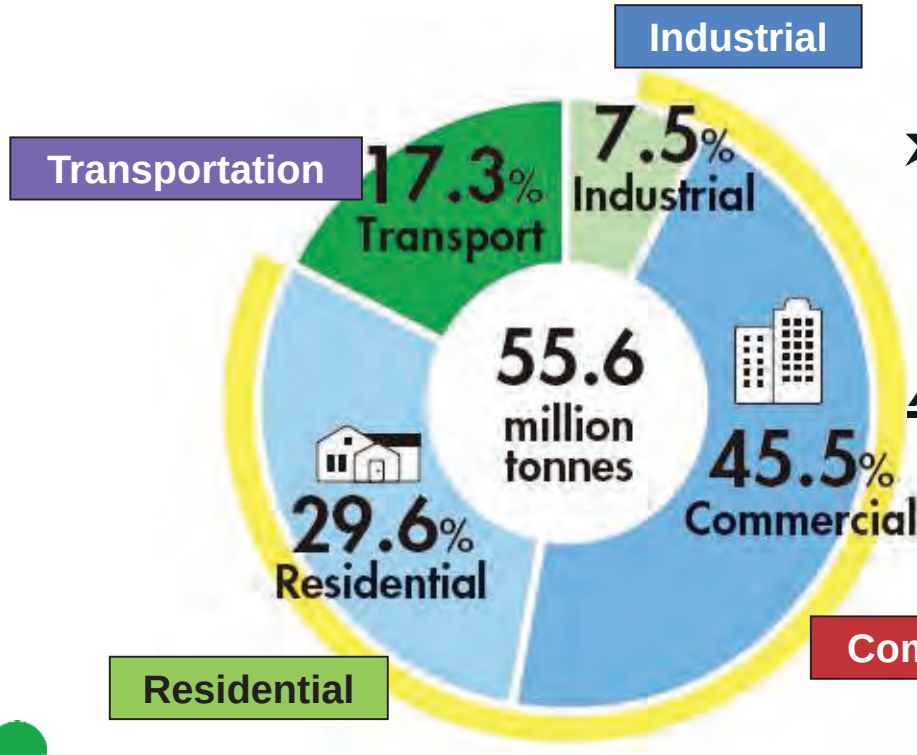



Dec.2019

**Tokyo declares** that it will seek to achieve the **1.5-degree goal** and realize **a Zero Emission Tokyo** to contribute to the world's net-zero carbon emissions **by around 2050**

# Energy-related CO2 in Tokyo (2018)

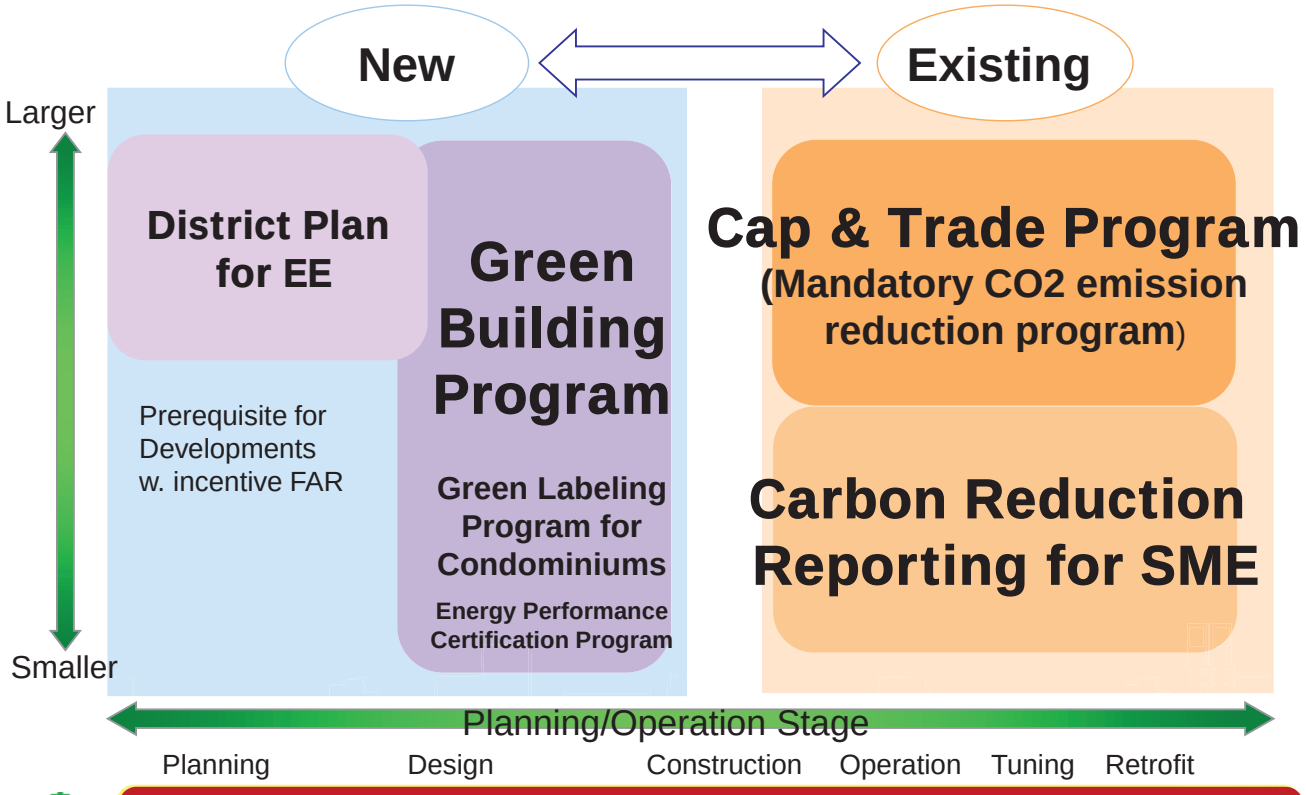





★***Building Sector emits Approx. 70 %***



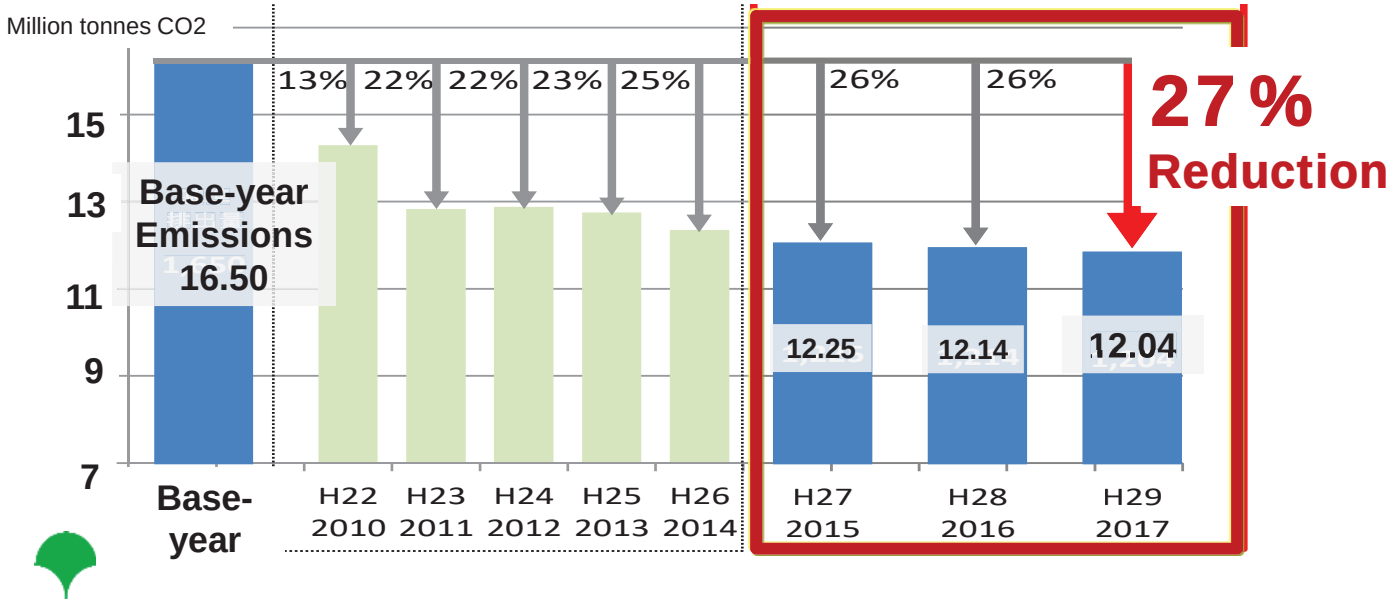
# Carbon Policy Framework for Buildings in Tokyo




**Action for TMG properties**(measure for public buildings )

# Tokyo Cap-and- Trade Program

- **Mandatory CO2 Reduction Program**
- Launched in 2010 by Tokyo ordinance
- 1200 facilities (office, commercial & institutional buildings, factories)






For Existing Large-sized Buildings

# Main Measures for CO2 Reduction

for 2nd compliance Period (2015-2019)

1. Installation of **high-efficiency heat source equipment**
2. Installation of **LED lights**
3. Installation of **high-efficiency air conditioning equipment**
4. Installation of **external air volume control** based on CO2 concentration

# Start from Proposer

Initiative
from city government
bringing policy up

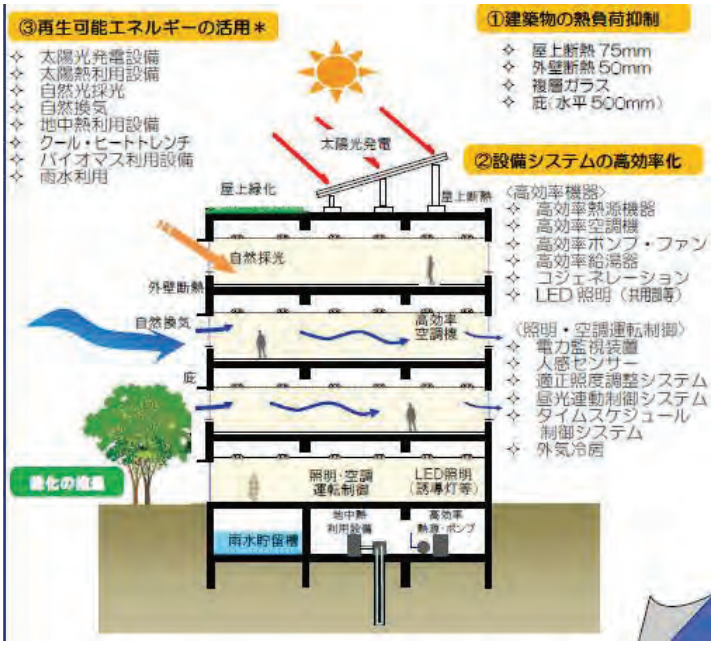
**■Action for TMG properties**
(measure for public buildings )



## For TMG properties

# 1. Highly EE &RE Equipment Installation

"**TMG guideline** on **energy efficiency** and **renewable energy specification**"
for **new or renovation**



# 2. Energy Efficient Operation

## 1) Management of light illuminance

- **less than 500 lux** on the desk

## 2） Efficient management of air conditioning equipment

- Room temperature

ex. 28℃ for cooling

With an action “COOL BIZ”



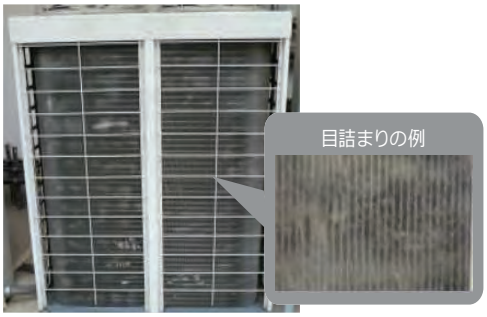

For TMG properties

# 2. Energy Efficient Operation

## 3) Make sure to check and clean the filters and the outdoor units regularly

省エネ事例／空調室外機の清掃（フィンコイル）

現状　熱交換器のフィンが目詰まりしていた。




対策実施　フィンを清掃し、風量を確保することで消費電力を削減する。

# 2. Energy Efficient Operation

**Investment** (hardware) + **Management & operation** (soft methods)

**Replace** with highly efficient equipment, etc

**Collaboration**

**Building management side**  **Employees and visitors**





# 3. Action for TMG City Hall

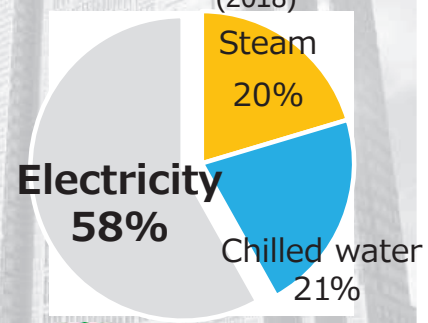
**30 % CO2 reduction**

compare to 2000's

<2017 Performance>

**Energy share of TMG city hall**

(2018)




**"+ action" in 2019**

Moving to **100% renewable energy (power) procurement** at City Hall from Aug. 2019

# Tokyo


Yuriko Koike,
Governor of Tokyo
Jan 27, 2021

**"Governor of Tokyo announced** at the Davos Agenda that **Tokyo will, by 2030, reduce GHG emissions by 50 %** from year 2000 levels, and **increase the use of electricity generated from renewable sources to 50%"**

# TOKYO - KUALA LUMPUR LOW CARBON SYSTEM (T2KLLCS)

C40 CITIES

ICLEI Local Governments for Sustainability Japan

JCI 気候変動イニシアティブ Japan Climate Initiative

SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD

TOKYO METROPOLITAN GOVERNMENT

# Tokyo to Kuala Lumpur Low Carbon System (T2KLLCS)

## Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change: **Carbon Neutral Kuala Lumpur By 2050**

February 5th, 2021. Friday

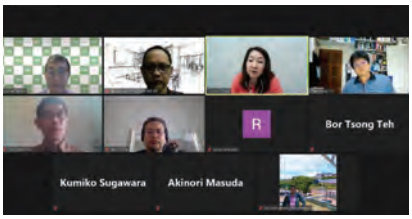
Nik Mohammed Faizal
City Hall, Kuala Lumpur

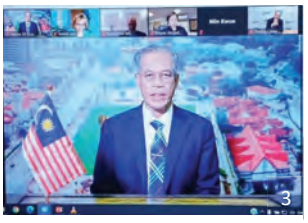




## CONTENTS

# PHASE 1 – City To City Collaboration

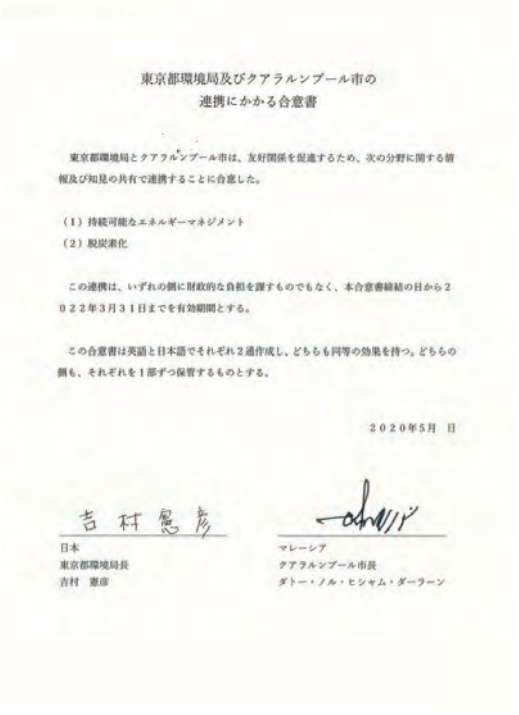





*Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change:* ***Carbon Neutral Kuala Lumpur By 2050***

# PHASE 1 – MOU, KLCH AND TMG

- Mayor of Kuala Lumpur signed the MOU on 24 July 2020
- KLCH will forward the hardcopy to TMG on Monday



東京都環境局及びクアラルンプール市の
連携にかかる合意書

東京都環境局とクアラルンプール市は、友好関係を促進するため、次の分野に関する情報及び知見の共有で連携することに合意した。

（1）持続可能なエネルギーマネジメント
（2）脱炭素化

この連携は、いずれの側に財政的な負担を課すものでもなく、本合意書締結の日から２０２２年３月３１日までを有効期間とする。

この合意書は英語と日本語でそれぞれ２通作成し、どちらも同等の効果を持つ。どちらの側も、それぞれを１部ずつ保管するものとする。

２０２０年５月　日

吉村 憲彦
日本
東京都環境局長
吉村　憲彦

マレーシア
クアラルンプール市長
ダトー・ノル・ヒシャム・ダーラーン

MEMORANDUM OF UNDERSTANDING
BETWEEN
KUALA LUMPUR CITY HALL
AND
BUREAU OF ENVIRONMENT, TOKYO METROPOLITAN GOVERNMENT

The Kuala Lumpur City Hall in exercise of its functions and powers as a local authority and the Bureau of Environment, Tokyo Metropolitan Government, have agreed to collaborate in sharing information and knowledge concerning the following areas for the promotion of friendly relations.

(1) Sustainable Energy Management
(2) Decarbonization

This collaboration shall not give rise to any financial obligation for either party and shall be effective for a period from the date of signing of the memorandum until March 31, 2022.

This memorandum of understanding has been made in duplicate in English and Japanese, both versions deemed equally authentic. Each party is to keep one copy of each version.

Signed on May , 2020

Dato' Nor Hisham A. Dahlan
Mayor
Kuala Lumpur City Hall

Malaysia

Norihiko Yoshimura
Director General
Bureau of Environment
Tokyo Metropolitan Government

Japan

## PHASE 2 – Challenges & Obstacles

- There are more than 3,000 electric bills identified from various types of DBKL buildings.
- Data are scattered and different person-in-charge are assign for each bill.
- under the previous Deputy Mayor (now the current KL Mayor), KLCH successfully obtained all bills from Tenaga Nasional Berhad (TNB).
- Meeting with various internal team and external organisations were conducted weekly & monthly to expedite the data collection.
- with the assistance from TMG, KLCH team successfully identified 112 high consumption DBKL buildings with EE & RE potential.
- Currently, DBKL is focusing on its 4 main buildings to undergo specific EE projects.



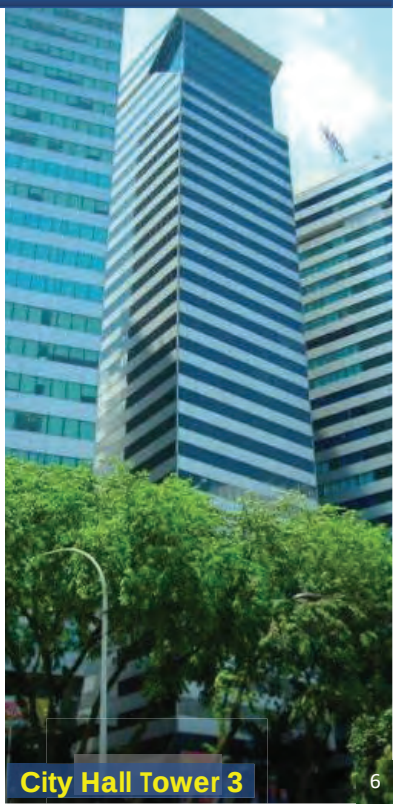
*Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change:* ***Carbon Neutral Kuala Lumpur By 2050***

## PHASE 2 – 4 Pilot Projects (EE)

City Hall Tower 1

City Hall Training Centre

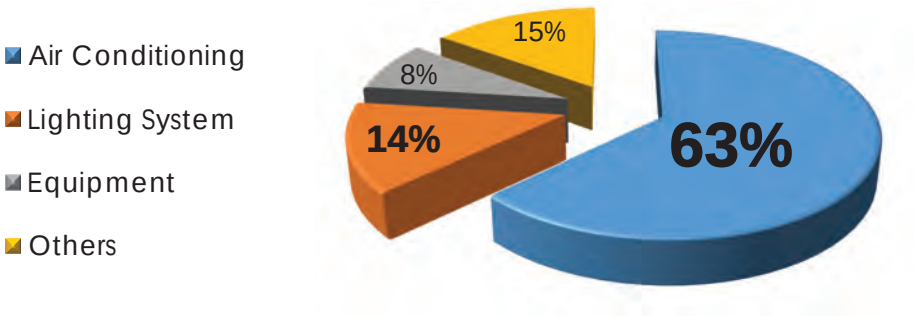

City Hall Tower 2


City Hall Tower 3

# PHASE 2 – Pilot Projects for High Energy Consumption Buildings

- City Hall Tower 1
- City Hall Tower 2
- City Hall Tower 3
- City Hall Training Center (IDB)

TMG identified that in almost all of the buildings, air-conditioning contributes to 63% of total KwH consumption.






*Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change:* ***Carbon Neutral Kuala Lumpur By 2050***

# AIR-CONDITIONING EQUIPMENT IN **KLCH TOWER 1**

| Space Cooling Equipment (year installed) | | No. of Pumps (year installed) | |
|---|---|---|---|
| 3 chillers at Ground Floor (for building) | 2017 | 12 unit chilled and condenser water pump (for chiller system) | 2017 |
| 5 unit cooling tower | 2017 | | |
| 30 units AHU<br>30 units FCU<br>6 units WCPU | **1998 (To be replaced in 2021)** | | |
| 2 chillers at Level 1 (for auditorium) | **1998 (To be replaced in 2021-complete system)** | | |

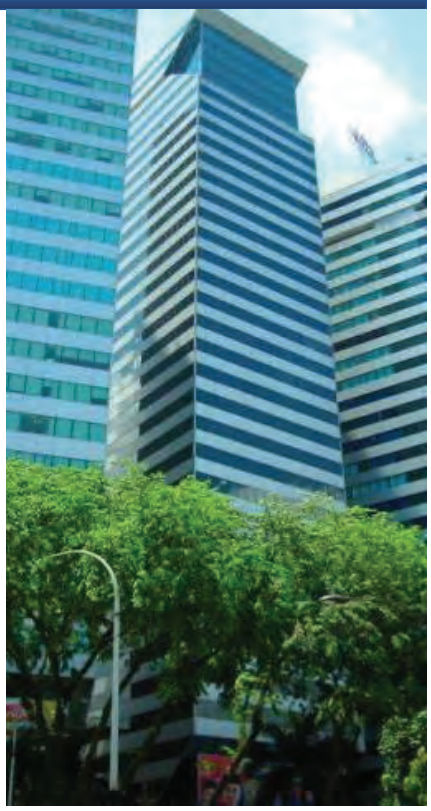
# AIR-CONDITIONING EQUIPMENT IN **KLCH TOWER 2**

| Space Cooling Equipment (year installed) | | No. of Pumps (year installed) | |
|---|---|---|---|
| 2 unit chiller (For Level 3-11) | 2010 | 8 unit chilled and condenser water pump (For Level 3-11 chiller system) | 2010 |
| 2 unit chiller (For Level G-2) | **2019** | | |
| 4 unit cooling tower (For Level 3-11) | 2010 | 8 unit chilled and condenser water pump (For Level G-2 chiller system) | **2019** |
| 4 unit cooling tower (For Level G-2) | **2019** | | |
| 16 unit AHU (For Level 3-11) | 2010 | | |
| 5 unit AHU (For Level G-2) | **2018** | | |
| 3 units WCPU | 2010 | | |

*Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change:* ***Carbon Neutral Kuala Lumpur By 2050***

# AIR-CONDITIONING EQUIPMENT IN **KLCH TOWER 3**

| Space Cooling Equipment (year installed) | | No. of Pumps (year installed) | |
|---|---|---|---|
| 2 unit chiller (For building) | 1999 | 2 unit chilled water pump and 2 unit condenser water pump (For chiller system) | 1999 |
| 2 unit Cooling Tower (For building) | 1999 | | |
| 42 unit AHU | 1999 | | |
| 19 unit FCU | 1999 | | |
| 28 unit CCFCU | 1999 | | |



Study will be conducted this year (2021) and budget will be applied to replace the existing air-condition system in 2022

# AIR-CONDITIONING EQUIPMENT IN **KLCH IDB**

| Space Cooling Equipment (year installed) | | No. of Pumps (year installed) | |
|---|---|---|---|
| 2 unit chiller (For event hall) | 1999 | 2 unit chilled water pump and 2 unit condenser water pump (For chiller system at event hall) | 2009 |
| 2 unit Cooling Tower (For event hall) | 2009 | | |
| 3 unit AHU | 2009 | | |
| 5 unit FCU | 2009 | | |
| 16 VRV systems (For academic tower) | **2009 (To be replaced in 2021)** | | |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## PHASE 2 – Air-condition Equipment (EE)

Chillers


Water Pumps

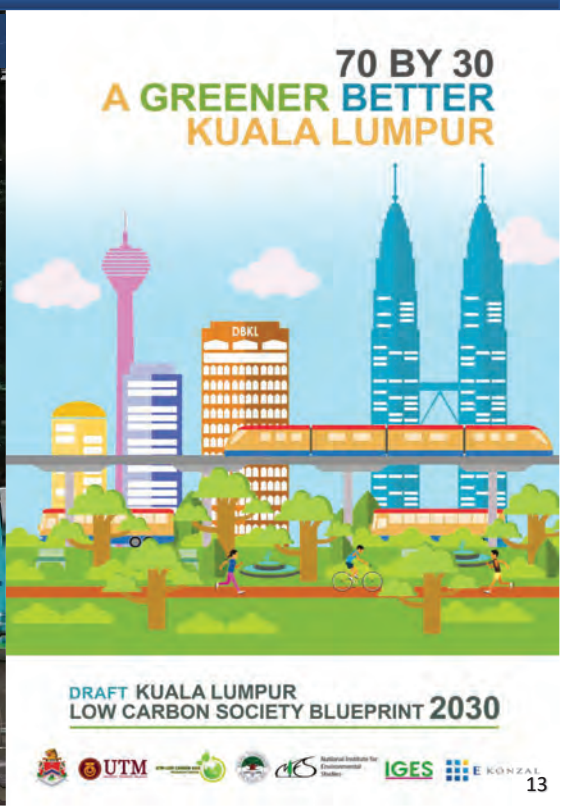

Cooling Tower


AHU

| Buildings & Equipments |
|---|
| City Hall Tower 1 (AHU) **(To Be Replaced 2021) budget obtained** |
| City Hall Tower 1 - Auditorium -Chiller, Pump, Cooling Tower & AHU **(To Be Replaced 2021) Budget obtained** |
| IDB-Academic Tower Variable Refrigerant Flow(VRF) System **(To Be Replaced 2021) Budget obtained** |
| City Hall Tower 3 -Chiller, Pump, Cooling Tower & AHU **(To Be Replaced 2022)** |

