

TOWARDS PUTRAJAYA GREEN CITY 2025

PUTRAJAYA BUILDING SECTOR
CARBON EMISSIONS MONITORING &
REPORTING PROGRAMME

INVENTORY OF PUTRAJAYA GREENHOUSE
GAS EMISSIONS 2014

UPDATES ON PUTRAJAYA'S INITIATIVES
ON TRANSPORTATION AND MOBILITY



National
Institute for
Environmental
Studies, Japan



TOKYO
METROPOLITAN
GOVERNMENT



TOWARDS PUTRAJAYA GREEN CITY 2025

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Foreword

It has now been 5 years since Putrajaya first started to implement programmes and initiatives to transform the city into a sustainable low carbon green city, starting with the preparation of Putrajaya Green City 2025: Baseline and Preliminary Study (PGC2025). PGC2025 has set an ambitious target to reduce Putrajaya's citywide greenhouse gas (GHG) emissions by 60% from its 2025 business as usual level.

The planning and development foundation of the city based on sustainable development principles has set the solid groundwork for the city's transformation towards becoming a sustainable low carbon green city by 2025.



Annually, Putrajaya Corporation (PJC) has been publishing updated reports on green initiatives that have been implemented in the city. For 2015, this report contains an introduction to a new programme targeting on the building sector's GHG emission namely, **PUTRAJAYA BUILDING SECTOR CARBON EMISSIONS MONITORING & REPORTING PROGRAMME** that is expected to be implemented in 2016. This programme is designed based on Tokyo Metropolitan Government's experience in the implementation of carbon reduction reporting programme in Tokyo.

PJC acknowledges the kind assistance of the research team from Universiti Teknologi Malaysia, Kyoto University, National Institute for Environmental Studies, Tokyo Metropolitan Government, Mizuho Information and Research Institute and the Ministry of the Environment, Japan in the design and development of the programme. We are also grateful for the support of the Ministry of Federal Territories, the Ministry of Energy, Green Technology and Water, the Federal Territory of Putrajaya Public Works Department and the Sustainable Energy Development Authority in the implementation of the programme in the near future. It is hoped that the programme will be able to reduce the GHG emissions from the building sector by approximately 600 to 700ktCO₂ by 2025 resulting in savings of about MYR500 million in terms of reduction of energy use in buildings in Putrajaya.

This report also includes the annual **INVENTORY OF PUTRAJAYA GREENHOUSE GAS EMISSIONS 2014** which still indicates an upward trend in GHG emissions for the city. This requires concentrated actions to be taken, particularly in the building and the transportation sectors.

UPDATES ON PUTRAJAYA'S INITIATIVE ON TRANSPORTATION AND MOBILITY is also included in this report consisting of **Putrajaya Bikeable City : Status Updates** as well as information on the **International Demonstration Project for EV Buses with super quick charging system in Putrajaya**, a project sponsored by the New Energy and Industrial Technology Development Organization (NEDO) of Japan and a consortium of Japanese companies anticipated to begin operation in the fourth quarter of 2016.

Again let me extend my utmost appreciation and gratitude to all parties involved in the planning, development and implementation of programmes and initiatives towards Putrajaya Green City 2025 and we look forward to their continuous and solid support for Putrajaya in years to come.

Thankyou.

A handwritten signature in black ink, appearing to read 'Hasim Bin Haji Ismail', written over a vertical line that extends from the 'Thankyou.' text above.

DATUK HAJI HASIM BIN HAJI ISMAIL
President
Putrajaya Corporation

Background of the city of Putrajaya

29th of August 2015 marked the 20th anniversary of the establishment of Putrajaya as the Federal Government's administrative centre of Malaysia. Sustainable development principles has been the adopted in the planning and development of the city since its inception. This is clearly evident in the designation of almost 40% of its total city area of 4,931 hectares, specifically for green and open spaces. Putrajaya is also intended to be a self-contained city with residential areas planned on neighbourhood planning concept. The road and transportation network are planned on a policy of modal split of 70:30 between public transport : private transport usage complemented with an extensive network of cycle ways and walkways. Its planned population is set at 350,000 people with a day time population of half a million people.