## PHASE 2 – Kuala Lumpur Low Carbon Target

Reduce **70%** carbon emissions by **2030**






## PHASE 2 – Kuala Lumpur Solar PV (Private Initiatives)


IKEA Cheras

DUKE-Plaza Toll


KEN Tower-TTDI

UTM-Semarak

# PHASE 2 – New Potentials SOLAR PV for KLCH Buildings

## Solar PV Project- Planning for 2021

**1. Titiwangsa Takraw Stadium**

1. TTDI Market
2. Sentul Perdana Community Centre
3. Ampang Hilir Hall and Community Centre
4. Keramat Mall Commercial Building
5. Kuala Lumpur Wholesale Market
6. Bandar Tun Razak Commercial Centre


1. Kuala Lumpur City Hall Training Centre (IDB)
2. Kuala Lumpur Public Library

1. Pudu Ulu Recreational Park
2. Kuala Lumpur Count Down Clock

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## KEY CONSIDERATION FOR ANALYSIS ON VIABILITY

| BUILDING | CATAGORY | Solar PV | | | | | | | | | | GHG | | Estimated Cost (RM) Budget |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Current Existing Power Usage/ Consumption (kWh) | Architecture Form (Roof Coverage Area) | Architecture Form (Roof Coverage Area and Type) | Additional Structural Load and Roof Type (to withold additional Solar Panel) | Transportation and Easy Installation | Impactful & Demonstrative (Physical Visibility) | Impactful & Demonstrative (Experience by users) | Vandalism Risk | Targeted Energy Type (RE/EE) | Targeted Energy Capacity (kWh) | Existing GhG emission | Targeted GHG emission reduction (Output) | |
| 1. Stadium Takraw Titiwangsa | Sport Centre | 540,144 | 4237.45 m2- (20%)= 3,389.96m2 | 3 | Subject to selection of solar panel & arrangement | 3 | 5 | 3 | Low | RE-Solar PV/NEM/EE | 75% | | | |
| 2. Pusat Komersial Bandar Tun Razak | Commercial | 908,203 | 4,551.12m2 – (20%) = 3,640.90 m2 | 3 | Subject to selection of solar panel & arrangement | 3 | 4 | 5 | Moderate | RE-Solar PV/NEM/EE | 75% | | | |
| 3.Taman Rekreasi Pudu Ulu Fasa 1 | Infra Parks & Others | 253,832 | 1480m2 – (20%) = 1,184m2 | 3 | Subject to selection of solar panel & arrangement | 5 | 5 | 5 | Low | RE-Solar PV/NEM/EE | 75% | | | |
| 4. IDB | Training Centre | 1,283,350 | 3961.64m2 – (20%) = 3,169.31m2 | 3 | Subject to selection of solar panel & arrangement | 4 | 4 | 3 | Low | RE-Solar PV/NEM/EE | 75% | | | |

## KEY CONSIDERATION FOR ANALYSIS ON VIABILITY

| BUILDING | CATAGORY | Solar PV | | | | | | | | | | GHG | | Estimated Cost (RM) Budget |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Current Existing Power Usage/ Consumption (kWh) | Architecture Form (Roof Coverage Area) | Architecture Form (Roof Coverage Area and Type) | Additional Structural Load and Roof Type (to withold additional Solar Panel) | Transportation and Easy Installation | Impactful & Demonstrative (Physical Visibility) | Impactful & Demonstrative (Experience by users) | Vandalism Risk | Targeted Energy Type (RE/EE) | Targeted Energy Capacity (kWh) | Existing GhG emission | Targeted GHG emission reduction (Output) | |
| 5.Perpustakaan Kuala Lumpur | Public Library | 737,120 | 1832m2 – (20%) = 1,465.60m2 | 3 | Subject to selection of solar panel & arrangement | 3 | 4 | 5 | Low | RE-Solar PV/NEM/EE | 75% | | | |
| 6. Pusat Komuniti Sentul Perdana | Commercial | 203,282 | 2266.16m2 – (20%) = 1,812.93m2 | 3 | Subject to selection of solar panel & arrangement | 2 | 4 | 3 | Low | RE-Solar PV/NEM/EE | 75% | | | |
| 7. Dewan Ampang Hilir | Infra Parks & Others | 226,661 | 2268.66m2 – (20%) = 1,814.93m2 | 3 | Subject to selection of solar panel & arrangement | 2 | 4 | 3 | Low | RE-Solar PV/NEM/EE | 75% | | | |
| 8. Pasar TTDI | Market | 728,117 | 7559.8m2 – (20%) = 6,047.84m2 | 5 | Subject to selection of solar panel & arrangement | 2 | 4 | 5 | Moderate | RE-Solar PV/NEM/EE | 75% | | | |

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## KEY CONSIDERATION FOR ANALYSIS ON VIABILITY

| BUILDING | CATAGORY | Solar PV | | | | | | | | | | GHG | | Estimated Cost (RM) Budget |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Current Existing Power Usage/ Consumption (kWh) | Architecture Form (Roof Coverage Area) | Architecture Form (Roof Coverage Area and Type) | Additional Structural Load and Roof Type (to withold additional Solar Panel) | Transportation and Easy Installation | Impactful & Demonstrative (Physical Visibility) | Impactful & Demonstrative (Experience by users) | Vandalism Risk | Targeted Energy Type (RE/EE) | Targeted Energy Capacity (kWh) | Existing GhG emission | Targeted GHG emission reduction (Output) | |
| 9.Keramat Mall | Commercial | 1,555,160 | 8300.76m2 – (20%) = 6,640.61m2 | 5 | Subject to selection of solar panel & arrangement | 2 | 4 | 5 | High | RE-Solar PV/NEM/EE | 75% | | | |
| 10. Pasar Borong Kuala Lumpur | Market | 2,178,180 | 14,816.08 m2 – (20%) = 11,852.86 m2 | 5 | Subject to selection of solar panel & arrangement | 3 | 5 | 5 | High | RE-Solar PV | 75% | | | |

## RATING ON KEY CONSIDERATION FOR ANALYSIS ON VIABILITY

| KEY CONSIDERATIONS | RATINGS | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Architecture Form (Roof Coverage Area) | Very Small<br>*(100msq-500msq) Very small scale solar farming and harvesting and not viable. Potential for Surplus Energy from other Solar Farming Buiding* | | Intermediate<br>*(500msq-5000msq) Potential for medium scale solar farming and harvesting* | | Very Big<br>*(>5000msq) Potential for higher solar farming and harvesting)* |
| Additional Structural Load and Roof Type (to withold additional Solar Panel) | Not Safe at all<br>*Metal decking. Existing structure could not withold the new proposed Solar PV installation.* | | So So<br>*Metal decking, pitched tile or RC Roof. Existing roof structure could withold the new proposed Solar PV installation.* | | Very Safe<br>*Metal decking, pitched tile or RC Roof. Existing roof structure with high strength to withold the new proposed Solar PV installation.* |
| Transportation, Logistic and Easy Installation | Not accessible at all<br>*The access from road to building is very tight and no facility in building (lift) and at all. No road side parking for loading and unloading and storage area within the building.* | | Neither so<br>*The access from road to building is okay , have parking on road side for loading and unloading and limited facility in building (lift) to cater for logistic. No/limited storage area within building for storage.* | | Very Accessible<br>*The access from road to building is very good and accessible , have ample parking on road side for loading and unloading, proper walkway and adequate facility in building (lift) to cater for logistic. Ample space for storage area within building.* |
| Impactful & Demonstrative (Physical Visibility) | Not visible at all<br>*Very High/Tall Building (Highrise) >17 storey building (>50m)* | Not So Visible<br>*Small Highrise Building 10-16 storey building (30-50m)* | Neither so<br>*Mediumrise Building 7-9 storey building (21-30m)* | Likely visible<br>*Multistorey Building 4-6 storey building (9-21m)* | Very Visible<br>*Very High/Tall Building (Highrise) 1-3 storey building (<9m)* |
| Impactful & Demonstrative (Experience by users) | Least likely<br>*Very limited Common Area/Public Area for installation and for public to experience renewable energy facilities.* | Unlikely<br>*Small Common Area/Public Area for installation and for public to experience renewable energy facilities.* | Neutral<br>*Medium size Common Area/Public Area for installation and for public to experience renewable energy facilities.* | Likely<br>*Bigger size Common Area/Public Area for installation and for public to experience renewable energy facilities.* | Very Likely<br>*Very large coverage of Common Area/Public Area for installation and for public to experience renewable energy facilities.* |
| Low Vandalism Risk | High Risk<br>*Location/placement of equipment is within public reach and very easy to disassemble. Location not within public vicinity or visual connectivity.* | | Neutral<br>*Location/placement of equipment is not within public reach and easy to disassemble. Location quite far from public vicinity or visual connectivity.* | | Low Risk<br>*Location/placement of equipment is not at all within public reach and not at all easy to disassemble. Location is close to public vicinity or visual connectivity to increase 'eyes on the streets'.* |

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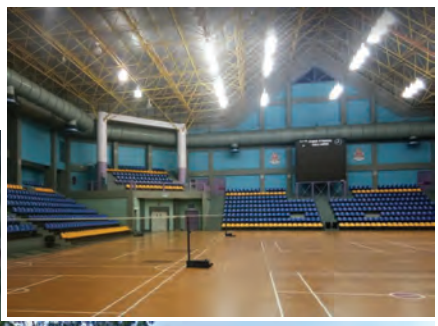
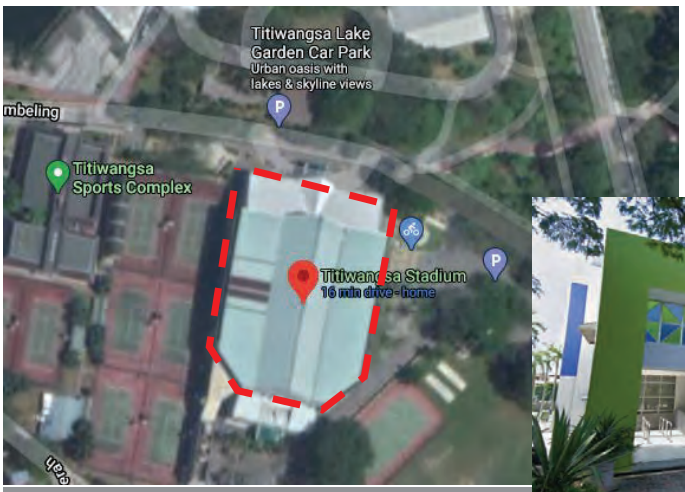
## 1. Titiwangsa Takraw Stadium

Address : Titiwangsa Takraw Stadium - Titiwangsa Recreational Park,
GPS : 3.1760713469860016, 101.70580141344048
Buildng Type : Sport Centre

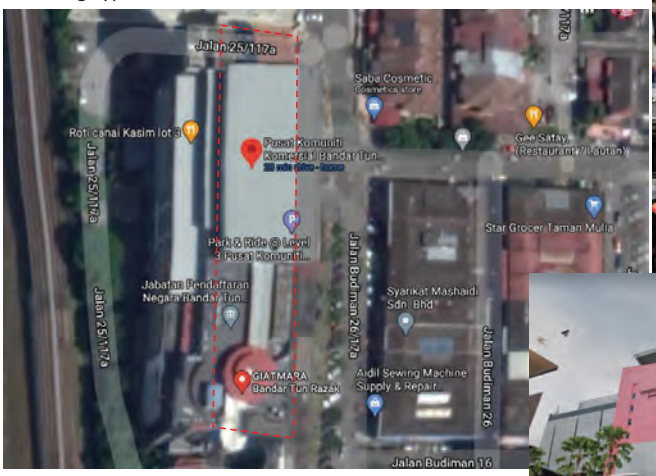


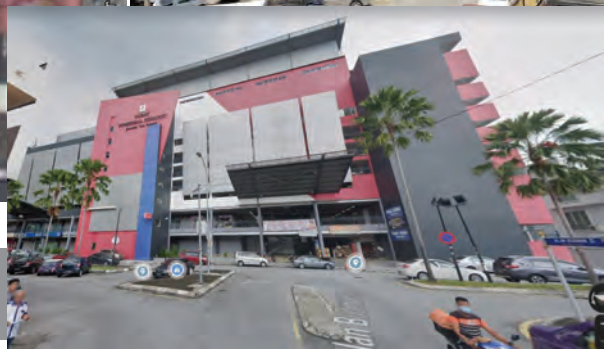



- Pitch Metal decking roof
- Big roof coverage area
- No disturbance on solar catchment from surrounding

## 2. Bandar Tun Razak Commercial Centre

Address : Bandar Tun Razak Commercial Centre - 56000 KUL
GPS : 3.0914272,101.7121614,138
Buildng Type : Commercial



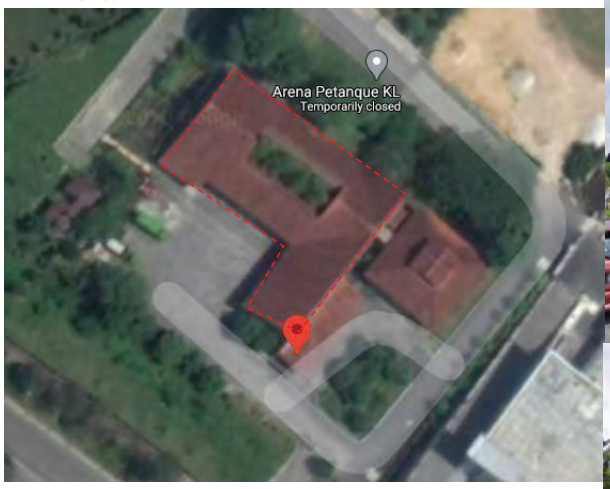



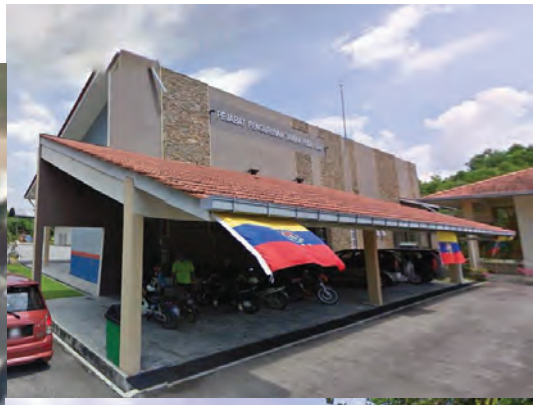
- Metal Decking Pitch Roof
- Big roof coverage area
- No disturbance on solar catchment from surrounding

*Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change:* ***Carbon Neutral Kuala Lumpur By 2050***

## 3. Pudu Ulu Recreational Park

Address : Pudu Ulu Recreational Park Office, KUALA LUMPUR
GPS : 3.1228519,101.7349772,116
Buildng Type : Infra Parks & Others



- Tiled Pitch Roof
- Big roof coverage area
- No disturbance on solar catchment from surrounding

## 4. City Hall Training Centre(IDB)

Address :KLCH Training Centre(IDB) - - 56000 KUL
GPS : 4659227168, 101.70148423412166
Building Type : Training Centre

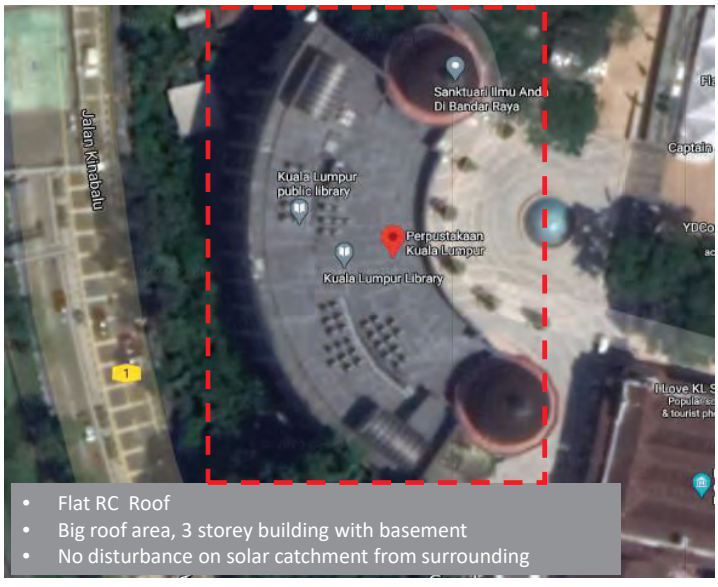


- Flat RC Roof and metal decking roof
- Big roof area
- 2 highrise office tower and apartment around the area

*Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change:* ***Carbon Neutral Kuala Lumpur By 2050***

## 5. Kuala Lumpur Public Library

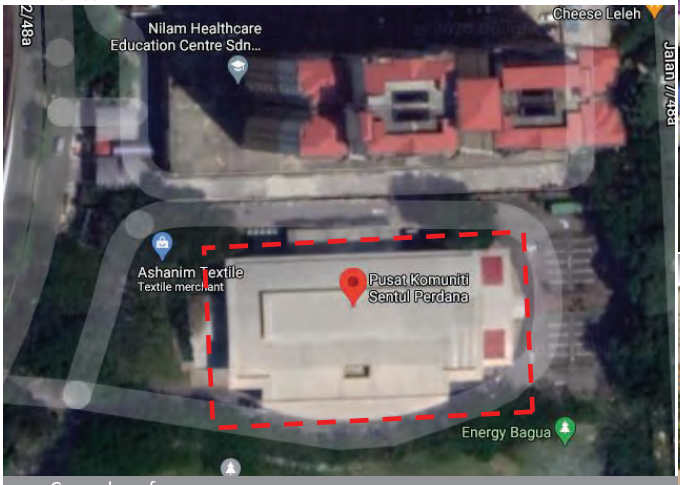
Address : Kuala Lumpur Public Library - JLN RAJA - KUALA LUMPUR 50050 KUL
GPS : 4659227168, 101.70148423412166
Building Type : Public Library




- Flat RC Roof
- Big roof area, 3 storey building with basement
- No disturbance on solar catchment from surrounding

## 6. Sentul Perdana Community Centre

Address : Sentul Komuniti Centre
GPS : 3.184090698646056, 101.69626615433617
Buildng Type : Hall & Community Centre




- Curved roof
- Medium roof coverage area
- High rise apartment on around the neighbourhood, potentially to be overshaddowed

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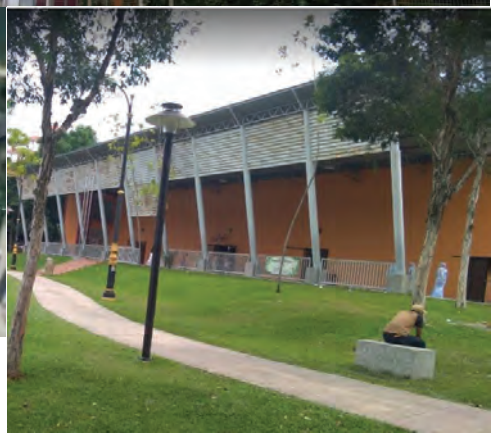
## 7. Ampang Hilir Hall

Address : Ampang Hilir Hall
GPS : 3.1522929,101.7435857,277
Building Type : Infra Parks & Others

- Pitched, metal decking roof
- Big roof coverage area
- No disturbance on solar catchment from surrounding

# 8. TTDI Market

Address : TTDI Market
GPS : 3.1386249784454607, 101.62896866193572
Building Type : Market


- Pitched, metal decking roof
- Big roof coverage area, 3 storey building
- Some part of roof is shadowed by Menara LGB TTDI

*Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change:* ***Carbon Neutral Kuala Lumpur By 2050***

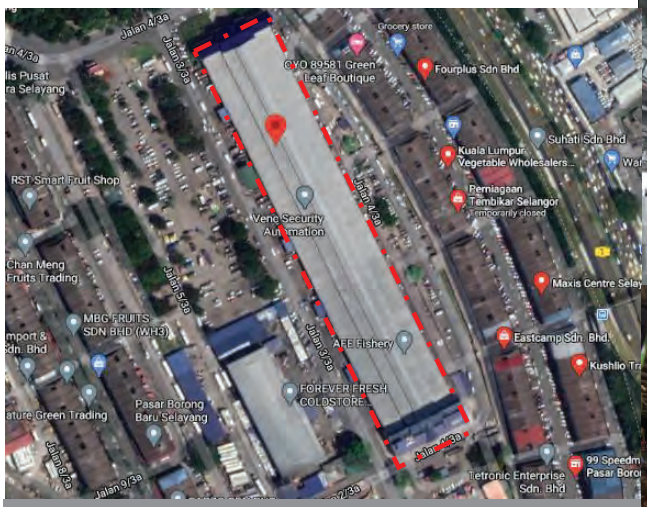
# 9. Keramat Mall Business Centre

Address : Keramat Business Centre
GPS : 3.16537831,101.72380994,35.66461661
Building Type : Commercial


- Flat and Pitchroof
- Big roof area
- No disturbance on solar catchment from surrounding

# 10. Kuala Lumpur Wholesale Market

Address : Kuala Lumpur Wholesale Market
GPS : 3.2362844,101.6671076,783
Buildng Type : Market





- Pitched Roof
- Big roof coverage area, approx. 16 storey building
- No disturbance on solar catchment from surrounding building

*Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change:* ***Carbon Neutral Kuala Lumpur By 2050***

# 11. Kuala Lumpur Count Down Clock

Kuala Lumpur Count Down Clock

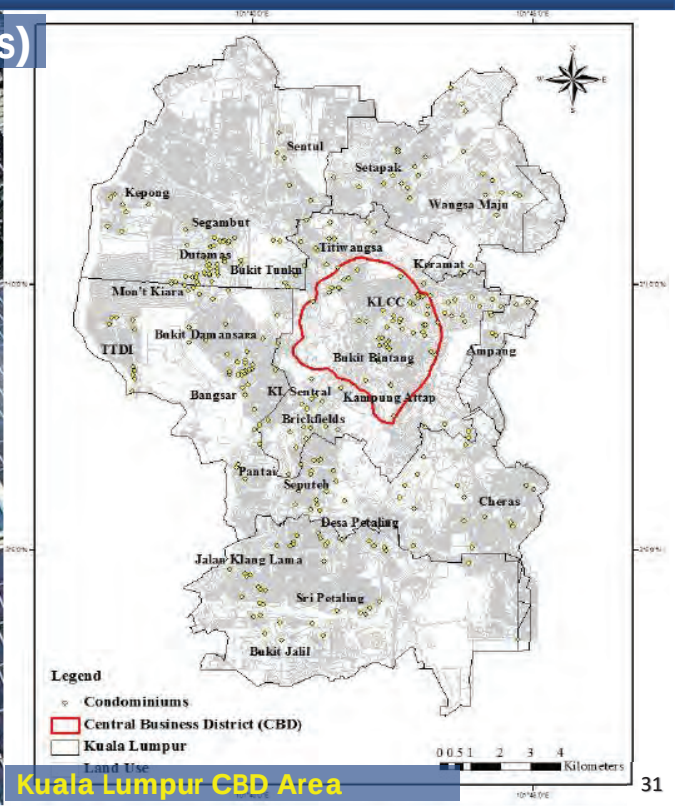
Buildng Type : Public Place


- Pitched Roof
- Near to Mayor Office
- No disturbance on solar catchment from surrounding building

# PHASE 3 – WAY FORWARD (Renewables)

**KL** Imposing on real estate developers to use at least **30%** Renewable Energy in early **2021**

KLCC- Solar PV




Kuala Lumpur CBD Area



*Kuala Lumpur City Hall (KLCH) And Tokyo Metropolitan Government (TMG) Joint Effort To Counter Climate Change:* ***Carbon Neutral Kuala Lumpur By 2050***

# PHASE 3 – WAY FORWARD (EV & Low Carbon Growth Centre)

malaymail

HOME · MALAYSIA

**DBKL to allocate reduced Budget of RM2.653b for 2021, says mayor**

Thursday, 17 Dec 2020 06:19 PM MYT

KUALA LUMPUR, Dec 17 — Kuala Lumpur City Hall (DBKL) is allocating RM2.653 billion for Budget 2021 to implement various initiatives for the well-being and prosperity of city dwellers, says its mayor Datuk Mahadi Che Ngah.

However, the Budget is less than this year's allocation of RM2.972 billion as DBKL is also affected by the Covid-19 pandemic.

Mahadi said the Budget themed, *'Sayangi Kuala Lumpur, Kota Sejahtera'*, comprised RM1.762 billion (66.4 per cent) for operating expenditure and RM891 million (33.6 per cent) for development expenditure.

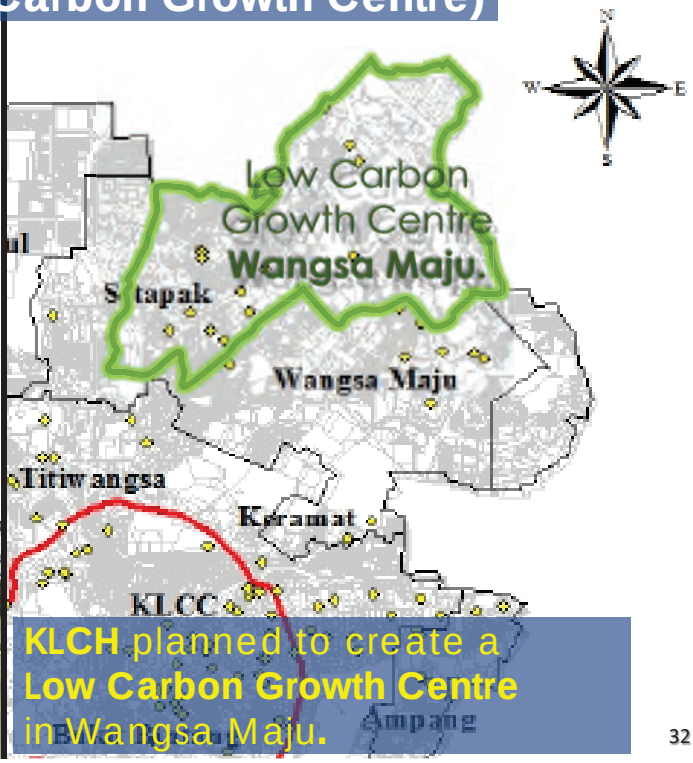
DBKL provides over ughout the city.

**KUALA LUMPUR Dec 17, 2020 :**

"Meanwhile, he said, DBKL aimed to reduce the intensity of greenhouse gas emission up to 70 per cent by 2030 by using solar energy for its buildings starting from the end of next year and **electrical power for the GO KL bus** service."



Kuala Lumpur EV Buses




**KLCH** planned to create a **Low Carbon Growth Centre** in Wangsa Maju.

## CONCLUSION-Carbon Neutral Kuala Lumpur By 2050

### Tokyo Metropolitan Government (TMG)

Tokyo declares that it will seek to become a **Zero Emission Tokyo** by 2050

### Kuala Lumpur City Hall (KLCH)

Kuala Lumpur aims to become **Carbon Neutral Kuala Lumpur** by 2050


Tokyo to Kuala Lumpur Low Carbon Society (T2KLLCS) Seminar

5 February 2021

# Update on Renewable Energy & Energy Efficiency

**Steve Anthony Lojuntin**

**Acting CEO**
**Sustainable Energy Development Authority (SEDA)**
***an agency under the Ministry of Energy and Natural Resources (KeTSA)***

*steve@seda.gov.my* / ***Tel: +6019 - 2829102***

## Overview of SEDA

SEDA was established on 1st September 2011 under the **SEDA Act 2011 [*Act 726*]** with some of the following functions:

01 **To advise the Minister & Government Entities on all matters relating to sustainable energy**

02 **To promote & implement national policy objectives for renewable energy**

03 **To promote, stimulate, facilitate and develop sustainable energy**

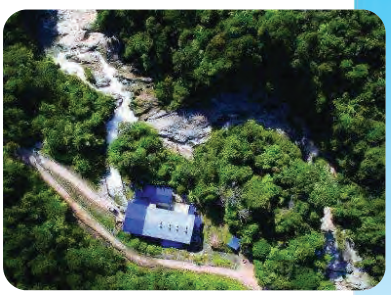
04 **To implement, manage, monitor & review the Feed-in Tariff (FiT) system**

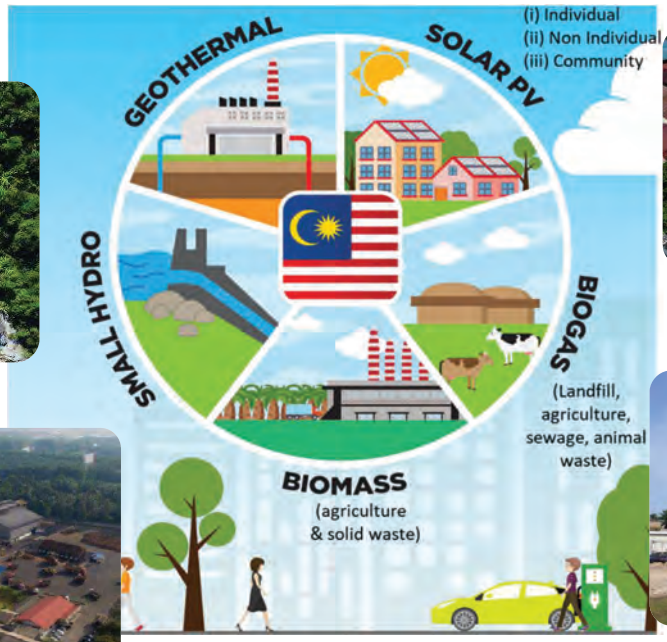
05 **To implement sustainable energy laws and recommend reforms to such laws to the Federal Government**

06 **To promote private sector investment in sustainable energy sector**

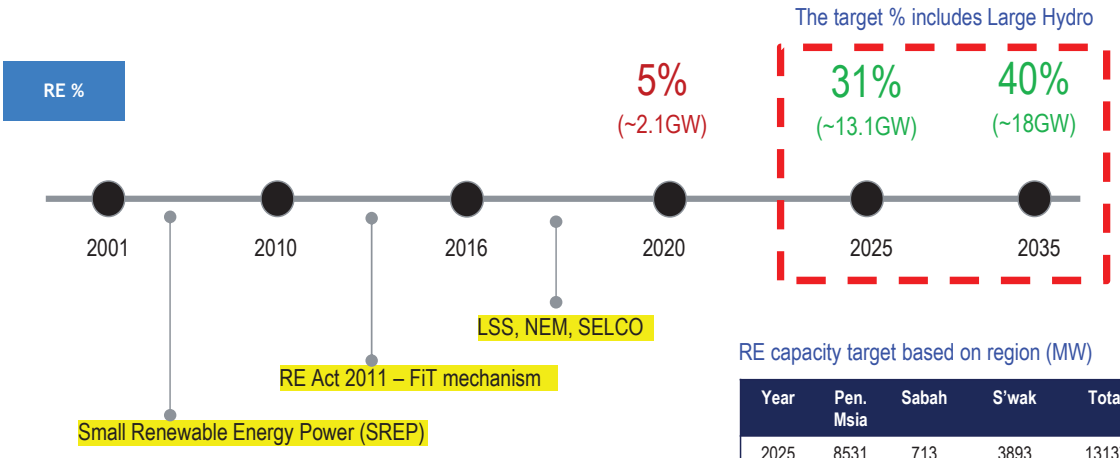
07 **To act as focal point on matters relating to sustainable energy & climate change matters relating to energy**

# Renewable Energy Resources under RE Act 2011






# SEDA alongside with other industry players are working towards realizing national renewable energy (RE) aspirations



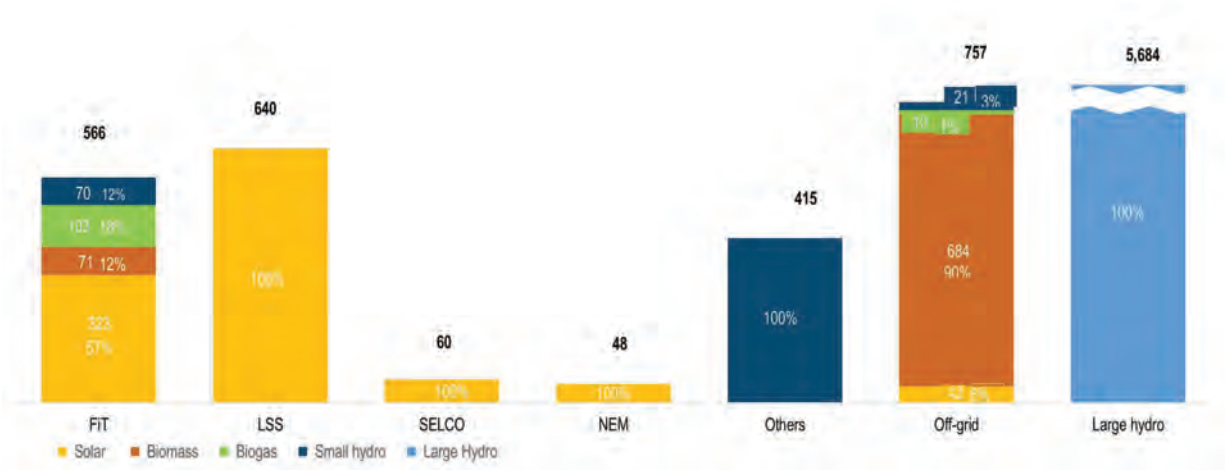

RE capacity target based on region (MW)

| Year | Pen. Msia | Sabah | S'wak | Total |
|---|---|---|---|---|
| 2025 | 8531 | 713 | 3893 | 13137 |
| 2035 | 10944 | 1627 | 5472 | 18043 |

Note:

1. The target is in line with the following:
    1. National Renewable Eneegy Policy and Action Plan (NREPAP)
    2. Nationally Developed Commitments (NDC) under Paris Agreement 2015

# Existing installed capacities (MW) by RE support mechanisms in Malaysia

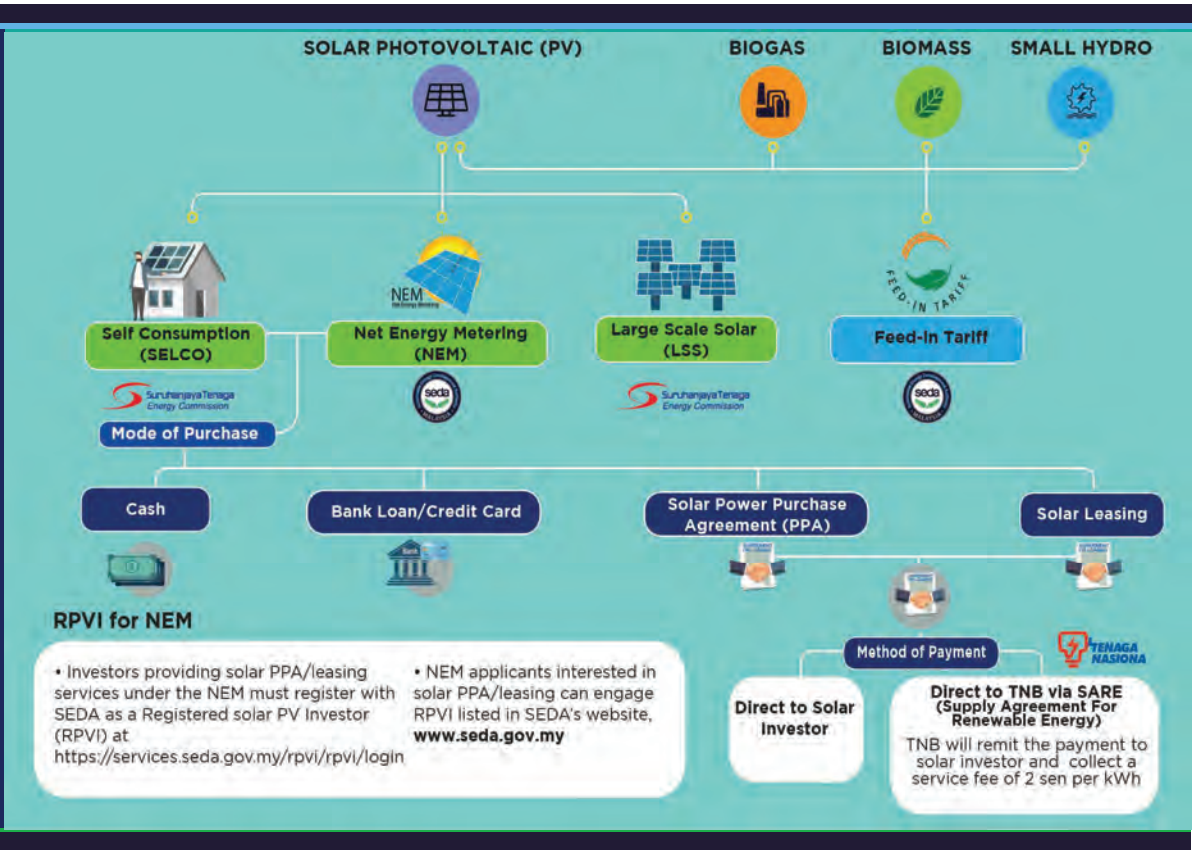



**Total RE installed capacity as of December 2019 in Malaysia: 8,170 MW**

Source: SEDA; ST; Roland Berger



# Renewable Energy Programmes In Malaysia



# Net Energy Metering (NEM) 3.0


Net Energy Metering 3.0 programme (NEM 3.0) - 2021 to 2023 with allocation of up to 500 MW. The NEM 3.0 will be divided into the following three (3) new initiatives/categories :-

| Initiative/Categories | Quota Allocation (MW) | Quota Opening Date |
|---|---|---|
| Program **NEM Rakyat** | 100MW | 1st February 2021 – 31st December 2023 |
| Program **NEM GoMEn** (Government Ministries and Entities) | 100MW | 1st February 2021 – 31st December 2023 |
| Program **NOVA** (Net Offset Virtual Aggregation) | 300MW | 1st April 2021 – 31st December 2023 |

## GOVERNMENT LEAD BY EXAMPLE (GLBE) PROJECT – SOLAR PV INSTALLATION AT 26 SELECTED GOVERNMENT BUILDINGS

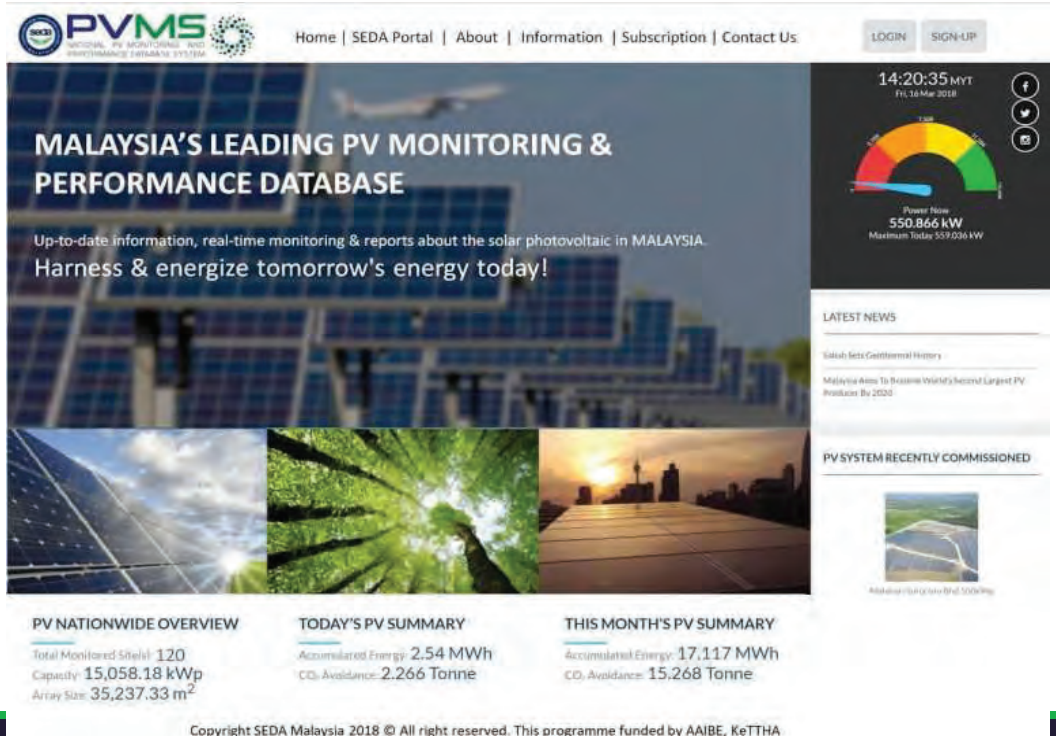
**Department of Islamic Development Malaysia (JAKIM) – 24kWp**

**Public Works Department Putrajaya – 20kWp**

**Legal Affairs Division Prime's Minister Department (BHEUU) - 48kWp**

**Institut Kanser Negara (IKN) – Hospital Putrajaya Pedestrian Walkway – 70 kWp**

## Solar PV Monitoring System




## Energy Efficiency Conversation Act (EECA)

**IN DRAFTING PROCESS**

- Malaysia is drafting a comprehensive new Energy Efficiency and Conservation Act in pursuit of achieving national aspirations.
- The Act aims to achieve the effective utilization of energy, **electricity and thermal**, across all key sectors.
- The Act will state the comprehensive measures which are necessary to promote efficient utilization of energy including **target setting, communication and education**.
- This Act will put in place as a form of **regulatory approach** in order to reduce GHG emission.
- The Act's components are cover the **existing buildings, requirement of energy managers, energy management & reporting & energy efficient appliances.**

# (QUICK WIN ON ACHIEVING LOW CARBON BUILDING)
## - Maximize Use of The Energy Efficient Reference Guide & Standard

1


***MS1525: CODE OF PRACTICE ON ENERGY EFFICIENCY AND USE OF RENEWABLE ENERGY FOR NON-RESIDENTIAL BUILDINGS***

**Note:**
**All PBTs (Jabatan Kawalan Bangunan) should adopt & gazette under UBBL the requirement of MS1525 to boost the development of low carbon / green buildings**


# OTHERS CODE OF PRACTICE

**Malaysian Standard 1837**

- Code of practice for **installation of grid-connected photovoltaic (PV) system**
- To provide guidelines on grid-connected PV system installation, electrical safety and fire protection requirements

**Malaysian Standard 2680**

- Code of practice for energy efficiency and use of renewable energy for **residential buildings**
- To provide guidelines on the design, selection of materials and electrical appliances and efficient use of energy including the application of renewable energy in new and existing residential buildings

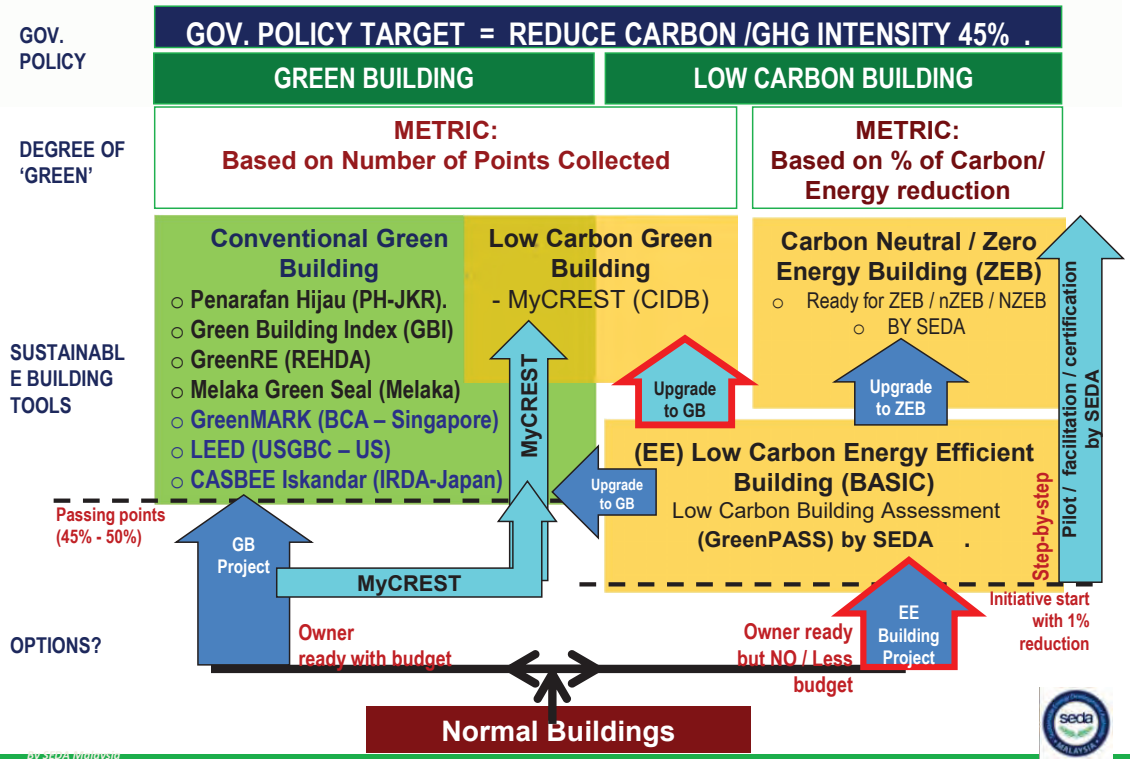
2

# EXISTING BUILDINGS:
# ADOPTION OF ENERGY MANAGEMENT PRACTICES
## (Energy Conservation & Energy Efficiency)

- Users routine practices.
- Operation & Maintenance.
- Identify potential savings
  - ✓ Energy Auditing.
  - ✓ Energy Saving implementation.

- Procurement of appliances.
- Retroffiting / Renovation.
- Add Renewable Energy System

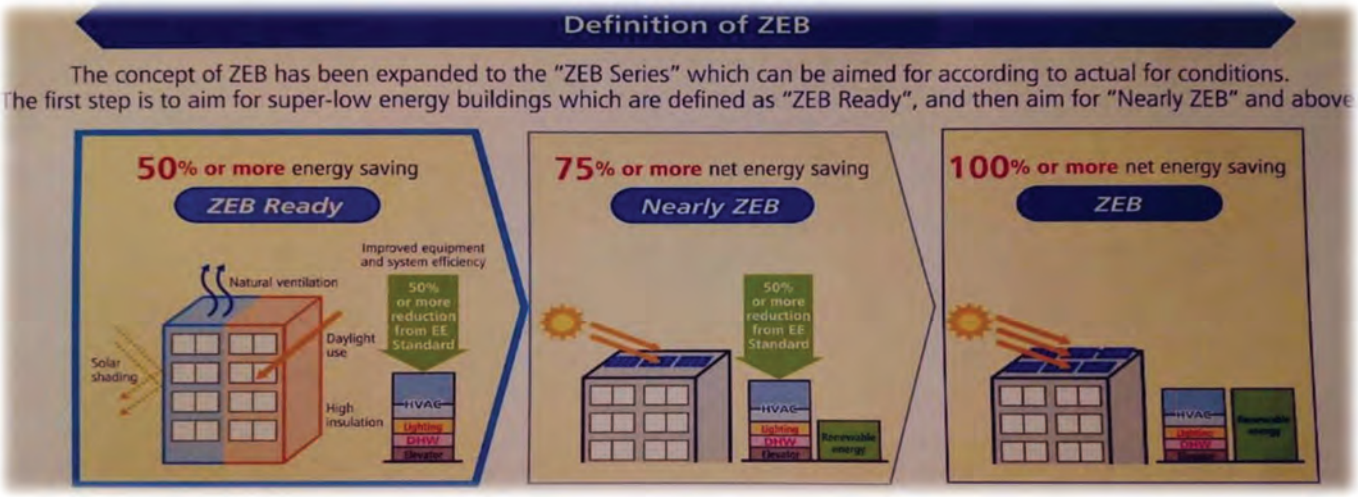

## SUMMARY / MAPPING OF GREEN BUILDING / LOW CARBON




Source : Sustainable Low Carbon Building Guide by SEDA Malaysia

# ZERO ENERGY BUILDING
# (advance Low Carbon Building by SEDA)

**ZEB = (EE + RE) X Sustainable Practices**




ZERO ENERGY BUILDINGS (ZEB) SERIES

(Malaysia adopted the Japanese definition on ZEB)

# TOOL TO MONITOR AND COLLECT DATA OF LOW CARBON BUILDINGS

**BEDOS**

**BUILDING ENERGY DATA ONLINE MONITORING SYSTEM**

(For Sustainable Energy Low Carbon Building Assessment-GreenPASS Application)

Publish their electricity energy consumption by this system. BEDOS provide historical energy consumption data display and analyse the data to provide energy report

Local authorities to collect energy & carbon reduction data

**www.seda.gov.my/bedos**

Energy & carbon monitoring system. To encourage users to monitor electricity energy usage

BEDOS also allow users to establish energy baselines and trace energy saving performance to help consumer manage energy usage

# TOOL FOR LOW CARBON BUILDINGS

## Building Energy Data Online System (BEDOS)

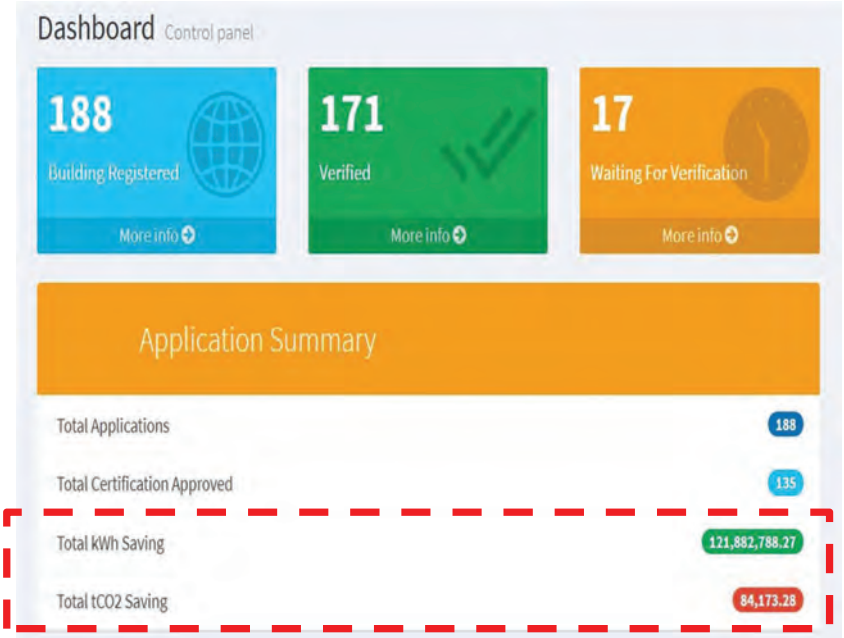
- BEDOS also **allow users to establish energy baselines and trace energy saving performance** to help consumer manage energy usage.

- **Analysis of potentials;**

✓ Energy & carbon emission & reduction.

✓ **LCB GreenPASS Diamond rating certification.**

✓ Used by number of organisations (PBTs, corporate organisations, etc).




# THANK YOU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**5°59'32.8"N 116°06'31.0"ET**

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SustainableEnergyDevelopmentAuthority-SEDAMalaysia

SEDA's material

# INTRODUCTION TO SUSTAINABLE ENERGY DEVELOPMENT AUTHORITY (SEDA) MALAYSIA

## ENERGY EFFICIENT BUILDINGS/LOW CARBON BUILDING DURING THE DEVELOPMENT & OPERATION

**Sustainable Energy Development Authority (SEDA) Malaysia**

# OUTLINE

1. **About Sustainable Energy Development Authority (SEDA) Malaysia;**
2. **Why Sustainable Energy;**
3. **Overview of Energy Efficiency;**
4. **Overview of Renewable Energy;**
5. **Examples of Energy Efficient Buildings/Low Carbon Building during The Development & Operation;**
   a) Case Study 1.0 (The LEO Building)
   b) Case Study 2.0 (The GEO Building)
   c) Case Study 3.0 (Panasonic Warehouse Building)
6. **Way forward (Quick Win on Achieving Low Carbon Building);**
   a) Maximize Use of The Energy Efficient Reference Guide & Standard (MS1525)
   b) Others Code of Practice (COP)
   c) Adoption of Energy Management Practices
   **d) Low Carbon Building (LCB)**
   **e) Building Energy Data Online System (BEDOS)**
   f) SEDA's Online Building Energy Performance Monitoring System
   g) Renewable Energy Programmes by SEDA Malaysia

## Overview of SEDA

SEDA was established on 1st September 2011 under the **SEDA Act 2011 [*Act 726*]** with some of the following functions:

01 To advise the Minister & Government Entities on all matters relating to sustainable energy

02 To promote & implement national policy objectives for renewable energy

03 **To promote, stimulate, facilitate and develop sustainable energy**

04 To implement, manage, monitor & review the Feed-in Tariff (FiT) system

05 To implement sustainable energy laws and recommend reforms to such laws to the Federal Government

06 To promote private sector investment in sustainable energy sector

07 **To act as focal point on matters relating to sustainable energy & climate change matters relating to energy**

## Vision Statement

To promote the deployment of sustainable energy measures as part of the solutions towards achieving energy security and autonomy.