	Planned (2025)	Current
Population	350,000 people	82,200 people
Housing	65,000 units	27,589 units
Government Office Space	3.4 million sqm	2.7 million sqm
Commercial space	4.5 million. sqm	0.7 million sqm

Background of Putrajaya Green City 2025

Putrajaya Green City 2025 : Baseline and Preliminary Study (PGC2025) is a collaborative research effort by a team consisting of Universiti Teknologi Malaysia, Malaysia Green Technology Corporation, Putrajaya Corporation, Kyoto University, Okayama University, National Institute for Environmental Studies, Japan and the Asia Pacific Integrated Model team.

PGC2025 is a study to assess the current state of the city in terms of its GHG emissions and to propose suggestions in terms of broad targets or counter measures to reduce emissions by 2025.

The study has calculated CO₂ emissions baseline for Putrajaya for base year 2007 and calculated the emissions level for the 'business as usual case' (BaU) for 2025. In order to reduce the emissions level by 2025, the quantitative environmental targets are outlined in three themes; Low CarbonPutrajaya, Cooler Putrajaya and 3R Putrajaya.



PUTRAJAYA BUILDING SECTOR CARBON EMISSIONS MONITORING & REPORTING PROGRAMME

National context

In 2009, the Prime Minister of Malaysia declared that Malaysia is adopting an indicator of a voluntary reduction up to 40% in terms of emission intensity of GDP by the year 2020 compared to 2005 levels. Prior to that, the government of Malaysia unveiled the National Green Technology Policy (NGTP) which was a turning point in the country's initiatives towards sustainable growth and development. In addition, the Eleventh Malaysia Plan (2016-2020) announced in May 2015 emphasizes on the importance of green growth. In order to embark on green growth and achieve the international pledge, implementation of intensive actions is required for the whole of Malaysia.

Putrajaya's position

One of many initiatives for embarking on green growth is to showcase Putrajaya and Cyberjaya as pioneer green cities. In line with this initiative, Putrajaya Corporation (PJC) has prepared the Putrajaya Green City 2025 (PGC2025), which consists of policy package for GHG reduction by 2025. PGC2025 indicates 60% of emissions in 2025 can be reduced, which corresponds to about 2,400 ktCO₂ by implementing 12 actions. . The GHG inventory in 2014 indicates that the building sector contributes the highest in terms of city's GHG emissions at 67% and there is a huge potential to reduce GHG emissions from this sector. This requires focus on implementing energy conservation and energy efficiency practices in the building sector. In 2014, PJC announced at one of the side events at COP20 that it is essential to take necessary actions to introduce a new programme to address this.

The way towards Putrajaya Green City

In order to reduce carbon emission in Putrajaya, PJC is now launching a new administrative programme, named **Putrajaya Building Sector Carbon Emissions Monitoring & Reporting Programme**. This programme will require building owners to report their energy consumption and GHG emissions from their building operations. They are also requested to submit the action plan for reducing their emission in the report. The participating entities can receive feedbacks and supports, including advices for improvement of energy efficiency, technical support for reducing consumption of utilities, awards for good energy practices.



Putrajaya Building Sector Carbon Emissions Monitoring & Reporting Programme

Overview of the Programme:

The scope of the programme covers buildings other than residential use. Buildings can be categorized into two groups: 1) large scale buildings with gross floor area (GFA) over 10,001 m², 2) Medium and small scale buildings with GFA below 10,000 m². The programme will require owners of large scale buildings to report their building's profile, energy consumption, GHG emission and action plan to reduce GHG emissions from their building operations. Owners of medium and small scale buildings are encouraged to report on a voluntary basis. The total number of buildings covered by the programme under the mandatory requirement is expected to reach 67%, involving 95% of total GFA of planned buildings.