## Mission Statement

01 Ensure sustainable energy plays an important role in the nation's economic development and environment conservation.

02 Ensure existing sustainable energy programmes are managed prudently and efficiently.

03 Continuously assess new potential sustainable energy solutions in partnership with our domestic and international stakeholders to diversify and complement the existing portfolio of our existing sustainable energy programmes.

04 Advocate the public towards accepting responsibility in a paradigm shift towards living sustainably.

# Management Team

**IR. DR. SANJAYAN VELAUTHAM**
Chief Executive Officer

**VACANT**
Chief Strategic Officer

**VACANT**
Senior Director,
Strategic Planning

**EN. ROSLAN ALI**
Director, Strategic Communications

**EN. KOH KENG SEN**
Acting Director,
Market Operations

**TS. EN. STEVE ANTHONY LOJUNTIN**
Director, Technical Development and Facilitation

**TS. EN. HAZRIL IZAN BAHARI**
Director, Digital Services

**PN. ZAFINA AHMAD**
Director, Finance

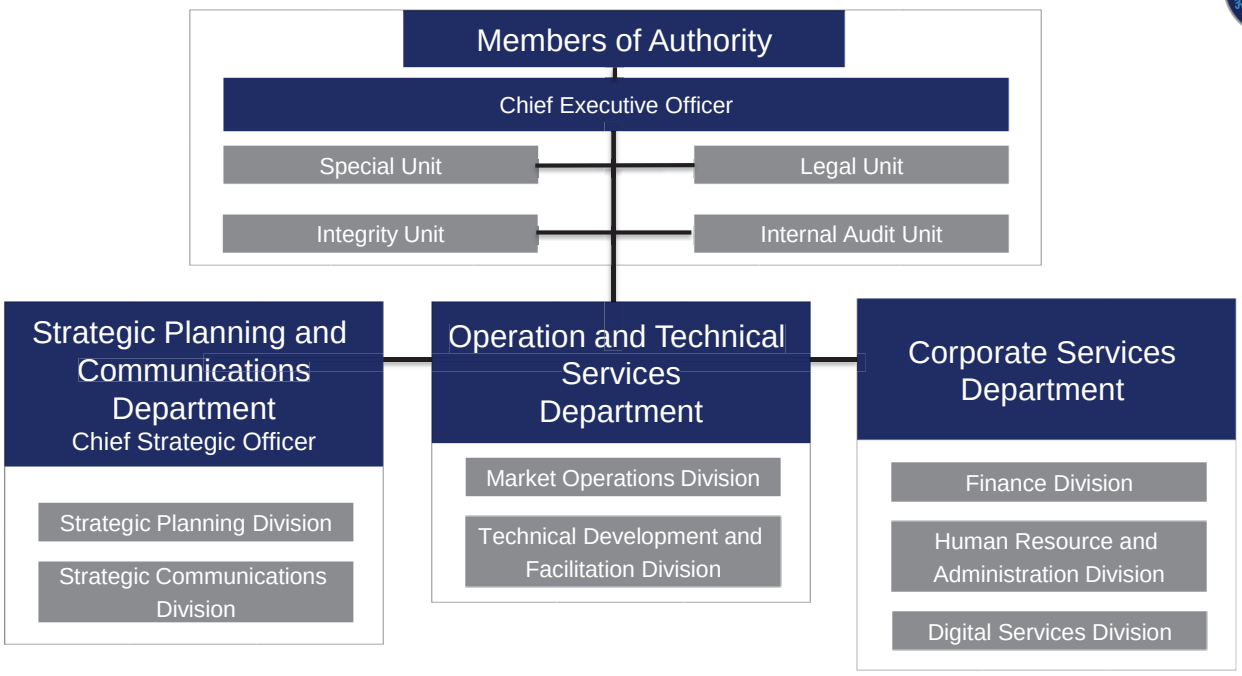
**PN. SAZLINDA AYU ARSHAD**
Acting Director, Human Resource & Administration

**PN. MAZLIANA MAZLAN**
Legal Advisor

**PN. NOR RADHIHA MOHD ALI**
Head, Internal Audit

**CIK SITI AISHAH MOHAMAD**
Covering Head,
Special Unit

# Team Structure



**List of Legislations under SEDA**

## Main Legislations

- Renewable Energy Act 2011 [*Act 725*]
- Sustainable Energy Development Act 2011 [*Act 726*]

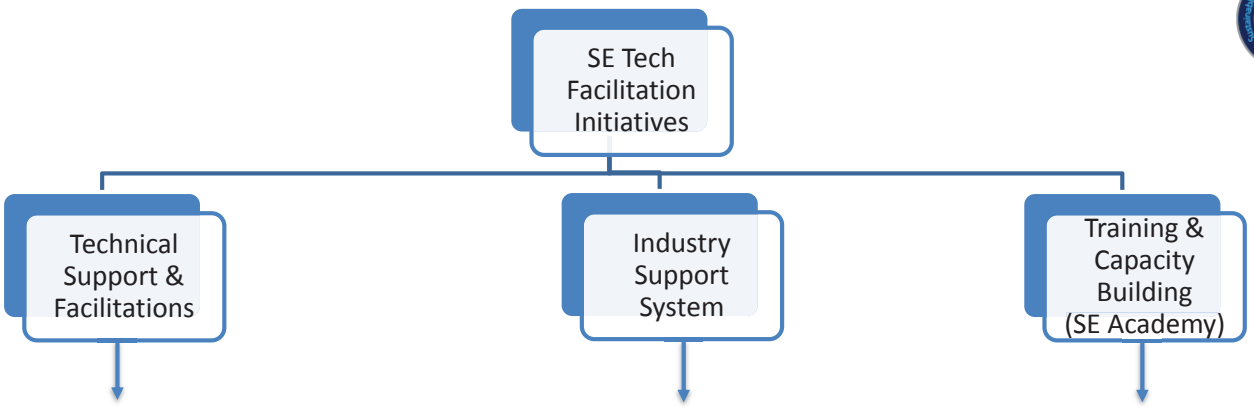
## Subsidiary Legislations

- Renewable Energy (Criteria for Renewable Resources) Regulations 2011 [*P.U.(A) 383/2011*]
- Renewable Energy (Manner of Appeal) 2011 [*P.U.(A) 309/2019*]
- Renewable Energy (Feed-in Approval and Feed-in Tariff Rate) 2011 [*P.U.(A) 385/2011*]
- Renewable Energy (Technical and Operational Requirements) Rules 2011 [*P.U.(A) 387/2011*]
- Renewable Energy (Recovery of Moneys by Distribution Licensee) Rules 2011 [*P.U.(A) 388/2011*]
- Renewable Energy (Renewable Energy Power Purchase Agreement) Rules 2011 [*P.U.(A) 386/2011*]
- Renewable Energy (Administrative Fees) 2011 [*P.U.(A) 389/2011*]
- Renewable Energy (Allocation from Electricity Tariffs) Order 2011 [*P.U.(A) 375/2013*]

# TECHNICAL DEVELOPMENT & FACILITATION (TECH) DIVISION
# BAHAGIAN PEMBANGUNAN & FASILITASI TEKNIKAL

(Sustainable Energy & Low Carbon Facilitation)

# RE & EE Technical Facilitation Initiatives




1. Project mandated by government:
    a) EACG Project
    b) EECA support implementations
    c) UNDP – GTALCC / UNIDO – Solar Thermal (EE-RE).
2. **SE Program with States & Local Authorities (EE&RE)**
    **a) Tech awareness & facilitation to stakeholders.**
    **b) EE/RE (inc NEM) initiatives.**
3. SE Low Carbon Building Facilitation.
    a) Energy management.
    b) Zero Energy Building (EE-RE)
4. General industry and public facilitation.
5. Consultancy and advisory.

1. Knowledge management portal
2. **BEDOS (Building Energy Data Collection & Operating System)**
3. **SE Low Carbon Building Assessment – *GreenPASS*.**
4. Online Energy Monitoring System
5. Online system aggregator IR4.0
6. Energy audit toolbox portal (online system)

1. **Development of training programs and modules**
2. **Review / update modules and universities programmes (panel)**
3. **Upskilling of industry needs by providing RE/EE trainings to local and international**
4. Dispatch of trainers / Technical Experts to local sectors ie Bomba, bankers/Fis, etc
5. **Industry-research, study, pilot & demonstration coordination with IPTs.**

*Yearly budgets

# RE & EE Technical Facilitation

## Capacity Building For Government (Federal, State, Industry and Public)

- Energy management and energy audit training to Government staff.
- SEDA is an active partner in providing solutions in RE trainings.

## Facilitations & Technical Services

- Sustainable Energy Low Carbon Building Facilitation
- Net Energy Metering (NEM)
- Energy Efficiency in Information and Communication (Low Carbon ICT)
- Awareness program & promotion

# Management Team

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Head, Internal Audit

**CIK SITI AISHAH MOHAMAD**
Covering Head, Special Unit

# Trainings

**Renewable Energy (Competency)**

- ❑ Grid-Connected PV Systems Design
- ❑ Grid-Connected PV for Wireman & Chargeman
- ❑ Off-Grid PV Systems Design
- ❑ Solar PV Installation and Maintenance
- ❑ O&M of Biogas Power Plant

**Energy Efficiency**

- ❑ Energy Management n Building
- ❑ Energy Efficient Management in Air-Conditioning & Mechanical Ventilation System (ACMV)
- ❑ Principle & Application in Compliance to MS1525
- ❑ Energy Audit in Building
- ❑ Facilitation on Sustainable Low Carbon Building Programme

# EE & RE BOOKS



# LOW CARBON BUILDING FACILITATION PROGRAMME

- Any activities such as;
  - ✓ Energy Efficiency / Energy Management program
  - ✓ Monitoring and Verification (setting target and annual assessment)
  - ✓ Development of data collection and online monitoring system
  - ✓ Energy Audit and Retrofitting program
  - ✓ Low carbon green building design input & management (new buildings)
  - ✓ Awareness program & promotion
  - ✓ Development of Common Carbon Metric (CCM) for various building topology
  - ✓ Data repository on carbon emission from building sectors
  - ✓ Building performance assessment using GreenPASS
  - ✓ Development of EE performance based incentive
  - ✓ Training & Capacity Building (Energy Efficiency & Renewable Energy)

# COLLABORATION WITH SELANGOR STATE GOVERNMENT

SEDA Malaysia has been **appointed & mandated** by UPEN Selangor for below activities:

1. **Energy Management and energy audit** for nine (9) Pejabat Daerah & Tanah (PDT) in Selangor ;
2. **Off-grid solar system installation** project for 12 homes at Kampung Orang Asli Sg. Relang, Gombak Selangor; and
3. **Solar PV installation project** for residential (Selangorku), Pangsapuri Seri Utama, Puchong Selangor.
4. **Active key stakeholder** of Jawatankuasa Tetap Teknologi Hijau, Pengguna & Alam Sekitar (since 2017).

# FACILATATION PROGRAM
# - CAPACITY BUILDING FOR PBTs (State of Selangor) STAFFS

**Energy management and energy audit training** to Government staff.

SEDA Malaysia also as **active partner in providing solutions, low carbon facilitation program & trainings** in Selangor :

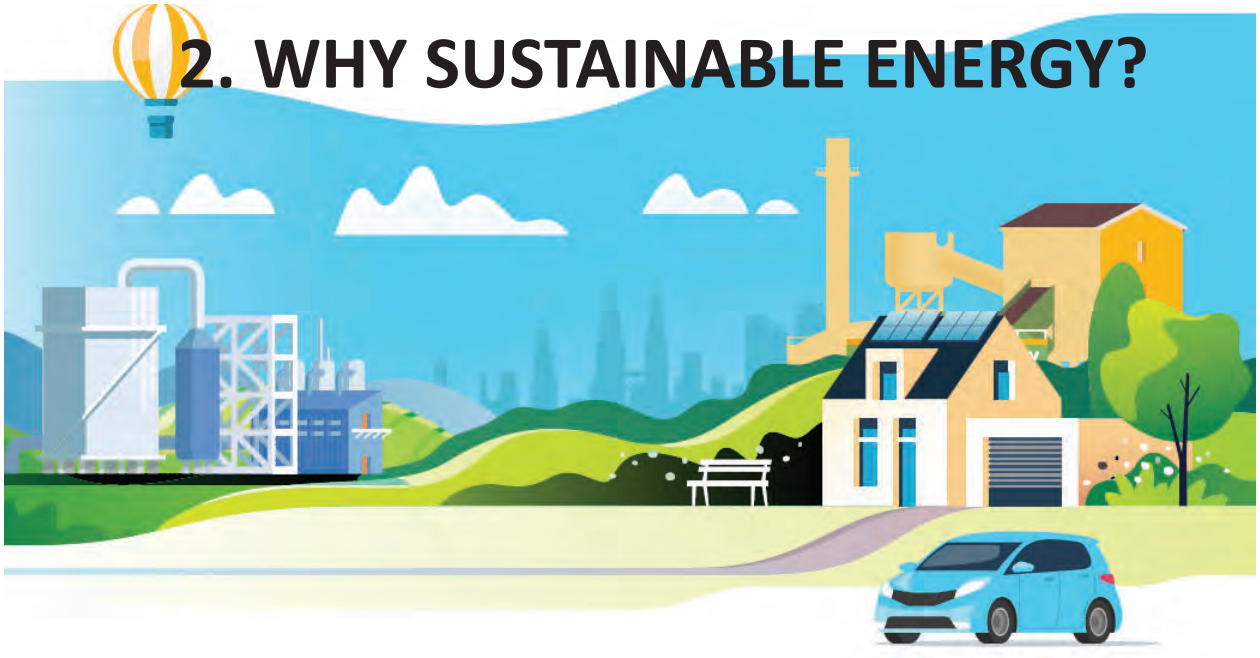
1. Majlis Bandaraya Petaling Jaya (MBPJ).
2. Majlis Perbandaran Sepang (MP Sepang).
3. Majlis Bandaraya Shah Alam (MBSA).
4. Majlis Perbandaran Kajang (MP Kajang).

# FACILITATION TO STATES & LOCAL GOVERNMENT

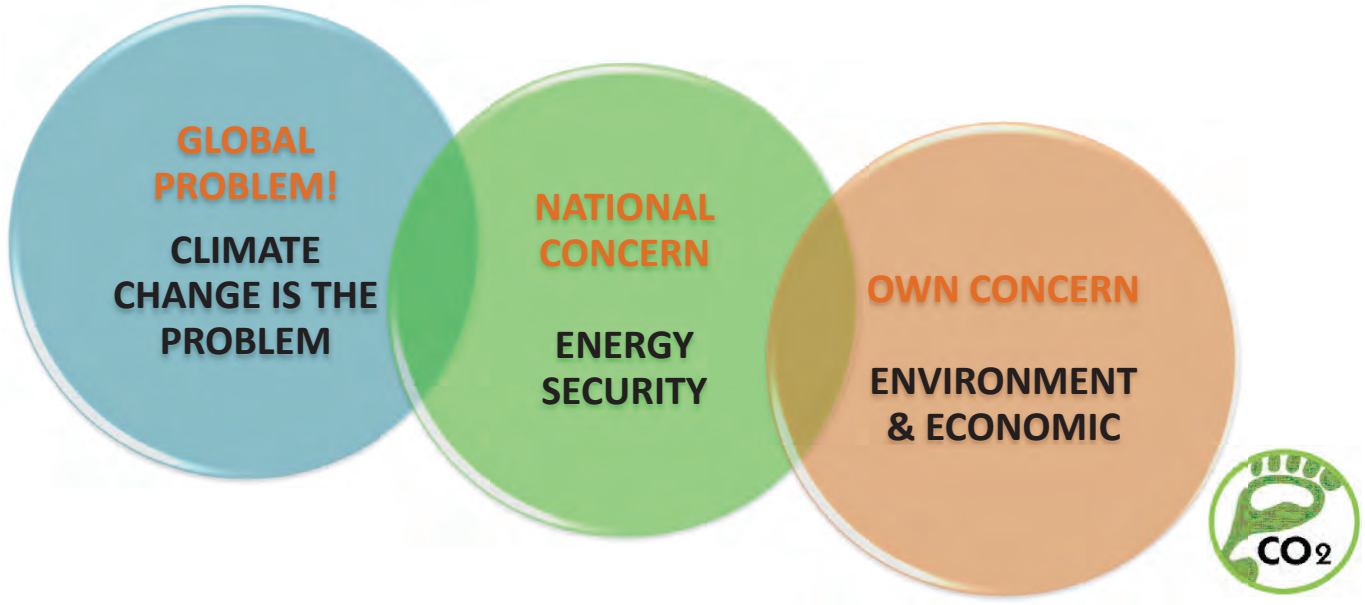
- Appointed as technical advisor for energy management program in Gov't agencies/IPTA
- Provide training & awareness campaign
- Facilitation, Advisory, Technical Assistance & Consultancy
- Energy Auditing & Retrofitting
- Project Management
- Monitoring & Verification
- Assessment and Reporting

  - **CURRENT PARTNERS :** UMS, Perbadanan Putrajaya, DBKL**,** MBSA, MARDI, MBPJ, MPSeremban, MPSepang, MPKajang, MPHTJ Melaka, ISKANDAR Malaysia, etc
  - **STATES :** UPEN / SUK - Selangor, Negeri Sembilan, Johor & Melaka

# 2. WHY SUSTAINABLE ENERGY?



# WHY SUSTAINABLE ENERGY?




# GLOBAL PROBLEM – CLIMATE CHANGE

**PROBLEM!**

**CLIMATE CHANGE IS THE PROBLEM [MAINLY CAUSED BY GREEN HOUSE GASES (GHG)]**

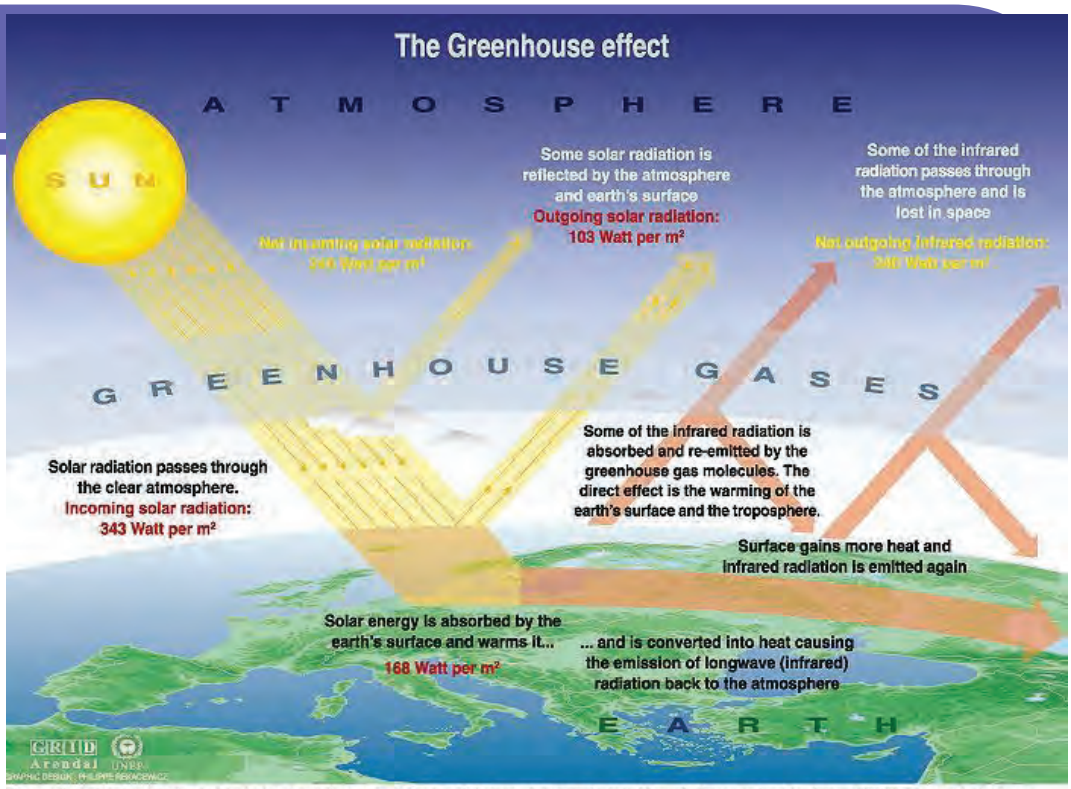

**SOLUTION!**

**GREEN TECHNOLOGY AND GREEN LIVING IS THE SOLUTION**

How dare you!

GHG : Carbon dioxide, Methane, NOx, SOx, CFC, etc

**"CO2 is the most important anthropogenic of GHG and the main sources of atmospheric CO2 is from burning of fossil fuels – 75% of increase in atmospheric CO2 since industrial times *(Source: Cities and Climate Change – Global Report on Human Settlements 2011, UN-Habitat).***




Sources: Okanagan university college in Canada, Department of geography, University of Oxford, school of geography; United States Environmental Protection Agency (EPA), Washington; Climate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge university press, 1996.

# GLOBAL WARMING'S EFFECT

Melting 'Ice Caps'

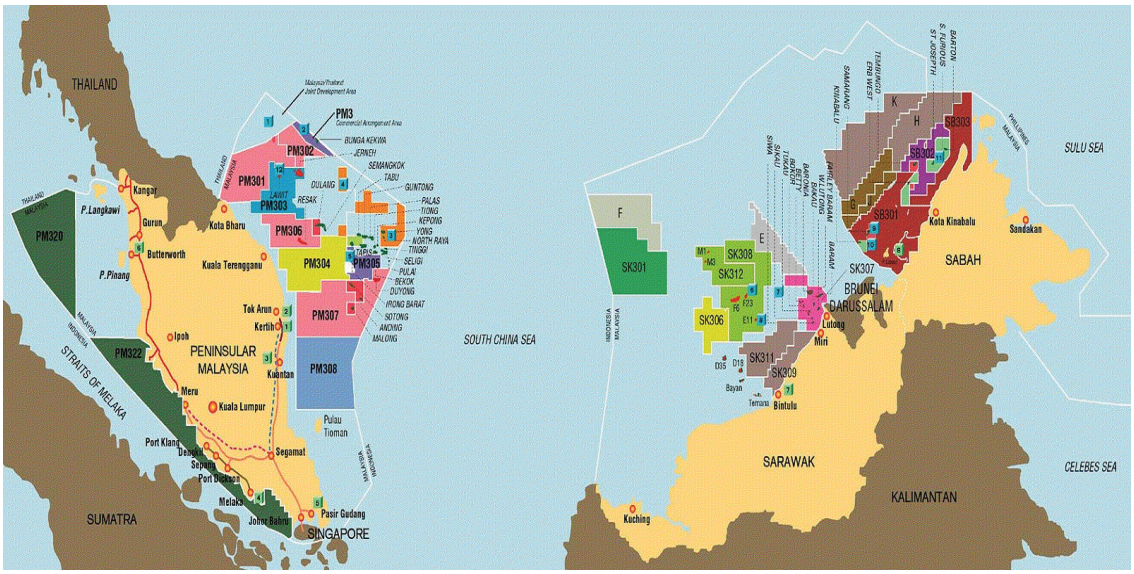
Rising Sea Levels

Flooding

Freak Weather

Loss of Biodiversity in Plants and Animals

# NATIONAL ENERGY SECURITY



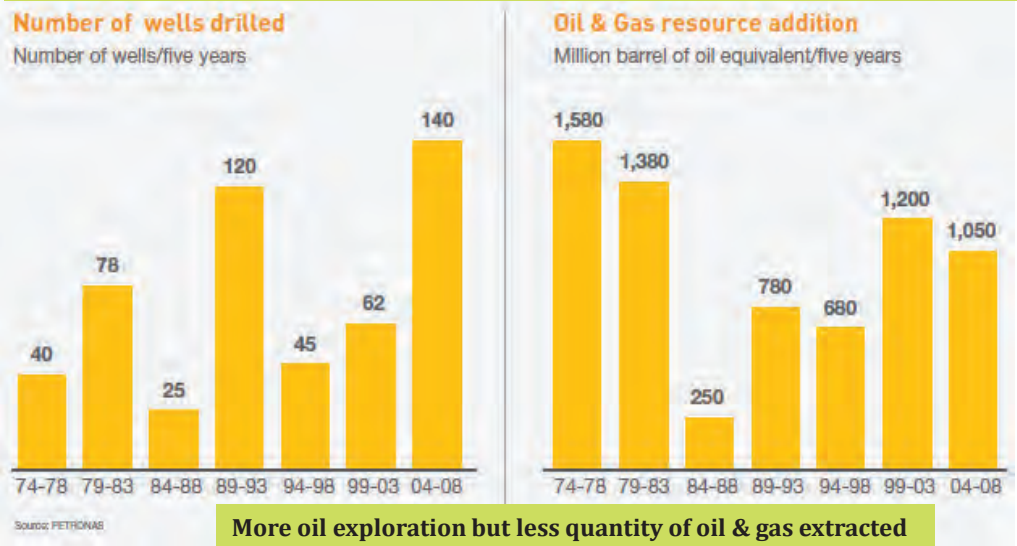

**CRUDE OIL : 5.46 *billion barrels*** ***NATURAL GAS* : 88.00 *trillion standard cubic feet***

**RESERVE LIFETIME : Minyak– 19 years, Gas - 36 years**

**(source : PETRONAS (1,January 2008)**

# NATIONAL ENERGY SECURITY

**Total accumulated sources are reduced although oil exploration activities has been increased.**




**More oil exploration but less quantity of oil & gas extracted from each weld.**

# NATIONAL POLICY : COMMITMENT TO REDUCE CARBON EMMISSION

- **2009: COP 15 in Copenhagen**

  "Malaysia is adopting an indicator of a voluntary reduction of up to 40% in terms of emissions intensity of GDP by the year 2020 compared to 2005 levels"

  17 December 2009

- **2015: COP 21 in Paris**

  "Malaysia intends to reduce its greenhouse gas (GHG) emissions intensity of GDP by 45% by 2030 relative to the emissions intensity of GDP in 2005"

  16 December 2016

- **2018: COP 24 in Poland**

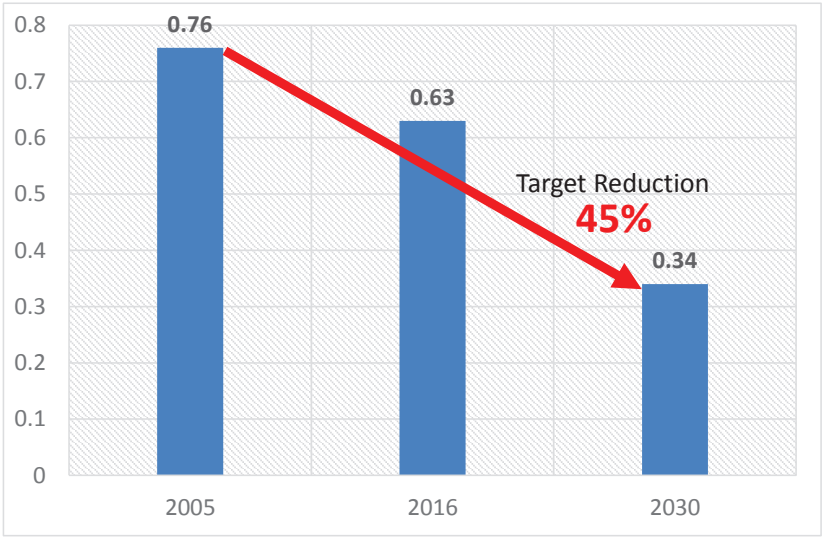
  "Malaysia Ready to do More"

  31 July 2018

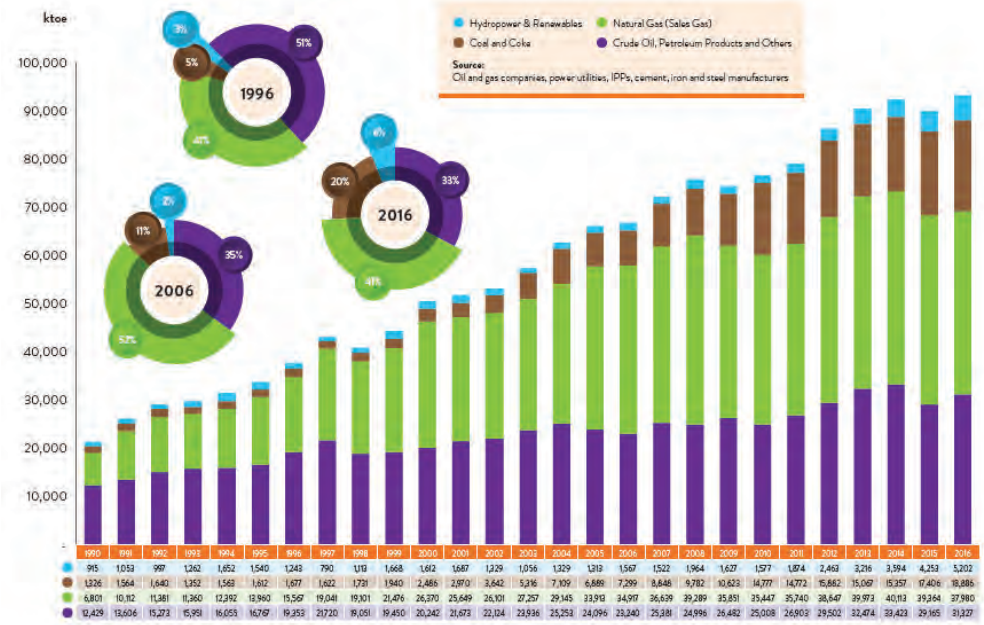

# MALAYSIA $CO_2$ EMISSION INTENSITY

$CO_2$ Emission Intensity Level (tonnes $CO_2$ eq/RM thousand)

*Source: International Energy Agency*



# PRIMARY ENERGY SUPPLY



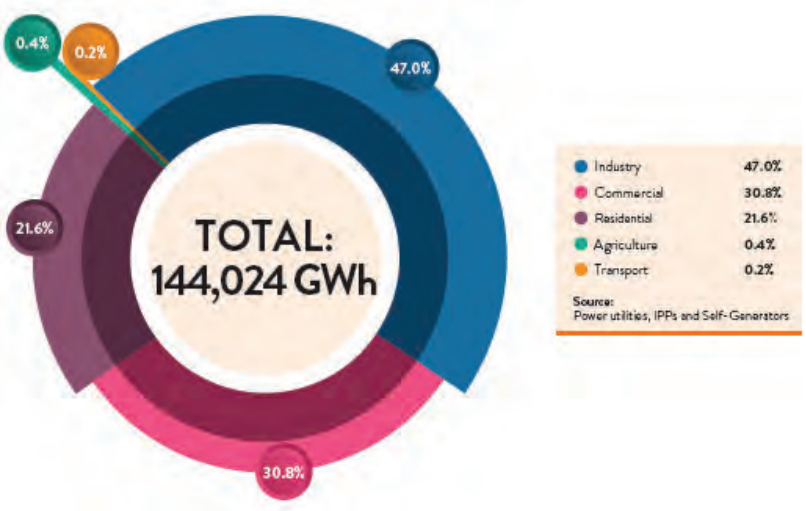

**MALAYSIA'S ENERGY SUPPLY HAS GROWN SIGNIFICANTLY OVER THE LAST 25 YEARS**

**MALAYSIA IS USING COAL & NATURAL GAS AS A MAJOR FUEL SOURCE FOR ELECTRICITY**

**1KTOE = 11.63GWH = 11,630MWH**



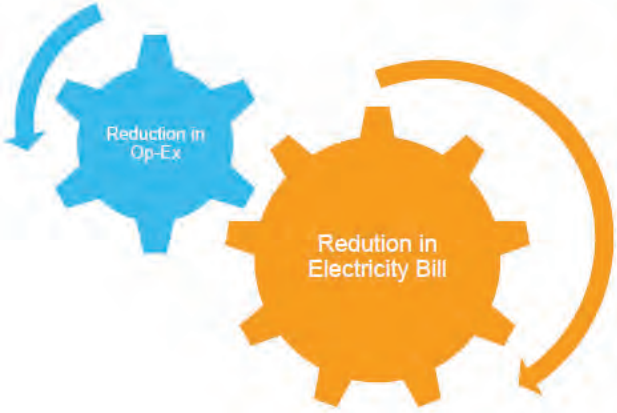
# ELECTRICITY CONSUMPTION BY SECTORS




**BUILDING SECTOR = COMMERCIAL + RESIDENTIAL CONSUME THE BIGGEST CHUNK OF ENERGY 52.4%**

**FOLLOWED BY INDUSTRIAL 47%**

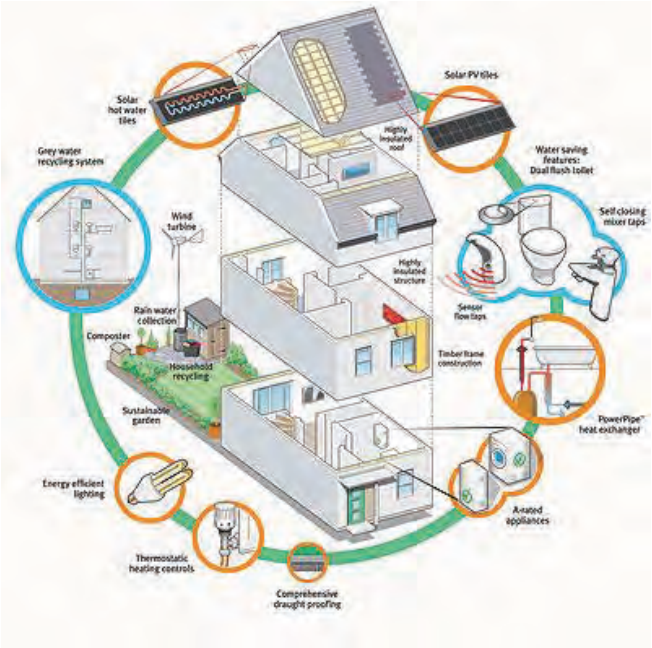
# OWN CONCERN – UTILITY COST



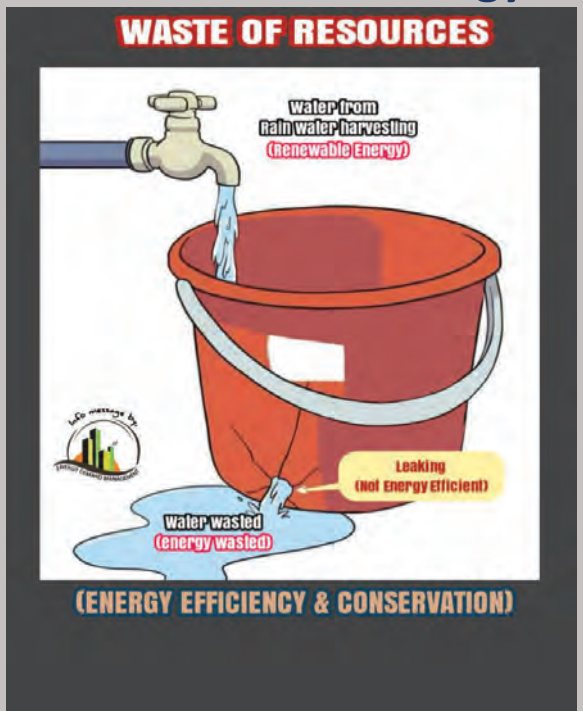

Conventional TARIFF
(Increase every 3 years)

| | TARIFF CATEGORY | UNIT | CURRENT RATE (1 JAN 2018) |
|---|---|---|---|
| A - DOMESTIC TARIFF | For the first 200 kWh (1 - 200 kWh) per month | sen/kWh | 21.80 |
| | For the next 100 kWh (201 - 300 kWh) per month | sen/kWh | 33.40 |
| | For the next 300 kWh (301 - 600 kWh) per month | sen/kWh | 51.60 |
| | For the next 300 kWh (601 - 900 kWh) per month | sen/kWh | 54.60 |
| | For the next kWh (901 kWh onwards) per month | sen/kWh | 57.10 |
| | *The minimum monthly charge is RM3.00* | | |

# 3. OVERVIEW OF ENERGY EFFICIENCY



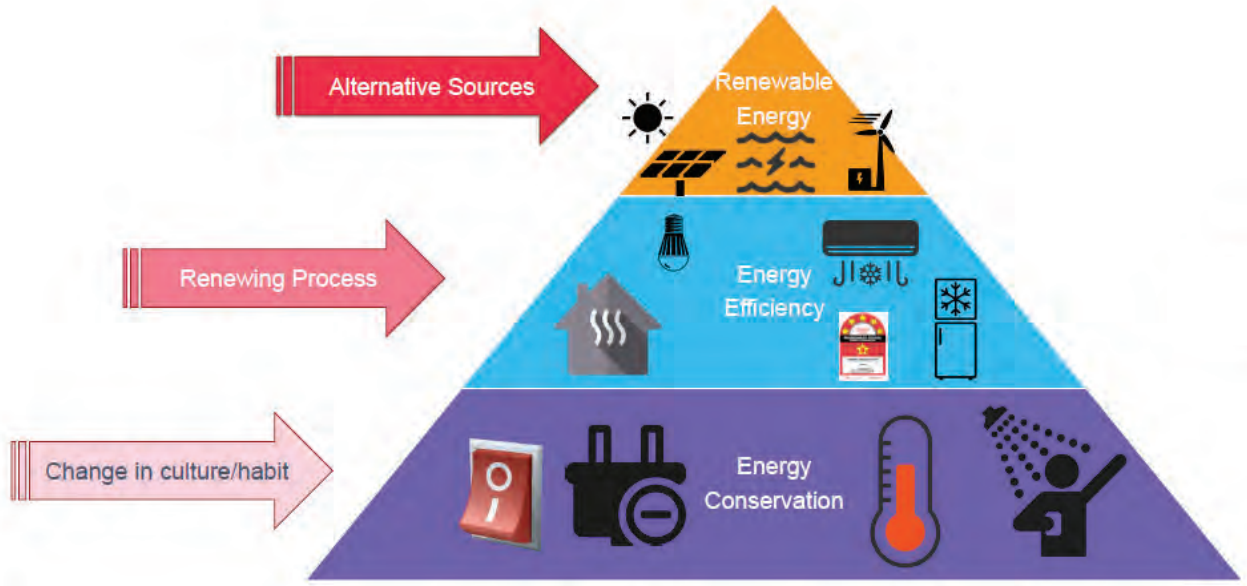
# PRACTICAL APPROACH
# to achieve Energy Efficiency




**STOP WASTAGE FIRST !!**

# WHAT IS ENERGY EFFICIENCY?

# WAYS TO ADOPT ENERGY EFFICIENCY




# REFERENCE TO DEVELOP SUSTAINABLE ENERGY BUILDINGS


## SOLUTION

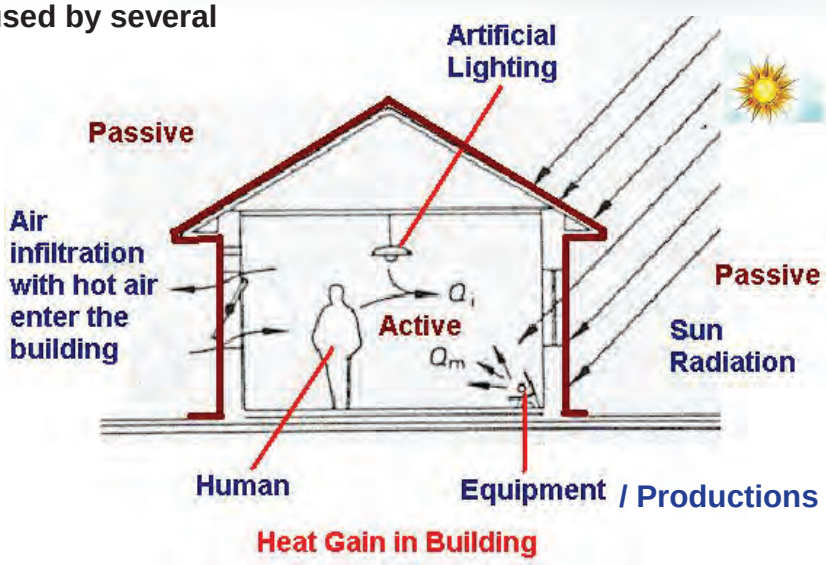
**TO REDUCE CARBON EMISSION, IMPROVE ENERGY SECURITY, SAVE OPERATIONAL COST**

(Environment – Social – Economics)

| REDUCE DEMAND | OFF-SET FURTHER ENERGY USAGE | GUIDELINES & STANDARD | ACTIONS | TOOLS |
|---|---|---|---|---|
| Energy Efficiency & Conservation | Renewable Energy | MS 1525 | Building owners, Professionals, FM & Local Authorities | Sustainable Building Tools, esp EE & Low Carbon Building |

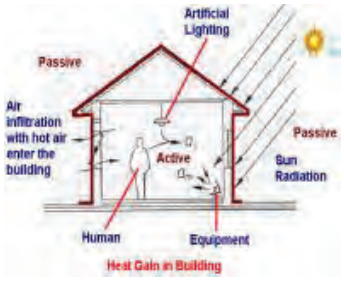
# ENERGY FLOWS IN A PREMISES

**Energy consumption caused by several main factors;**




*Reference : Gregers Reiman*

# MAPPING OF MS1525 MAIN ELEMENTS




| ENERGY LOAD | PASSIVE | ACTIVE |
|---|---|---|
| Heat | ✓ Shading, Insulation & Nat. ventilation. | |
| Lighting | ✓ Daylighting | ✓ EE Artificial Lighting |
| Equipment | ✓ RE assisted Equipment. | ✓ EE Building Services Sys.<br>✓ EE End-users Equipment. |
| Human | ✓ Condition of Thermal Comfort | ✓ Assisted Energy Management & Control Sys. |

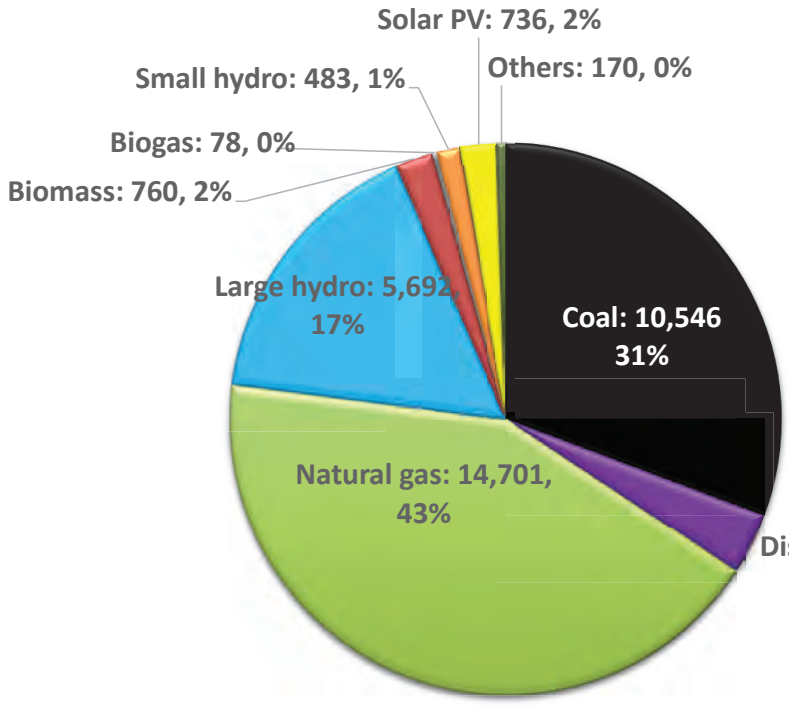
Integrated Optimization

< Building Energy Simulation >

# 4. OVERVIEW OF RENEWABLE ENERGY



## National Installed Capacity Mix (Dec 2019)




**Total :** 34,392 MW
**RE (excl large hydro) :** 6%
**RE (excl large hydro) 2025** : 20%
**RE (incl large hydro**) :** 22.5%
* Includes off-grid
**Large hydro > 100 MW

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# Govt optimistic of achieving 20 pct RE over next seven years



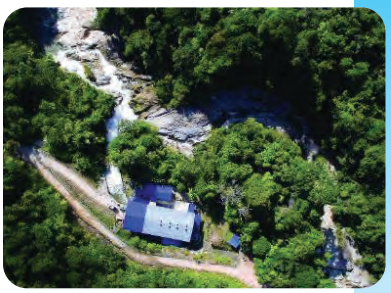
**By Bernama** - November 27, 2018 @ 9:57pm

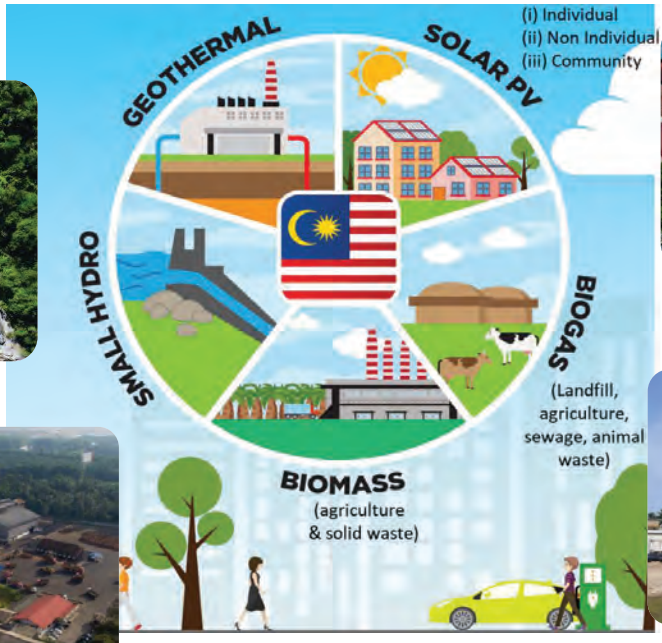
KUALA LUMPUR: The government is optimistic of achieving its target of **20%** electricity generation from **Renewable Energy (RE)** sources, equivalent to 3,991 MW, over the next seven years via various initiatives, programmes and policies.

To realize this target, Energy, Science, Technology, Environment and Climate Change Minister Yeo Bee Yin said the government would engage with industry players and study the relevant policies.

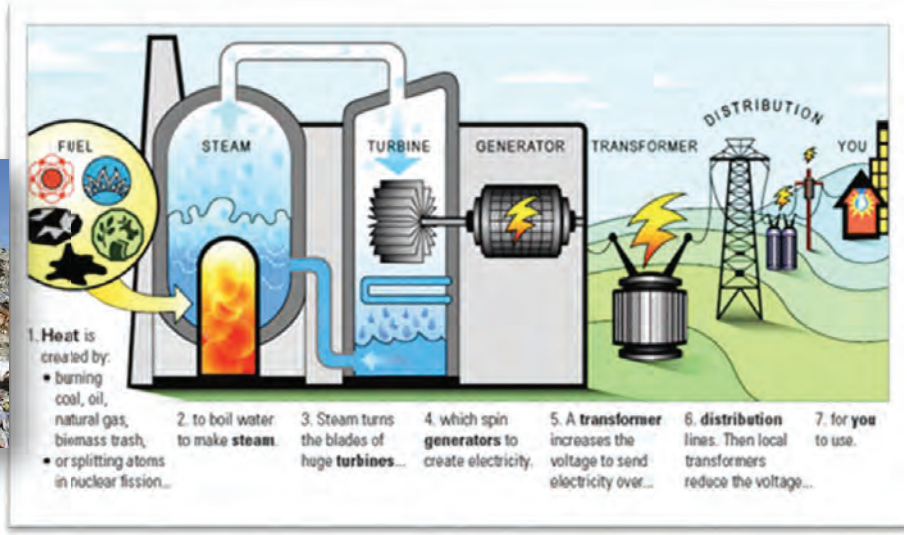
Though the country's clean energy generation is only at two per cent currently, the target could be reached with the implementation of various programmes, including **Net Energy Metering (NEM), Feed-in-Tariff (FiT) and Large-Scale Solar (LSS) programme**, she said.

# Renewable Energy Resources under RE Act 2011



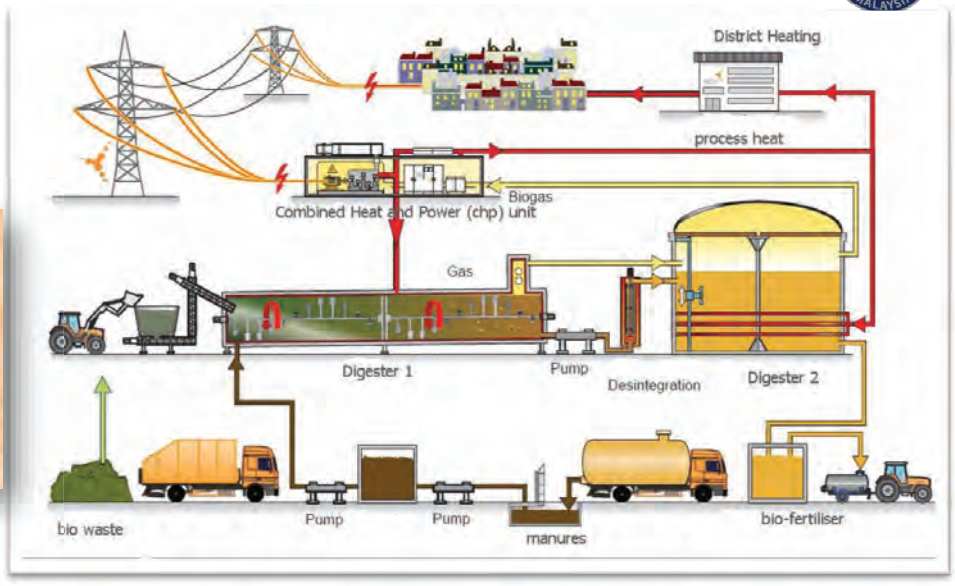



# Renewable Energy Resources - Biomass

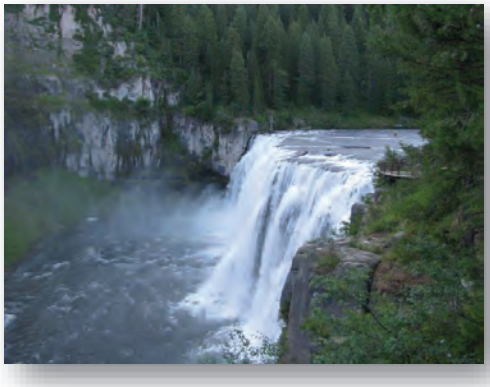

Biomass resources as fuel; a substitution of fossil fuel

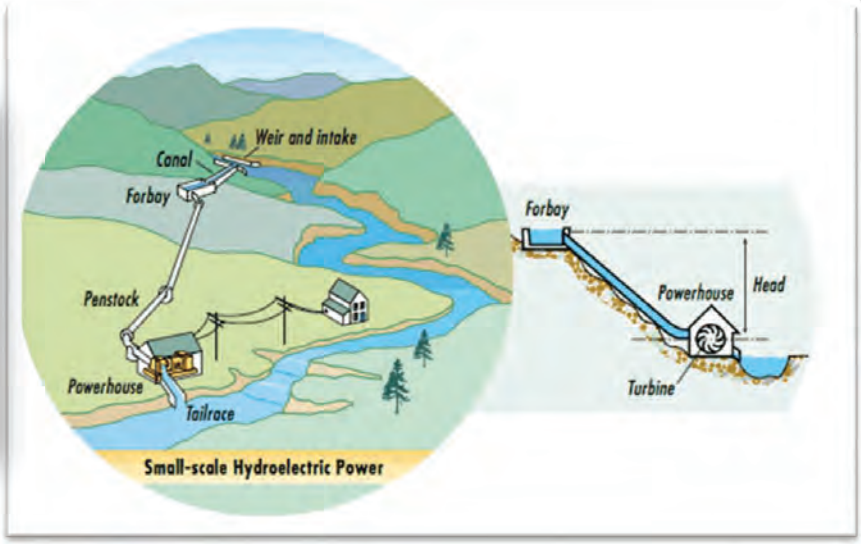
# Renewable Energy Resources - Biogas


Biogas from the fermentation processes been utilized as a fuel

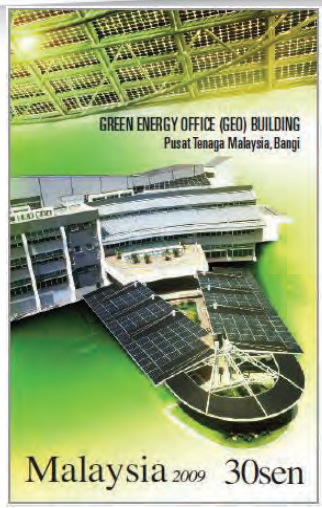
# Renewable Energy Resources – Small Hydro



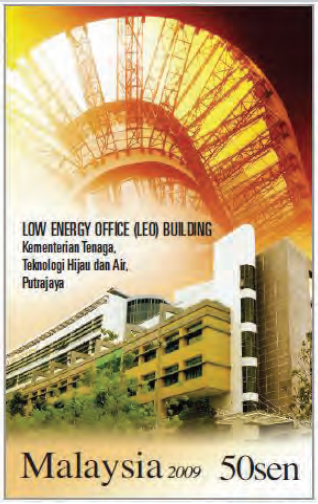



Transfer the kinetic energy in water to a mechanical energy before converting to electricity

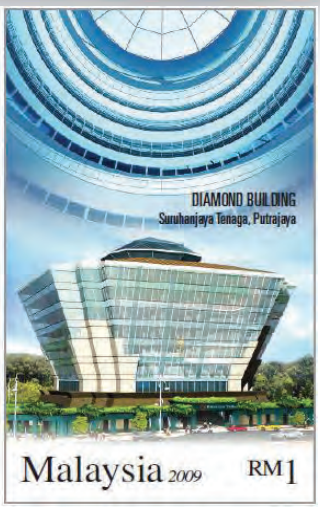
## 5. EXAMPLES OF ENERGY EFFICIENT BUILDINGS / LOW CARBON BUILDING DURING THE DEVELOPMENT & OPERATIONS




Net BEI = 30 (86% reduce)
65 TonCO2/year
GBI : Certified (2009)
ASEAN EA : 2009/2010/2011




Net BEI = 114 (59% reduce)
1,490 TonCO2/year
GBI : Silver (2011)
ASEAN Energy Award : 2006




Net BEI = 63 (70% reduce)
637 TonCO2/year (**To verify)
GBI & GreenMark : Platinum (2011)
ASEAN EA : 2012

# CASE STUDY 1.0

## The Low Energy Office (LEO) Building, Putrajaya

Construction : Year 2002 – 2004

Reference : DANIDA-KTAK LEO Building Project (2002 – 2006)

# The Low Energy Office (LEO) Building, Putrajaya

- A project by the Gov. of Malaysia with technical input on Energy Efficiency from DANIDA (Danish International Development Assistance)
- Commitment of the Government on "Leadership by Example"
- To build an energy-efficient and intelligent showcase building without compromising users' comfort
- To enhance awareness and increase the local capacity on EE building design (Integrated Building Design Concept)


*Reference : DANIDA-KTAK LEO Building Project (2002 – 2006)*

# The Low Energy Office (LEO) Building, Putrajaya

- **To prove the feasibility of achieving the standards as recommended in MS1525 :2001 Code of Practice on EE & Use of RE for Non-Residential Buildings***

** with reference to Guidelines for Energy Efficiency in Buildings, MEWC (1989)*

- **To provide research opportunities for professionals and academia in EE in buildings**
- **To introduce Energy Efficiency features which must be easily replicated in other Malaysian buildings**
- **To demonstrate the use of computer simulations in deriving the critical EE parameters and the potential savings (Using Building Energy Simulations, Energy-10[1] software)**

[1] *developed by U.S. NREL*

*Reference : DANIDA-KTAK LEO Building Project (2002 – 2006)*

# Energy Efficient Design Features

➢ **Passive Design Elements.**

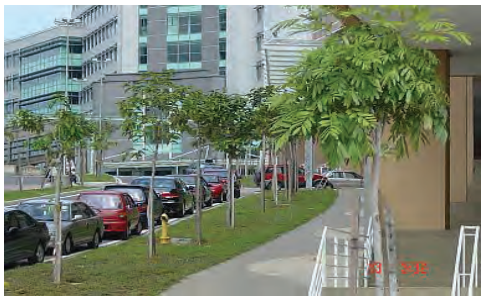
- Building Orientation.
- Building Envelope (OTTV).
- Natural Air Ventilation.
- Interior Space Layout Design.