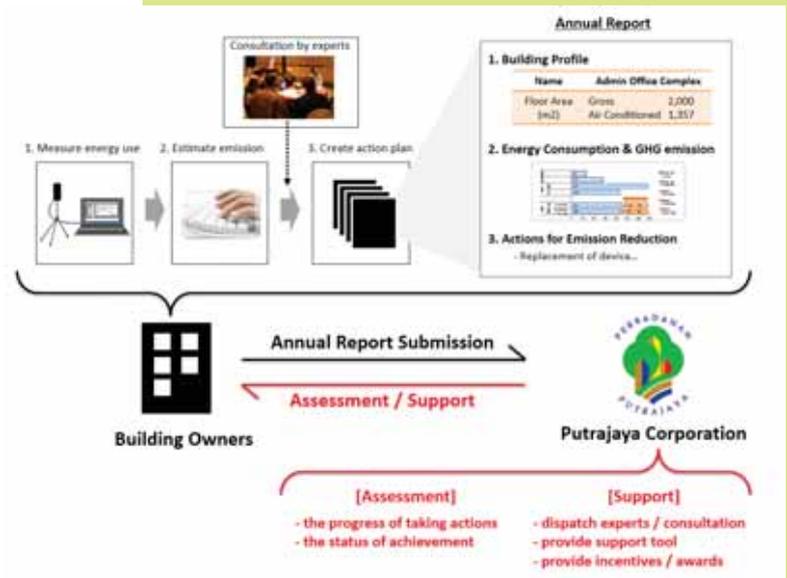
Building Category	Coverage in number of buildings		Total planned number of buildings
	Large scale buildings (GFA over 10,001 m ²)	Medium & Small scale buildings (GFA below 10,000 m ²)	
Government	98 (91%)	10 (9%)	108
Public Amenities & Facilities	62 (53%)	54 (47%)	116
Commercial	120 (62%)	73 (38%)	193
Total	280 (67%)	137 (33%)	417

Targeted building owners are required to perform the following activities and report:

- To measure their building consumption of electricity [kWh], chilled water [Rth], liquid petroleum gas [mmBtu] and water [m³] in the latest fiscal year through direct measurement or collecting bills for use of these utilities. Technical supports for measurement are provided.
- To estimate GHG emission from their building operation in the latest fiscal year in accordance with the following formula:

$$\text{GHG Emission [kgCO}_2\text{]} = \text{Consumption [kWh, Rth, mmBtu \& m}^3\text{]} \times \text{Emission Factor [kgCO}_2\text{/kWh, kgCO}_2\text{/Rth, kgCO}_2\text{/mmBtu \& kgCO}_2\text{/m}^3\text{]} (*)$$
 PJC will provide a detailed guideline and simplified toolkit for estimation.
 (*) The effort for saving gas/water use can be included in the context of emission reduction according to the formula.
- To prepare an action plan to reduce GHG emission from their building operation.
- To summarise all of the things written above, and submit the report to PJC.

The report especially action plan will be assessed from the viewpoints of sufficiency in lineup and strength of actions.



Target of the Programme:

This programme adopts Building Energy Index (BEI) as an indicator. PGC2025 indicates that average BEI of non-residential buildings has the potential to be reduced by 36% in 2025 compared to baseline scenario to an average BEI of about 23.4 toe/000m² (272 kWh/m²). In order to realise this reduction potential, the programme targets to achieve an average BEI of 23.4 toe/000m² (272 kWh/m²) by 2025. If all of non-residential buildings accomplish the target, around 600 ktCO₂ can be reduced; amounting to about MYR450 million in savings through the reduction in energy use. To achieve this target, the average BEI has to be reduced by 28% from the 2014 average BEI of 32.7 toe/000m² (381kWh/m²).

Required Actions for Building Owners:

- Introduction of energy management system for managing energy consumption
- Replace energy equipments with high energy efficient ones
- Retrofit energy equipments by introducing energy saving devices
- Upgrade building envelopes by insulation improvement

Expected benefits of the programme:

For PJC

- ability to examine and manage energy consumption and GHG emission for individual buildings
- enforcement/encouragement for building owners to take effective actions
- the achievement of PGC2025 targets as well as contribute towards national reduction target