➢ **Active Elements**

- Air Conditioning & Mechanical Ventilation.
- Innovative Lighting System.
- Energy Efficient Office Appliances
- Plug Loads.
- Comprehensive Energy Management System.

➢ **Other Sustainable Elements**

- 3.3kWp Solar Photo-voltaic (building grid connected)
- Rain Water Harvest system (for landscape system)



*Reference : DANIDA-KTAK LEO Building Project (2002 – 2006)*

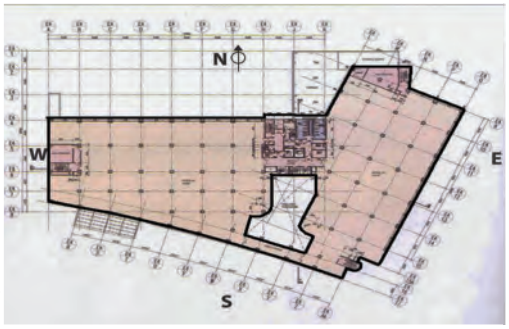
# PASSIVE DESIGN FEATURE: - Building Orientation

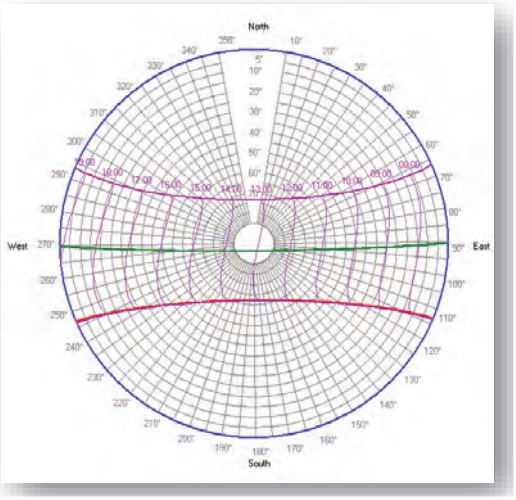
**Orientation along the East-West direction.**

Since the sun rises up from the east and sets in the West, less direct sunlight will heat the building façade.

**To minimise heat gain from the sun radiation:**

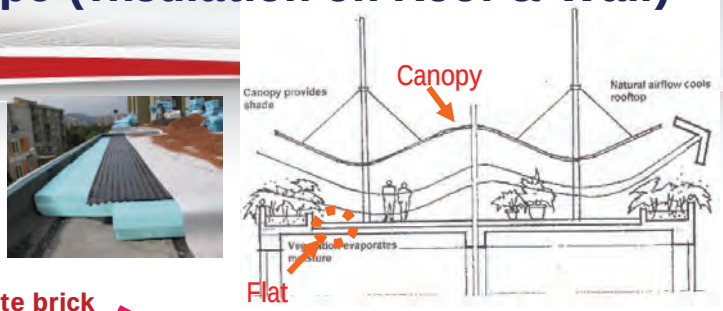
- Most windows/glazing facing North and South
- Less windows facing East and West




*Reference : DANIDA-KTAK LEO Building Project (2002 – 2006)*

# PASSIVE DESIGN FEATURE:
# - Building Envelope (Insulation on Roof & Wall)

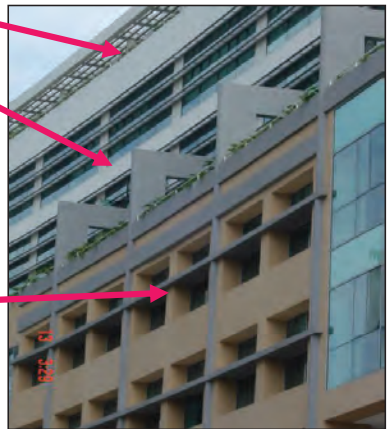





**Concrete Roof**
**Above - metal deck canopy**
**Inside - 100 mm extruded Styrofoam (normal 25 mm.)**

**Walls:**
**200 mm aerated concrete brick (normal 115 mm brick)**
**OTTV - 35 W/m² (normal: 43 W/m² )**

Flat roof



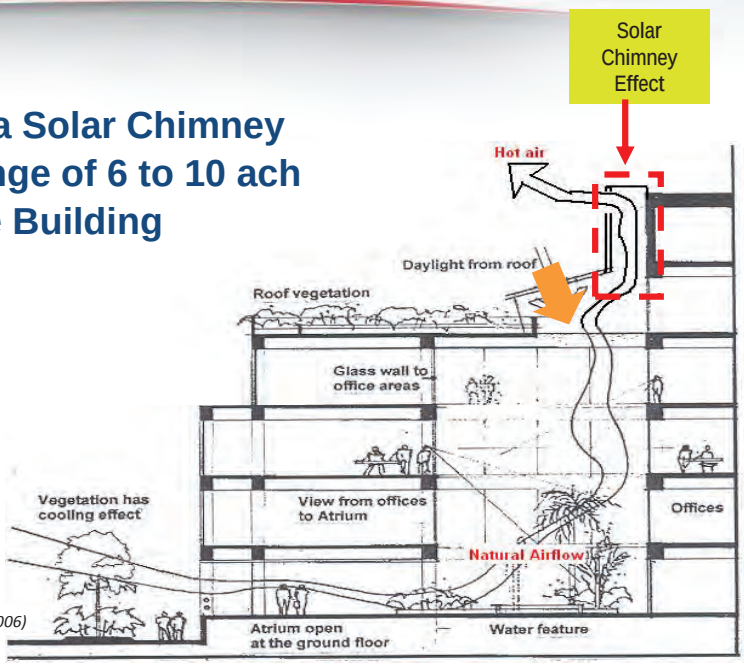
**Punch Hole Windows: (600 - 1000 mm)**
**-Better shading effect - deeper penetration of daylight**

**All glazing near façade-12 mm light green glass.**
**-Provides more diffuse daylight but less heat -**
**Visible light trans. = 65%.**
**Solar Heat only 51% pass through**

*Reference : DANIDA-KTAK LEO Building Project (2002 – 2006)*

# PASSIVE DESIGN FEATURE:
# - Natural Cross Air Ventilation at the Atrium
# - Reduce use of mechanical ventilation system

- ✓ Natural Ventilation Assisted by a Solar Chimney
- ✓ Computer simulation of air change of 6 to 10 ach
- ✓ Provides Daylight Deep into the Building

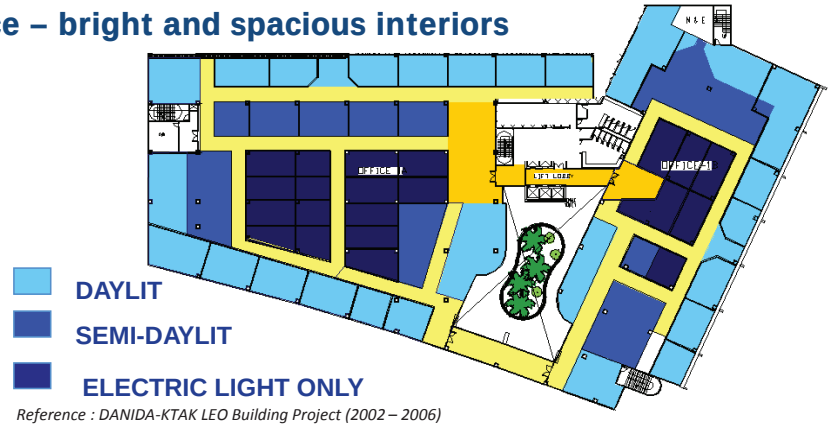



*Reference : DANIDA-KTAK LEO Building Project (2002 – 2006)*

# PASSIVE DESIGN FEATURE:

- Maximise Use of Daylighting.
- Reduces use of artificial lightings.

- Most intensive work area near the façade.
- Less intensive work area at the centre floor area.
- To maximise penetration and utilisation of daylight
- Effective zoning of interior spaces to minimize energy consumption
- Creating a comfortable ambience – bright and spacious interiors

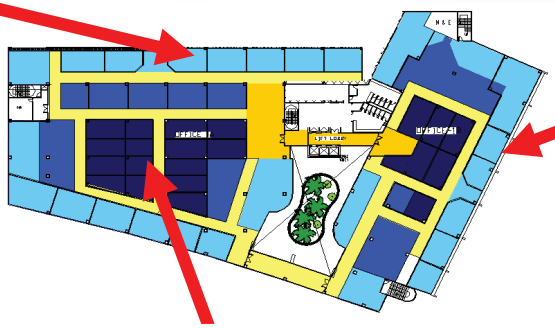




*Reference : DANIDA-KTAK LEO Building Project (2002 – 2006)*

# PASSIVE DESIGN FEATURE:

- Maximum Use of Daylighting.
- Reduces use of artificial lightings.

Work area near the façade



Open plan working space near the façade

Stores/Meeting/ Documentation rooms at the core of building

- Daylit
- Semi-daylit
- Artificial Lighting

*Reference : DANIDA-KTAK LEO Building Project (2002 – 2006)*

## ACTIVE DESIGN FEATURE:
- **Energy Efficient Lighting System**
- **Energy Efficient lamps.**

Built-in Photocell-Occupancy Sensor

➢ **Lighting Zoning / Grouping:**
- Multi circuit lighting system.
- Easy to control and optimize.

➢ **Lighting Automation System:**
- Occupancy sensor and Photo sensor.
- System integrated with Building Energy Management system.

➢ **Design luminance level in Offices : 350 lux**
- Proposed by MS 1525:2001* : 300 – 400 lux.
- Base design requirement : 500 lux.

*Reference : DANIDA-KTAK LEO Building Project (2002 – 2006)*

## ACTIVE DESIGN FEATURE:
- **Energy Efficient Cooling System**

➢ **CO2 Sensors & Heat Recovery Heat Wheel**
**- Helps to reduce cooling load of fresh air intake.**

➢ **Temperature control set point : 24ºC.**
**(Acceptable comfort level)**
**-Base design requirement : 22°- 23˚C.**
**-Proposed by MS 1525:2001* : 23°C – 26°C**

➢ Low Friction Losses design
- Reduce installed CHW pump and Fan capacity and less energy consumption.

**Pump / Fan System Efficiency**

Timer switch control

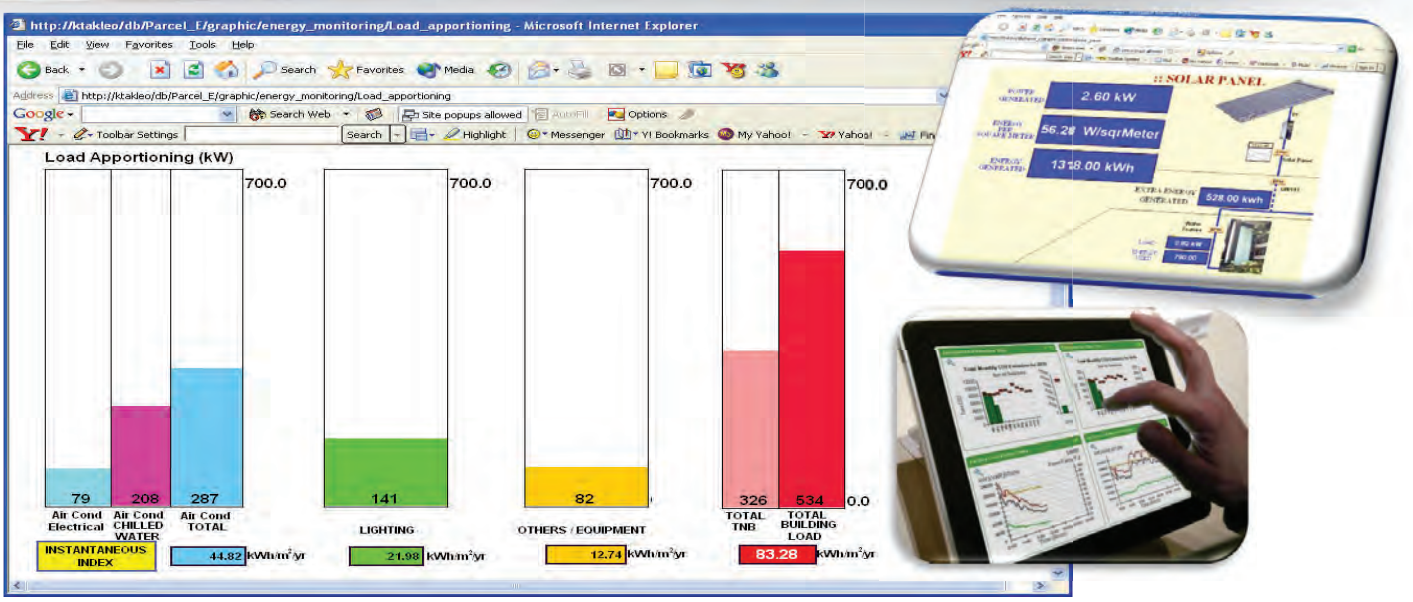
Thermostat control

Duty cycle programming

$CO/CO_2$ sensor control

*Reference : DANIDA-KTAK LEO Building Project (2002 – 2006)*

# ACTIVE DESIGN FEATURE:
## - Energy Management & Monitoring System



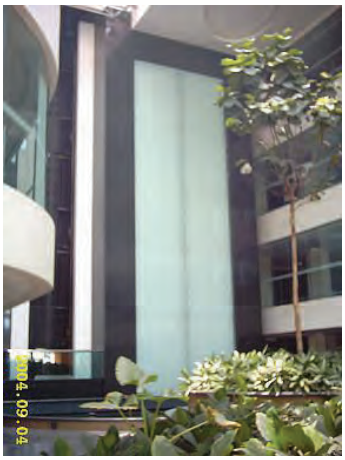

Total Power & Energy Monitoring page

*Reference : DANIDA-KTAK LEO Building Project (2002 – 2006)*

# ACTIVE DESIGN FEATURE:
## - Renewable Energy System (3.3kWp)

- Demonstrates a small Grid Connected Photo-voltaic System to power the Water Wall system in the atrium.

PV Panels on the roof top

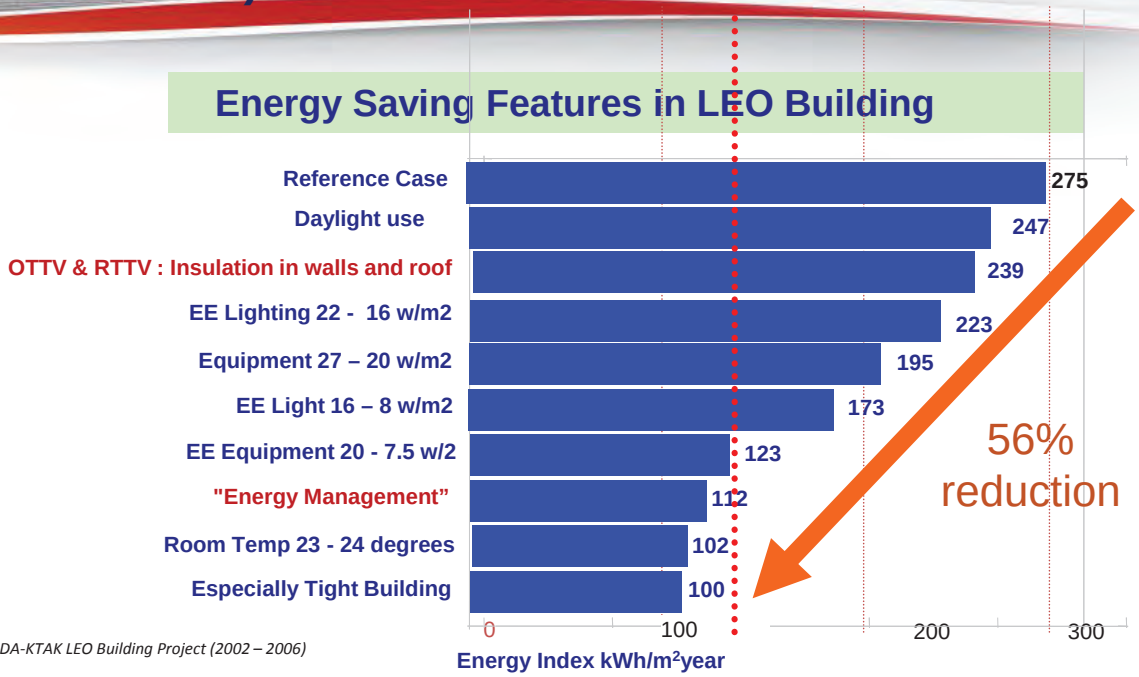



Water wall in the

*Reference : DANIDA-KTAK LEO Building Project (2002 – 2006)*

# BUILDING ENERGY SIMULATION:
- Integrated Design Approach (Using Energy 10).

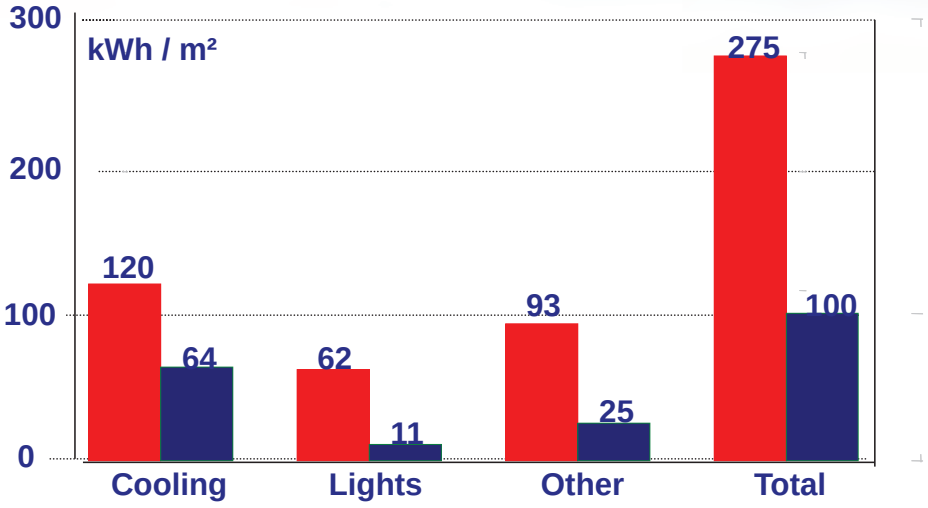
## Energy Saving Features in LEO Building




*Reference : DANIDA-KTAK LEO Building Project (2002 – 2006)*

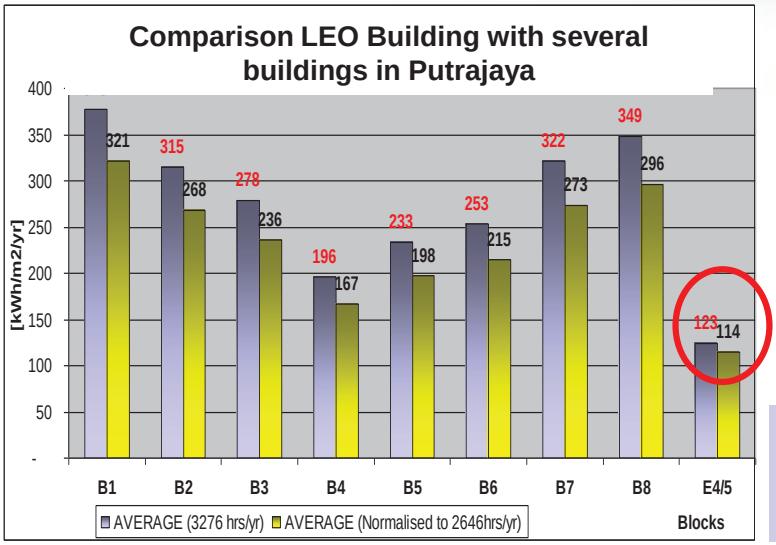
# BUILDING ENERGY SIMULATION:
- Integrated Design Approach (Using Energy 10).

## Conventional ⟷ Energy Efficient Design




*Reference : DANIDA-KTAK LEO Building Project (2002 – 2006)*

# ENERGY MANAGEMENT IN OPERATIONAL:
## - Fine tune, Optimisation & Maintain Performance.




**LEO Building**

LEO BEI = 100

(Conventional) BEI = 275

**175 kWh/m2year**

= 3,366,475 kWh/yr
or more than **RM 800,000 per year** Tariff C1 28.8 sen/kWh

Savings = 56%

= 3,366,475 kWh/yr x
0.614 kg CO2/kwh
= 2,067,016 kg/year CO2
**= 2,067 tones CO2/year**

*Reference : DANIDA-KTAK LEO Building Project (2002 – 2006)*

# CASE STUDY 2.0

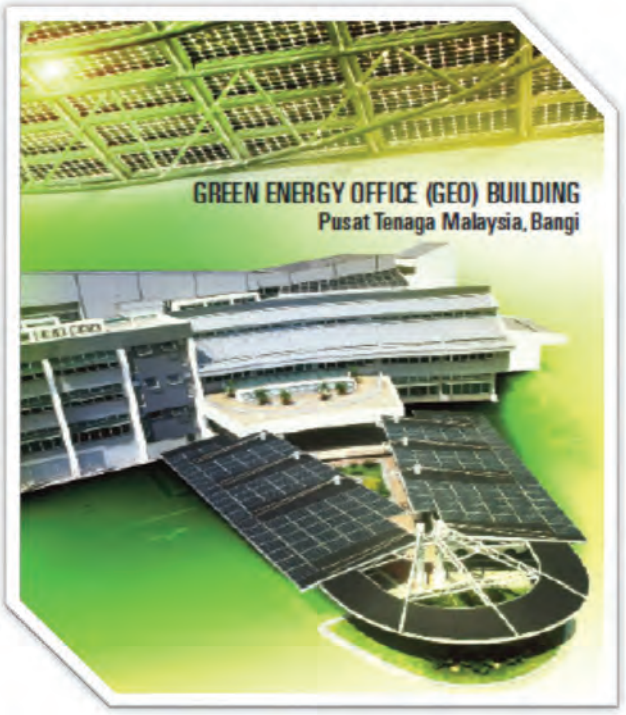
## 2007

## GreenTech Malaysia's GEO Building

Net BEI = 30 (86% reduce)
65 TonCO2/year
GBI : Certified (2009)
ASEAN EA : 2009/2010/2011

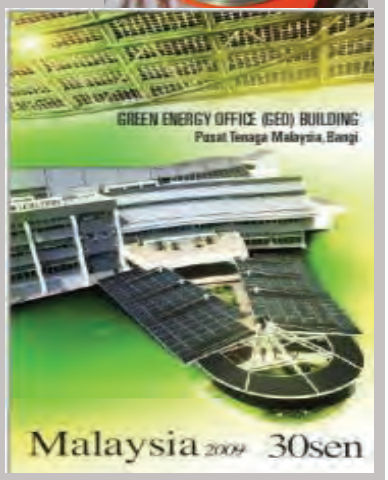
Potential LCB-GreenPASS (Operational carbon) Assessment

**Nearly ZEB**



# In 2007: THE GEO BUILDING IN BANGI

- **Daylighting (almost 100%)**
- **EE lighting + task lights**
- **EE office equipment** (laptops, LCD monitors, networked printers)
- **Green IT Network & server room** (75% wireless network)
- **EE air conditioning & ventilation**
- **Floor slab cooling** (For radiant cooling and thermal storage)
- **PCM storage cooling system** (minimised air-cond chillers capacity)
- **Controls & Sensors** (VSDs, VAVs, $CO_2$, BMS / Energy monitoring)
- **Double glazing** (heat and sound insulation)
- **Roof and wall Insulation** (reduce outside heat gain)
- **Grid connected BIPV system** (Sell energy to TNB / no batteries)
- **Rain water harvest system** (landscape, aircond and cleaning)


# In 2007: THE GEO BUILDING IN BANGI

GreenTech GEO Building
( ~100% Daylight)

# In 2007: THE GEO BUILDING IN BANGI (Energy & CO2 @ Savings)

**GEO BEI = 65**

(Conventional) BEI = 220

a/c area 3,175 sq.m

**155 kWh/m2year**

Savings (EE) = 70%

Net saving with Renewable Energy (EE+RE) = 85%

Potential LCB-GreenPASS on ZEB Assessment

**Nearly ZEB**

**Energy saved** = 492,125 kWh/yr
or **RM 195,374 per year**

**Tariff B** *(Low Voltage Commercial Tariff) for all kWh 39.7sen.kWh*

**$CO_2$ saved** = 492,125 x 0.614
= 302,165 kg/year CO2
**= 302 tones CO2/year**

**NEAR TO CARBON NEUTRAL BUILDING**

**0.614 kg of CO2** emitted to the atmosphere for each 1 kWh electricity generated by power plant (Peninsula Malaysia)

# CASE STUDY 3.0

## 2011 ESB – PANASONIC GREEN WAREHOUSE in SHAH ALAM


- Net BEI = 15.6kWh/m2/year (more than 70% energy reduced)
- 384.2 TonCO2/year
- SME Green Award 2012
- ASEAN Energy Award : 2012 : 1st Runner-up Tropical Buildings

Potential GreenPASS (Operational carbon) Assessment

# WAY FORWARD (QUICK WIN ON ACHIEVING LOW CARBON BUILDING)

## - Maximize Use of The Energy Efficient Reference Guide & Standard

1

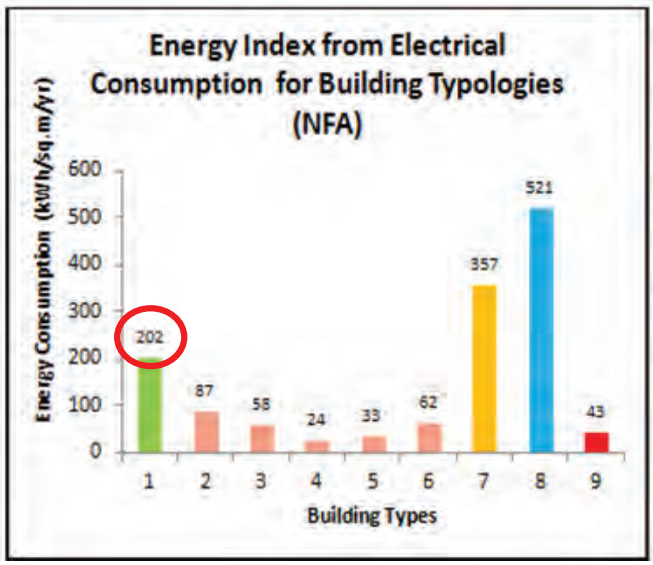

***MS1525: CODE OF PRACTICE ON ENERGY EFFICIENCY AND USE OF RENEWABLE ENERGY FOR NON-RESIDENTIAL BUILDINGS***

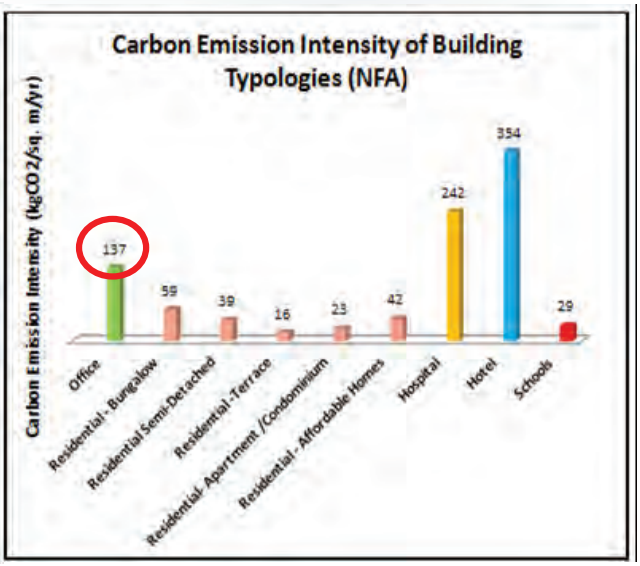
**Note:**
**All PBTs (Jabatan Kawalan Bangunan) should adopt & gazette under UBBL the requirement of MS1525 to boost the development of low carbon / green buildings**

# WAY FORWARD

## - Example Successful Adoption of MS1525 in New Buildings (Putrajaya)

### Common Carbon Metric in Buildings (Putrajaya) 2010

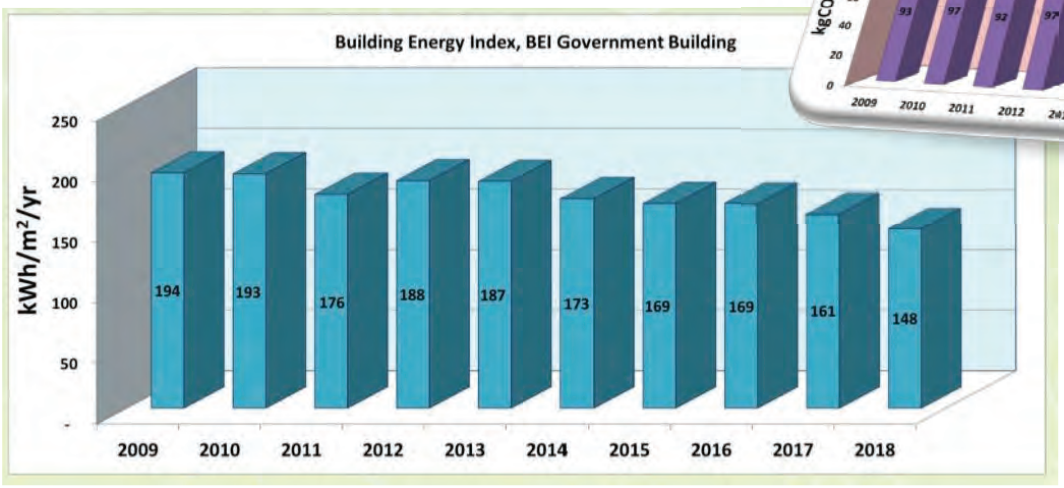


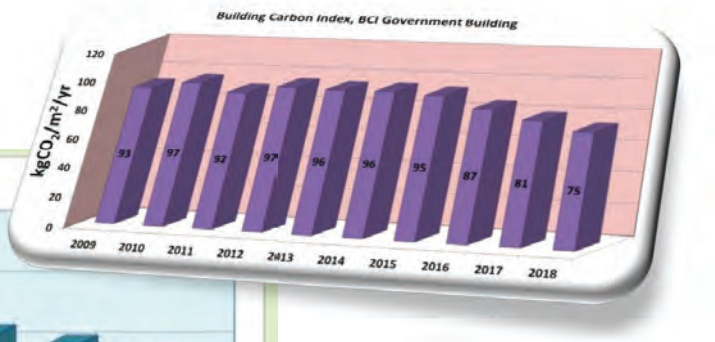



# WAY FORWARD
## - Example Successful Adoption of MS1525 in Putrajaya.

### Annual Common Carbon Metric in Buildings (Putrajaya)

* Source : Perbadanan Putrajaya – Putrajaya Low Carbon Green Cities 2025 Monitoring




**Energy Reduction 2018 vs 2009**


# WAY FORWARD
# OTHERS CODE OF PRACTICE


**Malaysian Standard 1837**

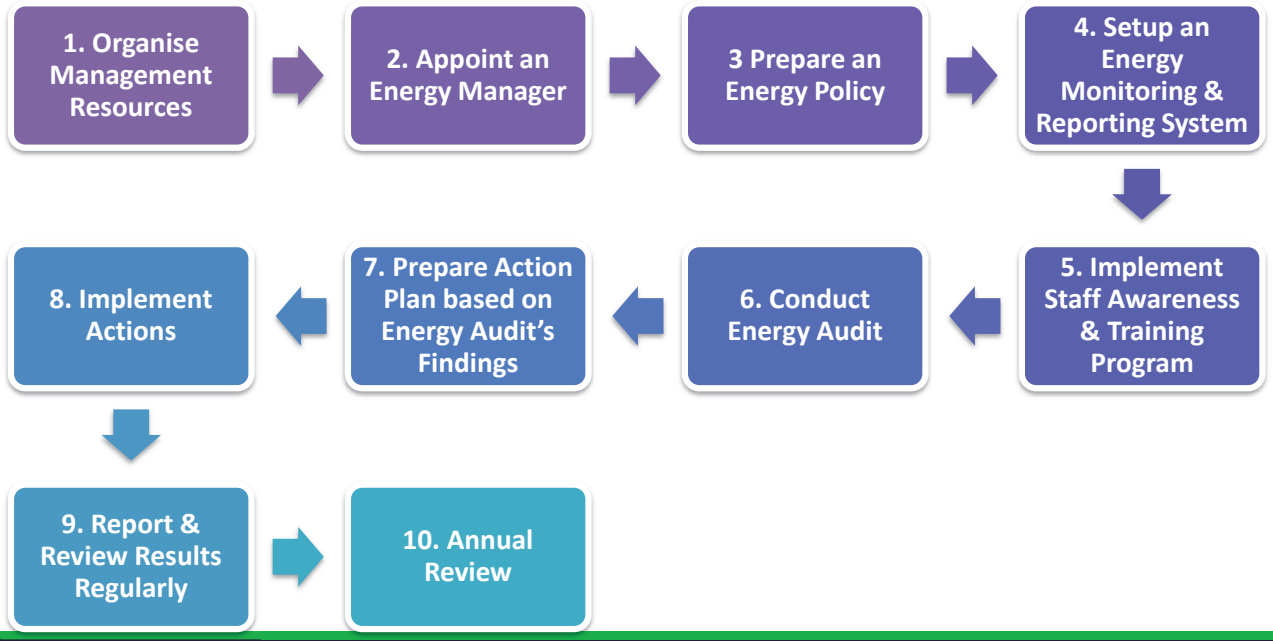
- Code of practice for installation of grid-connected photovoltaic (PV) system
- To provide guidelines on grid-connected PV system installation, electrical safety and fire protection requirements

**Malaysian Standard 2680**

- Code of practice for energy efficiency and use of renewable energy for **residential buildings**
- To provide guidelines on the design, selection of materials and electrical appliances and efficient use of energy including the application of renewable energy in new and existing residential buildings

# 3 ADOPTION OF ENERGY MANAGEMENT PRACTICES


# SIMPLIFIED CYCLE OF ENERGY MANAGEMENT PROCESS



# ENERGY MANAGEMENT

**All activities to ensure efficient use of energy in the organization**

- One of management resources of a company
- Required due to its influence to operation and activities

# 4 LOW CARBON BUILDING

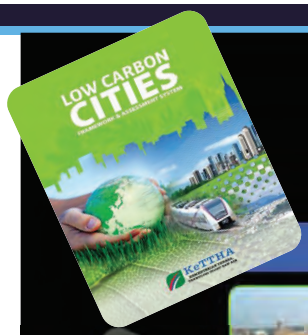
## Low Carbon Building

**An alternative way to go green building.**
**A basic green building that focus on sustainable energy, starting with basic energy efficient features.**

# Low Carbon Cities Framework & Assessment System
## - Use of Document

This document is to *assist local authorities, township developers, designers and individuals* in assessing whether developments carried out within the city contributes towards the reduction or decrease in GHG.


**Was Launched in Sept 2011 by YAB Prime Minister**




# LCCF
## PERFORMANCE CRITERIA
Base on Carbon Footprint

**4 Elements for GHG Reductions in Cities and Townships**

**Urban Environment**
- Site Selection
- Urban Form
- Urban Greenery & Air Quality

**Urban Transportation**
- Shift of Transport Mode
- Green Transport Infrastructure
- Green Vehicles
- Traffic Management

**Urban Infrastructure**
- Infrastructure Provision
- Waste
- Energy
- Water

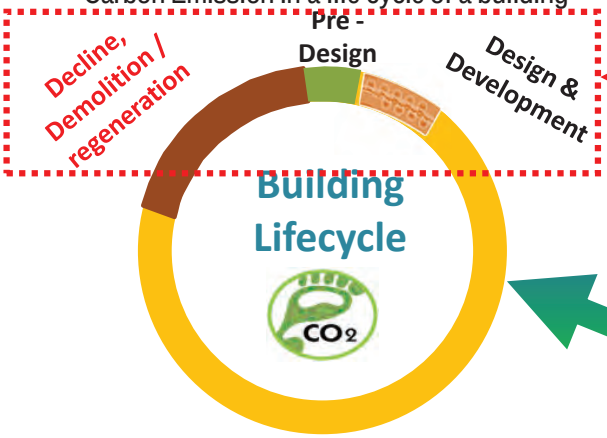
**Buildings**
- Low Carbon Building
- Community Service

Elements Contribute to GHG emission → 13 Performance Criteria* → 35 Sub Criteria

*Performance Criteria are measurable strategies to reduce carbon emission through:-
Policy control, technological dev., better process & product management, change in procurement system, carbon capture, consumption strategies & others.

# Low Carbon Building Focus on Operational Energy !

IMPORTANT FACT (by UNEP SCBI)
Carbon Emission in a life cycle of a building




Sustainable Buildings and Climate Initiative
UNEP Common Carbon Metric

**During development phase**
[Embodied CO2 footprint]
~ 20%

**Operation Phase : Use, Management & Maintenance**
[Higher Operational CO2 footprint]
From Energy Usage !!
80%

Next Step: After Energy Efficiency then Use Renewable Energy to off-set further the CO2 emission in building

**FACT! Most of the $CO_2$ emission is during the operation phase !!**
**ENERGY MANAGEMENT to tackle the source of the $CO_2$ emission**

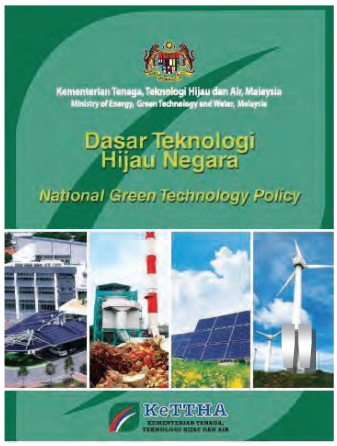
# NATIONAL GREEN TECHNOLOGY POLICY

## Definition of "Green Technology"

**Green technology is the development and application of products, equipment, and systems used to conserve the natural environment and resources, which minimizes and reduces the negative impact of human activities**

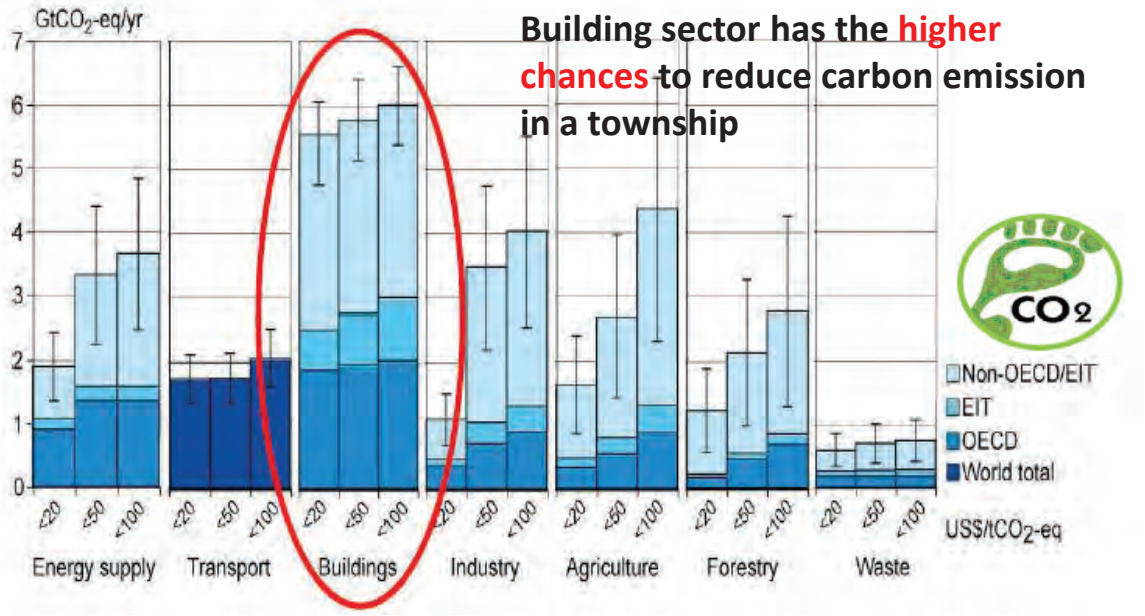
- Minimizes the degradation of the environment.
- It has zero or low green house (GHG) emission.
- It safe for use and promotes healthy and improved environment for all forms of life
- It conserves the uses of energy and natural resources; and
- It promotes the use of renewable resources.

Download copy @ www.mestecc.gov.my




**2010 : Green Technology Policy to support green and low carbon development**

# THE QUICK WINS: CHANCES TO REDUCE $CO_2$ EMISSION




**Building sector has the higher chances to reduce carbon emission in a township**

## Voluntary Initiatives By the Government & Private Organisations

*Compiled by SEDA Malaysia*

### Sustainable Tools in Malaysia (by chronology)

1. GreenMARK (BCA – Singapore)
2. Green Building Index (GBI)
3. LEED (USGBC – US)
4. GreenRE (REHDA)
5. Melaka Green Seal (Melaka)*
6. CIS 20:2012 – GreenPASS (CIDB, now adopted by SEDA)* - For Low Carbon Building & Zero Energy Building
7. Penarafan Hijau (PH-JKR)*.
8. MyCREST (CIDB-JKR)*.
9. CASBEE Iskandar (IRDA-Japan)

** Government tools*
** * * The underlined are tools made in Malaysia.*

### STANDARDS

- MS 1525
- ISO 50001
- ISO 14000

*Notes:*
- *GreenPASS is based on 100% CO2 reduction assessment.*
- *MyCREST is based on partially CO2 reduction assessment.*

** * **FACTS : No single tool can provide fair assessment to all types of buildings**. That is why more tools have been created and adapted to different assessment methods for the combination of various elements of sustainability (usually the final evaluation in the form of accumulated marks) or only subject to a single sustainability metric (such as GHG, Carbon, water or ecology index).*

# Next Improvement ….
# (To obtain full green building certification)

**Energy Efficient / Low carbon Building**

Low Carbon Building Assessment

IN FUTURE CAN UPGRADE TO FULL GREEN BUILDING CERT.

**Green Building Tools in Malaysia**

- MyCREST (CIDB-JKR).
- Penarafan Hijau (PH-JKR).
- Green Building Index (GBI)
- GreenRE (REHDA)
- Melaka Green Seal (Melaka)
- GreenMARK (BCA – Singapore)
- LEED (USGBC – US)
- CASBEE Variant (IRDA-Japan)

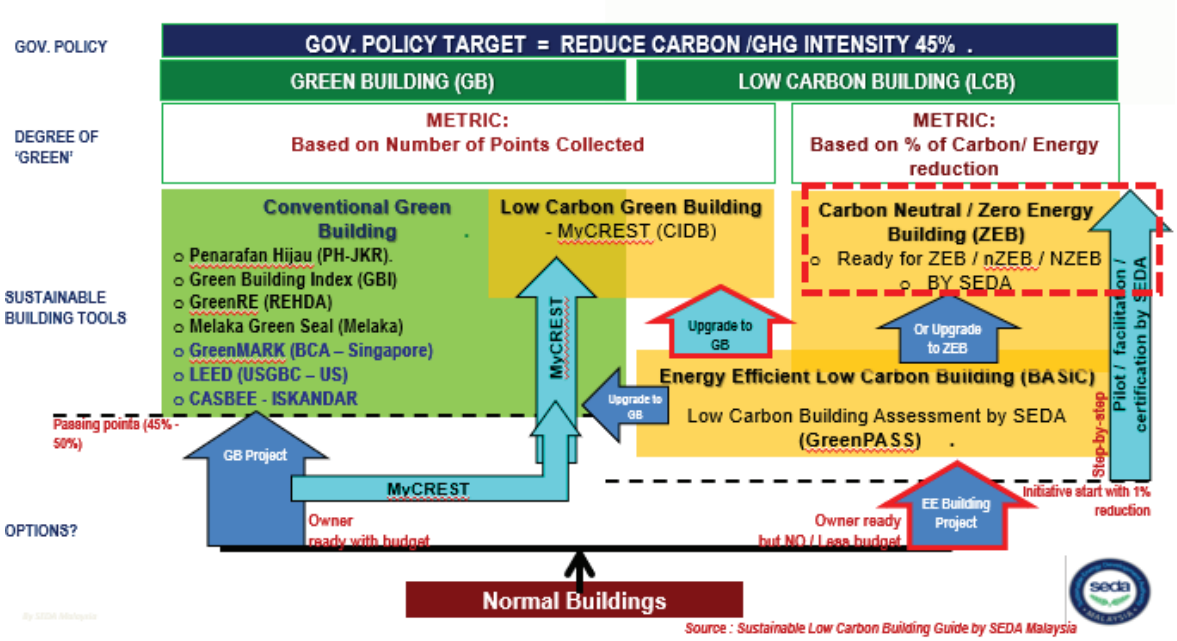
**STANDARDS**

- MS 1525
- ISO 50001
- ISO 14000

**Carbon Neutral Building**

- Zero Energy Building (NZEB)

# MAPPING OF GREEN BUILDING / LOW CARBON BUILDING / ZERO ENERGY BUILDING (ZEB)

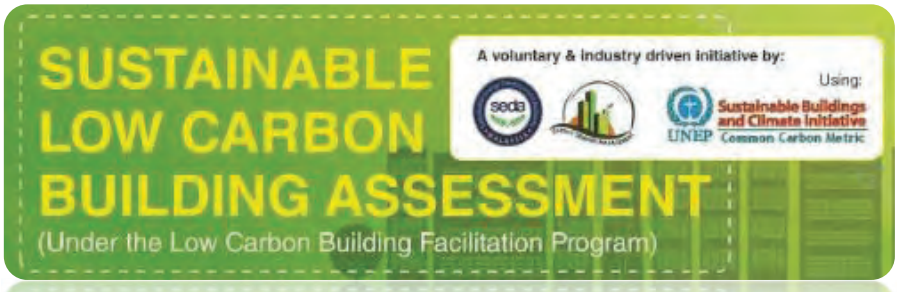



Source : Sustainable Low Carbon Building Guide by SEDA Malaysia

# TOOLS & SYSTEMS

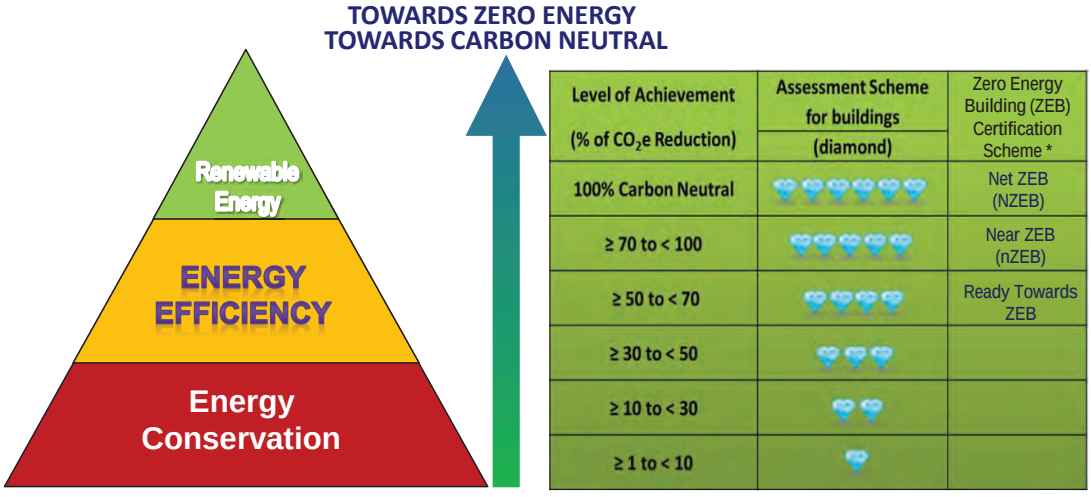
## Sustainable Low Carbon Building Assessment GreenPASS

- Buildings represent the biggest opportunities for carbon reduction in mitigating climate change, as they are responsible for about 80-90% of the carbon emissions during their operations.
- **A lot of initiatives on sustainable energy low carbon building has been done but absent the way to access the achievement.**
- The assessment program will become platform to appreciate the sustainable energy low carbon building initiatives, using **UNEP-SBCI Common Carbon Metric / CIDB's CIS20-GreenPASS**.