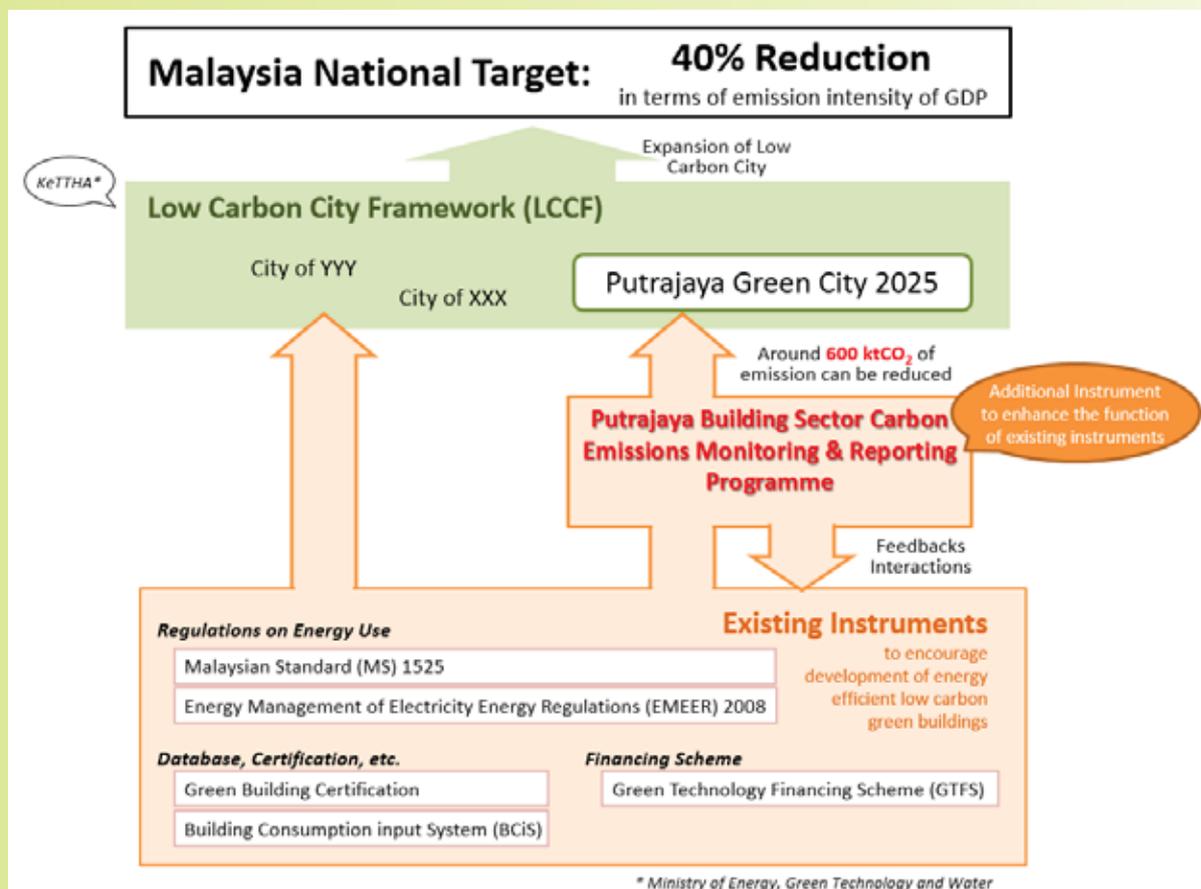
For Building Owners

- savings on utilities costs by taking actions
- facilitate in Green Building certification
- obtain good reputation through GHG emission reduction

Relationship between the programme and existing schemes

There are various national policies, laws/standards, tools for diffusing energy efficient green buildings in Malaysia. These instruments can be utilized as reference, or support tools for implementing the programme in Putrajaya. The programme will be implemented through collaboration with various ministries and agencies, among others, the Ministry of Federal Territories, Ministry of Energy, Green Technology and Water (KeTTHA), Federal Territory of Putrajaya Public Works Department (JKR Putrajaya), Sustainable Energy Development Authority (SEDA) and others. The programme will play a key role in achieving the target of Putrajaya as a Green City by 2025, and will contribute towards the achievement of the national target of 40% reduction in carbon intensity in 2020.