# LOW CARBON BUILDING/ ZERO ENERGY BUILDING
# Assessment Tool by SEDA Malaysia

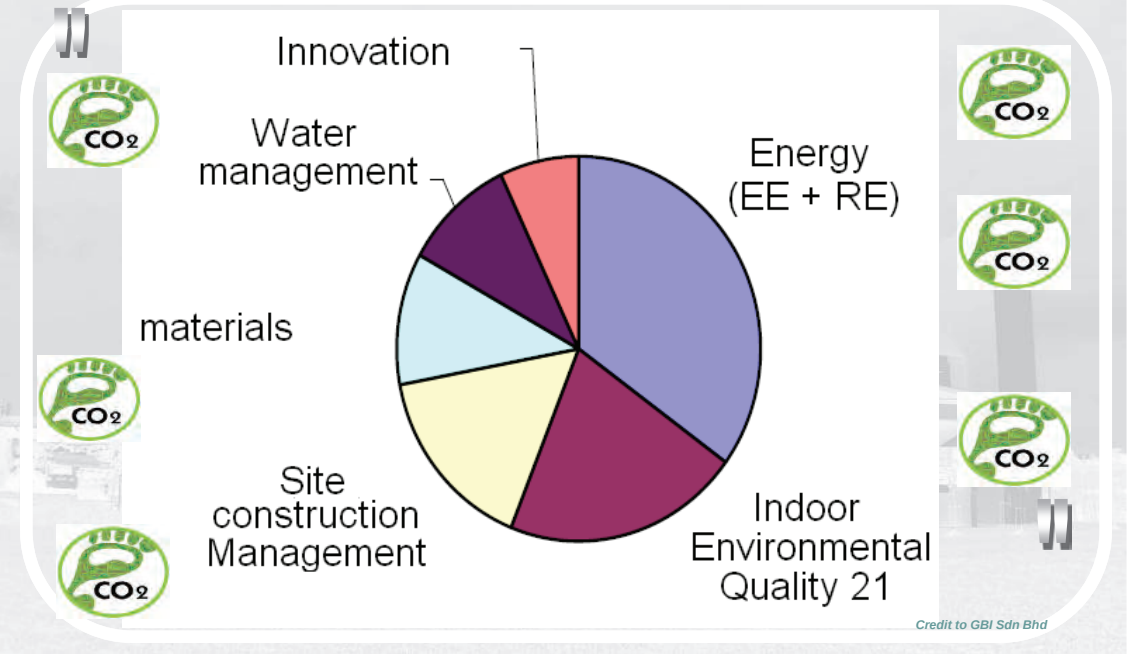
* Adopted the CIDB's Construction Industry Standard (CIS-20:2012) – GreenPASS Operation




| Level of Achievement (% of $CO_2e$ Reduction) | Assessment Scheme for buildings (diamond) | Zero Energy Building (ZEB) Certification Scheme * |
|---|---|---|
| 100% Carbon Neutral | | Net ZEB (NZEB) |
| ≥ 70 to < 100 | | Near ZEB (nZEB) |
| ≥ 50 to < 70 | | Ready Towards ZEB |
| ≥ 30 to < 50 | | |
| ≥ 10 to < 30 | | |
| ≥ 1 to < 10 | | |

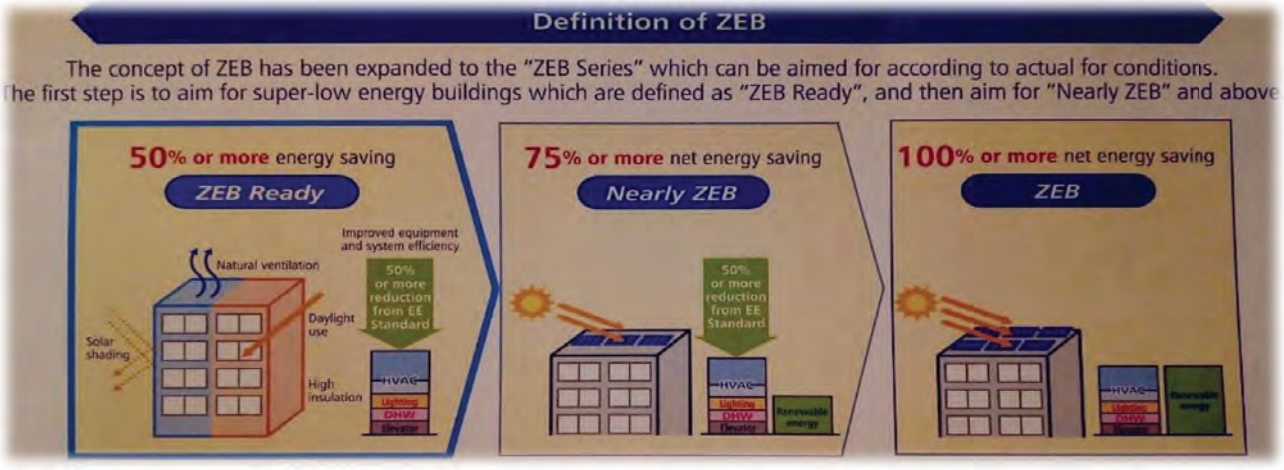
* Note : Possible aligning to Japan ZEB Scheme Concept

# Common Green Building Elements




# TOOLS & SYSTEMS

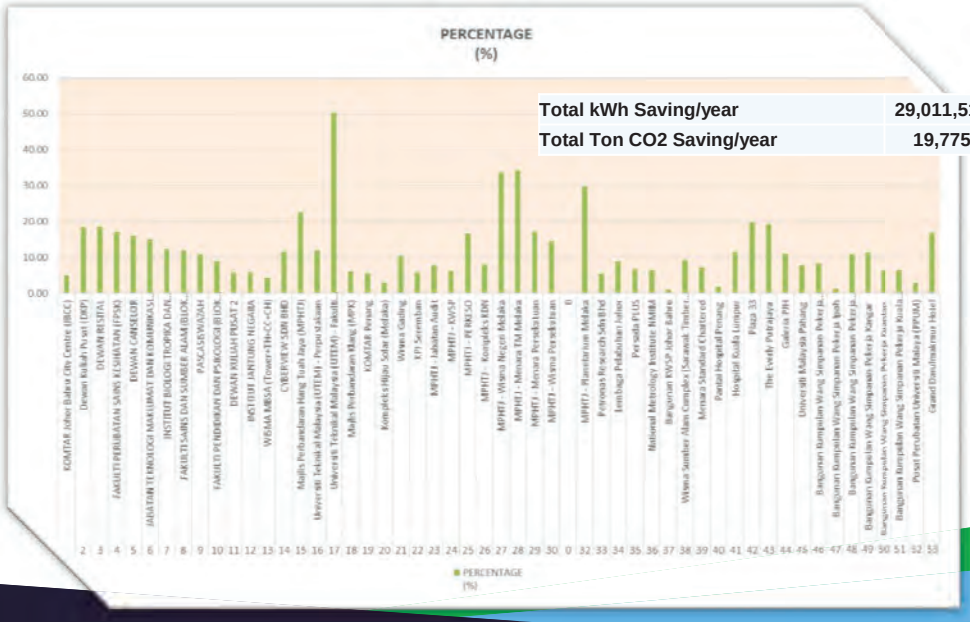
## ZERO ENERGY BUILDING FACILITATION PROGRAM




ZERO ENERGY BUILDINGS (ZEB) SERIES
(Malaysia suitable to adopt the Japanese definition on ZEB)

# Tools & Systems

## Tools – GreenPASS under the SEDA's Low Carbon Building Facilitation Program




| | |
|---|---|
| Total kWh Saving/year | 29,011,515 |
| Total Ton CO2 Saving/year | 19,775 |

# Tools & Systems

## GreenPASS under the SEDA's Low Carbon Building Facilitation Program


Current status

| | |
|---|---|
| Total Applications | 55 |
| Total Approved | 53 |
| Total kWh Saving | 29,011,287.93 |
| Total CO2 Saving | 19,773.44 |

| CERTIFICATION (DIAMOND RATING) | Total |
|---|---|
| 1 Diamond | 25 |
| 2 Diamonds | 23 |
| 3 Diamonds | 3 |
| 4 Diamonds | 1 |
| 5 Diamonds | 1 |

| Level of Archivement (% of $CO_2e$ Reduction) | Assesment Scheme for Buildings (diamonds) | ZEB Scheme |
|---|---|---|
| 100% Carbon Neutral | 6 | Net ZEB (NZEB) |
| > 70 to < 100 | 5 | Near ZEB (nZEB) |
| > 50 to < 70 | 4 | Ready for ZEB |
| > 30 to < 50 | 3 | |
| > 10 to < 30 | 2 | |
| > 1 to < 10 | 1 | |

# Low Carbon Building GreenPASS Certification


Collaboration with Perbadanan Putrajaya

GreenPASS join certification by SEDA – Local Authority


GreenPASS certification by SEDA

# Low Carbon Building GreenPASS Certification Event with PBT


Handing over GreenPASS certificate to building owners

**Collaboration with MPHTJ**

# TOOLS & SYSTEMS

## Building Energy Data Online System (BEDOS)

- **Energy & carbon monitoring system.** The encourage users to monitor electricity energy usage.
- Publish their electricity energy consumption by this system. BEDOS provide historical energy consumption data display and analyse the data to provide energy report.
- BEDOS also allow users to establish energy baselines and trace energy saving performance to help consumer manage energy usage.


5

BEDOS

BUILDING ENERGY DATA ONLINE MONITORING SYSTEM

(For Sustainable Energy Low Carbon Building Assessment-GreenPASS Application)

Publish their electricity energy consumption by this system. BEDOS provide historical energy consumption data display and analyse the data to provide energy report

Local authorities to collect energy & carbon reduction data

www.seda.gov.my/bedos

Energy & carbon monitoring system. To encourage users to monitor electricity energy usage

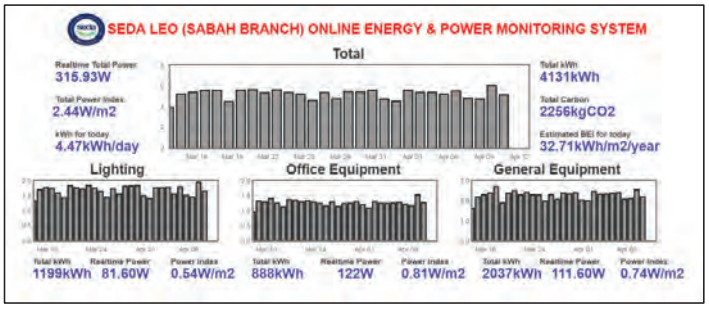
BEDOS also allow users to establish energy baselines and trace energy saving performance to help consumer manage energy usage

# TOOLS & SYSTEMS

## 6 SEDA's Online Building Energy Monitoring System

Objectives are as follows:

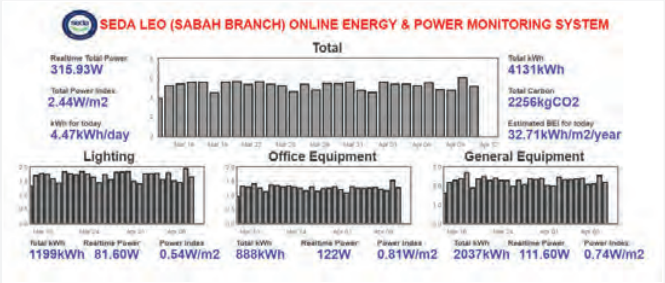
- To provide platform for building owners to monitor their energy usage and their building performance;
- To support visualise data on systematic assessment to encourage energy efficiency in building
- As one of the platform and can be one of contributing point for achieving the current Low Carbon Building or Green Building Certification cert in Malaysia



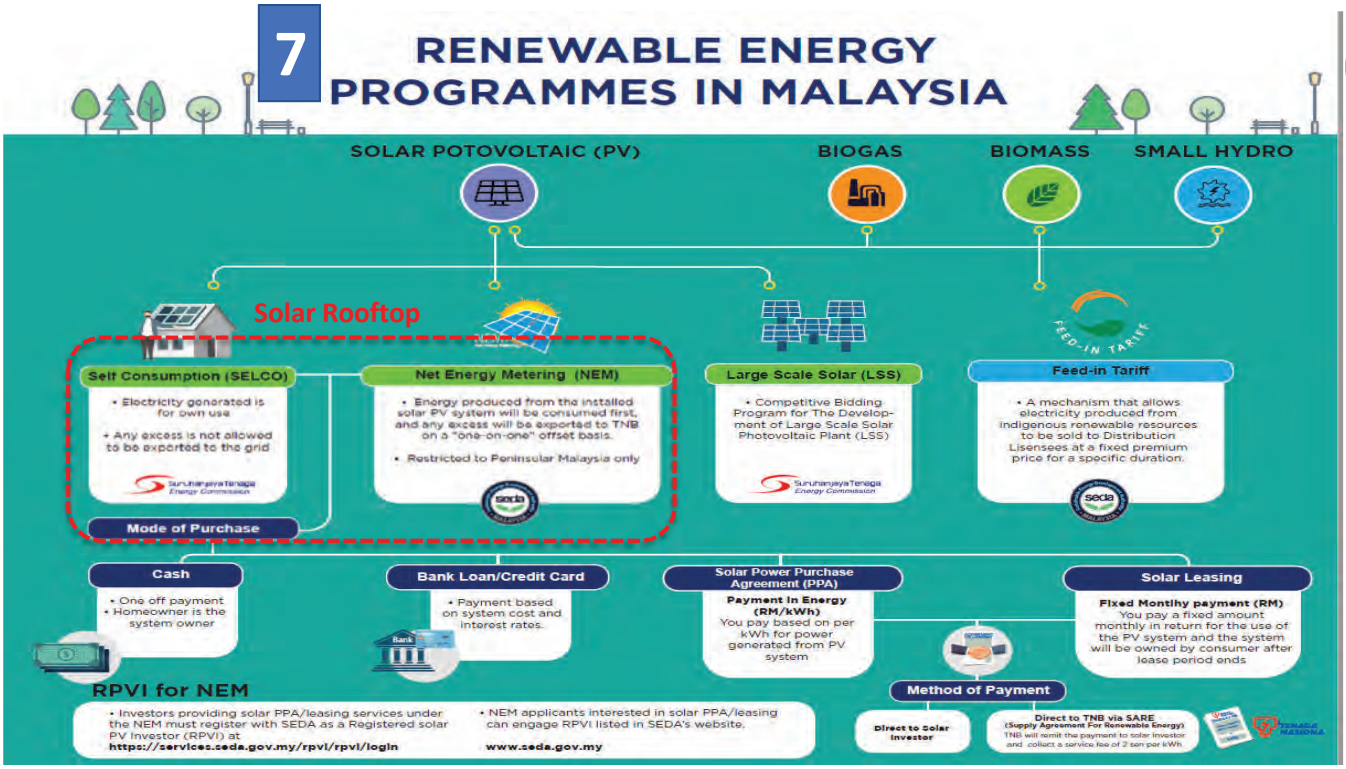

## 6 Tools & Systems

### SEDA's Online Building Energy Performance Monitoring System

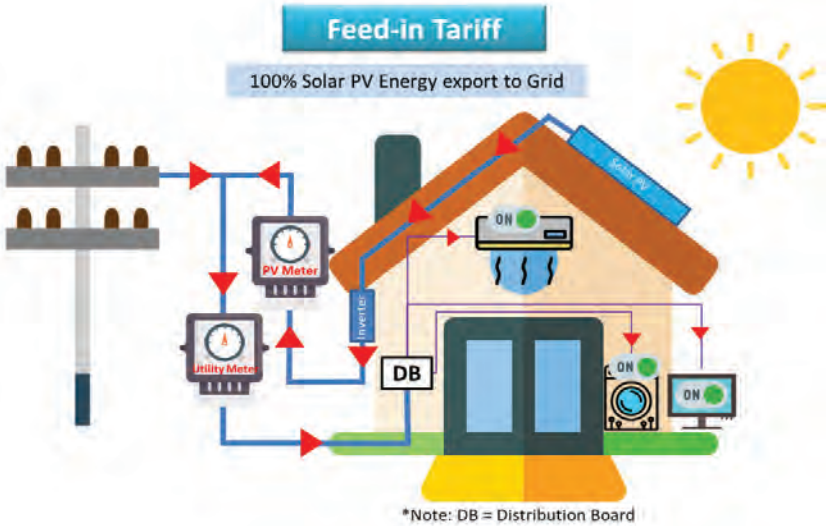
Demonstrate the performance of building in Malaysia. Part of the exercise under this component is to install and demonstrate online energy monitoring. Objectives are as follows:




1. To understand the demographic of energy usage in building for Malaysia, in order to form a specific baseline for typical office building in Malaysia
2. To provide platform for building owners to monitor their energy usage and their building performance
3. To support visualise data on systematic assessment to encourage energy efficiency in building
4. As one of the platform and can be one of contributing point for achieving the current Low Carbon Building or Green Building Certification cert in Malaysia



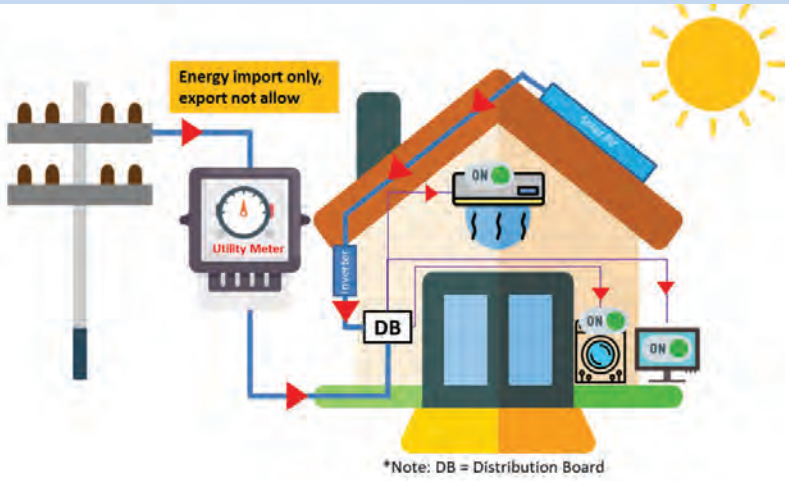

# Feed-in Tariff Scheme (2012 – 2017)




- *FiT allows consumer to **sell their solar PV energy** to TNB/SESB with premium rate (FiT) (21 years contract)*
- *FIT provides a fixed monthly income for every kWh energy exported to the grid.*
- *However, solar under FiT scheme ended in **2017 due to fund limitation (quota) & heavily oversubscribed.***
- ***Non-solar quotas are still be made available***

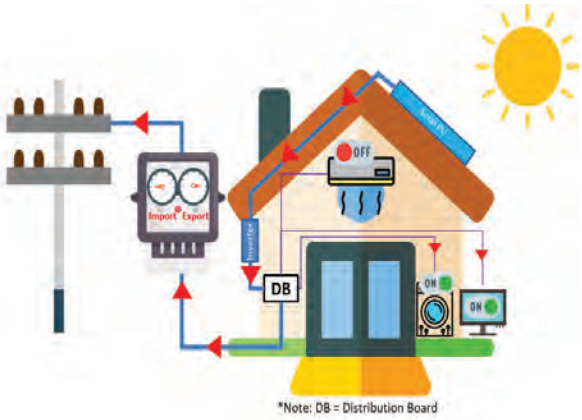
# Self-Consumption (SelCo) Scheme (since 2017)

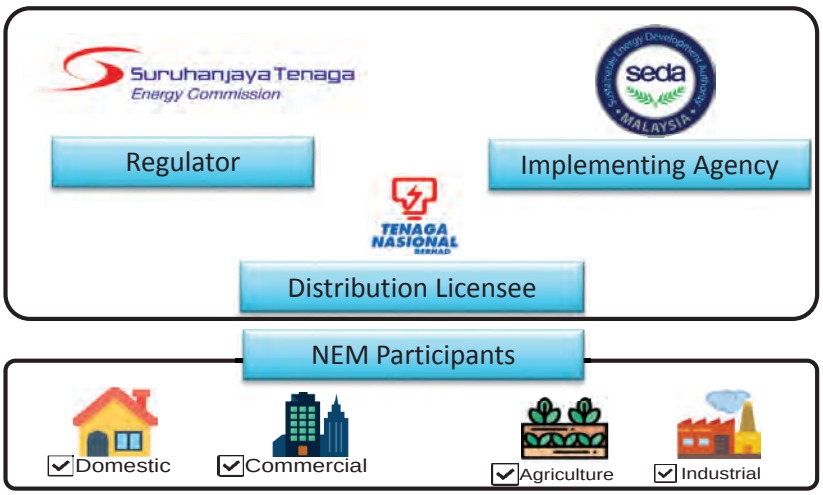
SelCo = Solar PV energy generated 100% for own-used only




- SelCo allows consumer to self-consume 100% from solar PV energy, while reducing energy import from TNB/SESB.
- Reduce electricity bill (Less energy import from TNB)

# Net Energy Metering (NEM)



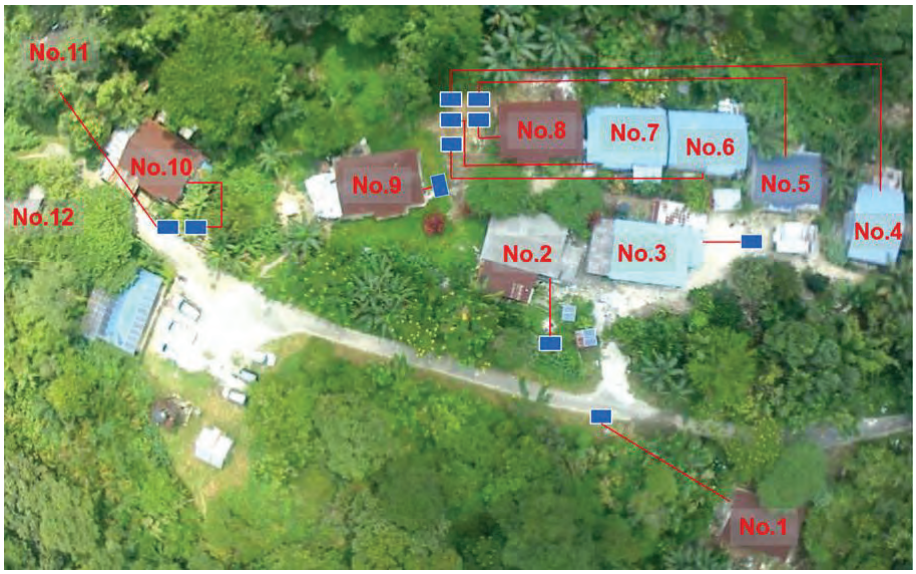




**The concept of NEM 2.0 (w.e.f 1st Jan 2019) 500MW is that the energy produced from the installed solar PV system will be consumed first, and any excess will be exported to TNB on a "one-on-one" offset basis. Opportunity to save your electricity bill!**

# Off – Grid PV Solar System installation for KOA

solar off-grid system - minimum 1.2 kWp for each house

a) 5 unit LED lamps
b) 1 unit standing fan
c) Wiring, power socket, distribution board and electrical protection devices.
d) 12 months technical support



Training and hand over session

## NEM Calculator

Tariff Group

Type to search

Building Type

Average Electricity Bill Monthly (RM)

RM Enter your value

Calculate

Disclaimer :

For **detailed proposals**, kindly contact your **PV service providers** for more consultation. While SEDA Malaysia strives to ensure the data is correct, no warranty expressed or implied is given as to the completeness, accuracy or timeliness of the given data. The above data may be updated, changed or modified from time to time. Users should take action to independently confirm the data available before relying on it. In no event shall SEDA Malaysia be liable to any person for any special, indirect or consequential damages relating to this data.

**https://services.seda.gov.my/nemcalculator/#/**

# NEM Calculator

Category: Tariff A - Domestic Tariff View Tariff
Building Type: Terrace House

| Your Current Monthly Bill | Your Monthly Bill after NEM | Your Monthly Saving |
|---|---|---|
| RM400 | RM77 | RM323 |

| Proposed Installed Capacity (adjustable) | Simple Payback Period | * Estimated Minimum Upfront Cost |
|---|---|---|
| 6.08kWp | 6.7Years | RM26,144 |

## Space Required

Rooftop Area
36.5m²
1 kWp approximately 6m²

## Environmental Impact **

Carbon Dioxide ($CO_2$) Avoidance
127 tonne $CO_2$

=

Distance travel avoidance by car (petrol)
0.5 million km

=

No. of tree seedlings grown for 10 years to absorb the $CO_2$
2,006 trees

Print Result → | Outright Purchase → | Leasing → | New Calculation →

# Photos

11.5MW, Kina Biopower Sdn Bhd, Sandakan Sabah

1.1MW, Felda Industri Sdn Bhd, Serting Hilir, Negeri Sembilan

# Photos

507.3 kW, Perpustakaan Raja Tun Uda, Shah Alam, Selangor

675.2 kWp, Lean Lee Solar (M) Sdn Bhd, Bukit Mertajam, Penang

# Photos

2.5 MWp, Goodyear Malaysia Bhd, Shah Alam, Selangor

3.15 kWp Terrace House, Kota Damansara, Selangor

# THANK YOU

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**5°59'32.8"N 116°06'31.0"ET**

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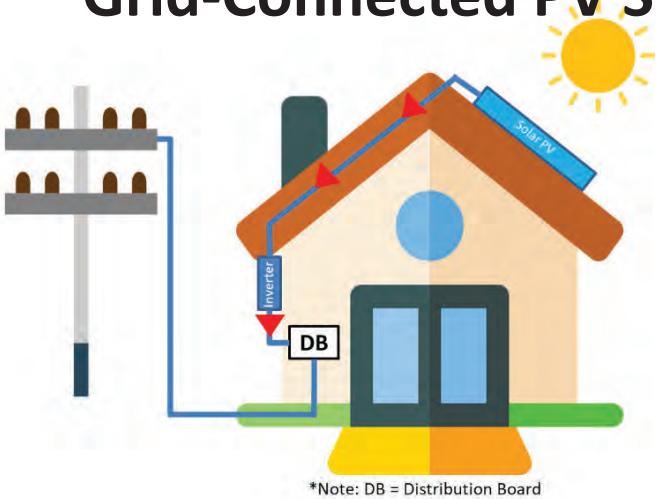
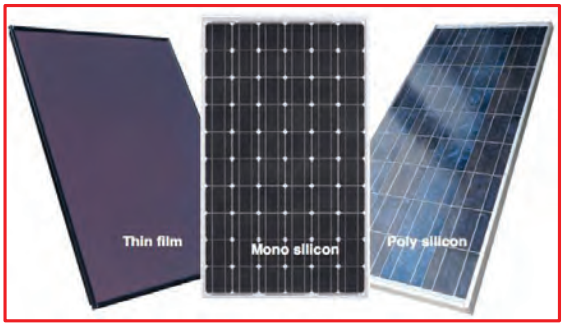
SustainableEnergyDevelopmentAuthority-SEDAMalaysia

# Grid-Connected PV Systems in Malaysia




*Note: DB = Distribution Board




Absorb & convert sunlight to electricity


FY2020 MOE City-to-City Collaboration for Zero-Carbon Society project
（Project developing a policy and implementation framework for building energy efficiency through city to city collaboration between Kuala Lumpur Government and Tokyo Metropolitan Government）

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