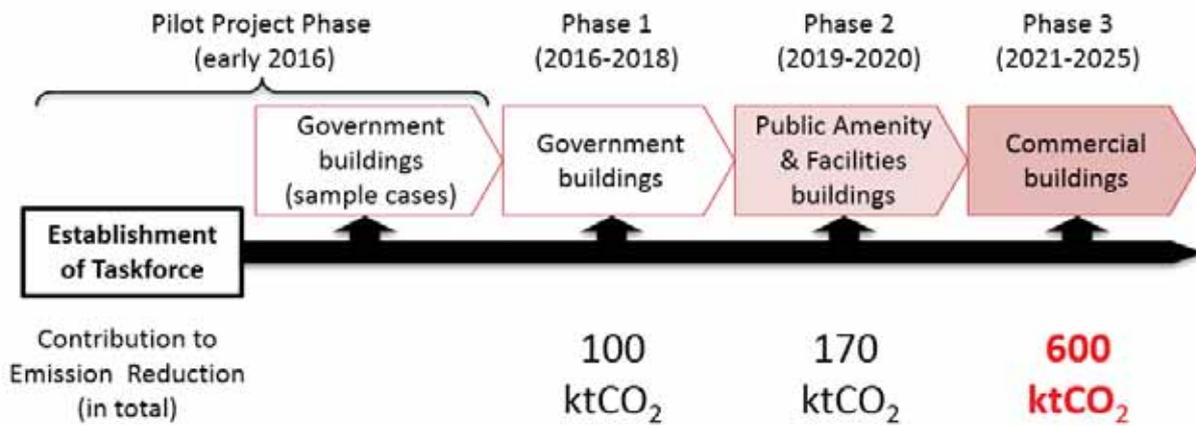
The programme can be diffused to other cities through the LCCF programme or other initiatives by KeTTHA and the Ministry of Urban Wellbeing, Housing and Local Government.



Schedule for Implementation of the Programme

In order to introduce the programme smoothly, voluntary based scheme with limited target is desirable in the initial stage of the implementation. The target buildings shall be expanded gradually. The following figure shows the steps for expanding the scope of the program.

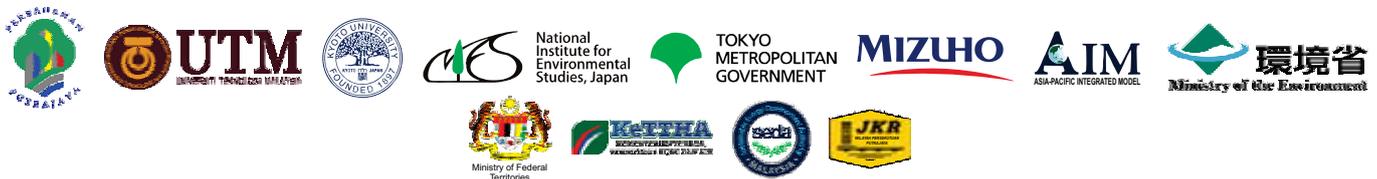
- Pilot Project Phase: This is the preparation stage for initiating the programme. The Taskforce for designing and operating the programme has already begun the activities. The taskforce will select two or three buildings and run the programme as trial practice. This stage will be completed by March 2016.
- Phase 1: The government buildings will be encouraged to participate the programme on a voluntary basis in the initial one or two years. Implementation period for phase 1 is from 2016 to 2018.
- Phase 2: The scope of the programme will be expanded to cover the public amenity and facilities buildings. Implementation period for phase 2 is from 2019 to 2020.
- Phase 3: The scope of the programme will be expanded to cover the commercial buildings. Implementation period for phase 3 is from 2021 to 2025.



Task force

Name	Affiliation	Position
Dato’ Omairi Hashim	PUTRAJAYA CORPORATION	Vice President (City Planning Department)
Azhar Othman	PUTRAJAYA CORPORATION	Principal Assistant Director (Putrajaya Green City Section)
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Yuzuru MATSUOKA	KYOTO UNIVERSITY	Professor
Junichi FUJINO	NATIONAL INSTITUTE FOR ENVIRONMENTAL STUDIES	Senior Researcher
Yuko NISHIDA	TOKYO METROPOLITAN GOVERNMENT	Planner
Kazutaka OKA	MIZUHO INFORMATION AND RESEARCH INSTITUTE	Chief Consultant
Kazuya FUJIWARA	MIZUHO INFORMATION AND RESEARCH INSTITUTE	Chief Consultant
Aya NAITO	MIZUHO INFORMATION AND RESEARCH INSTITUTE	Consultant

This activity is sponsored by Ministry of the Environment, Japan (MoEJ)



INVENTORY OF PUTRAJAYA GREENHOUSE GAS EMISSIONS 2014

Putrajaya Corporation has been preparing annual inventories on greenhouse gas emissions since 2012. As per previous years, the greenhouse gas emissions for Putrajaya for year 2014 were calculated based on seven sectors namely:

- i. Government buildings
- ii. Commercial buildings
- iii. Public amenities and facilities
- iv. Residential
- v. Passenger transport
- vi. Freight transport and
- vii. Solid waste

The overall GHG emissions for year 2014 have increased 17 per cent to 1,542ktCO₂eq as compared to 1,316ktCO₂eq for year 2013. This is mainly due to factors such as the increase in the completed building floor space and the number of population as well as the number of workers in the city. Emissions per capita were 16.3tCO₂eq compared to year 2013 at 13.2tCO₂eq and year 2012 at 12.1tCO₂eq.

Figure 1 summarises the GHG emissions level for 2012, 2013 and 2014 as compared to the base year 2007 and the target year 2025.

The inventory results indicated that the highest GHG emissions is still predominantly from the building sector at 67% (1,038 ktCO₂eq), followed by the transportation sector at 28% (432ktCO₂eq) and solid waste at 5% (72ktCO₂eq).

The highest source of GHG emissions is from the use of electricity at 57% (881 ktCO₂eq) followed by petroleum at 24% (366ktCO₂eq) and natural gas at 14% (218ktCO₂eq) indicating that the citywide energy usage are still very much dependent on non-renewable energy sources. The same situation can be observed since 2012 and this is closely related to the development of government office complexes, commercial premises as well as residential buildings in 2014.

Sector	2013	2014	2025BaU	2025CM
Residential	79	98	266	150
Government building	600	626	363	139
Commercial	240	277	1435	769
Public amenities & facilities	34	38	240	112
Passenger transport	305	426	1314	368
Freight transport	7	7	156	89
Waste	51	72	414	189
Total Emissions	1,316	1,542	4,186	1,815
carbon sink				35
Net emissions	1,316	1,542	4,186	1,780

Table 1: Comparison of GHG Emissions by Seven Sectors

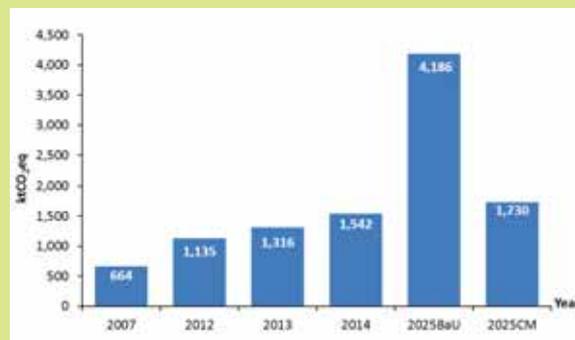


Figure 1: GHG Emissions Comparison

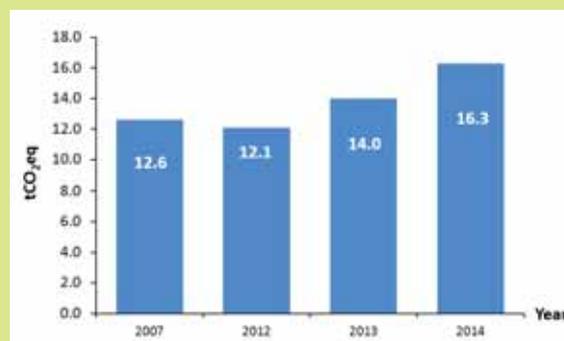


Figure 2: GHG Emissions per Capita

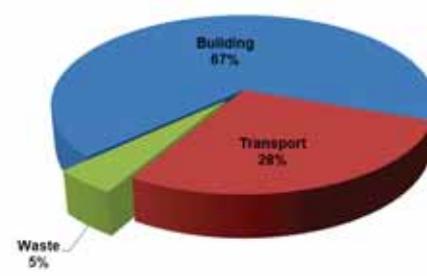


Figure 3: GHG Emissions based on 3 main scopes

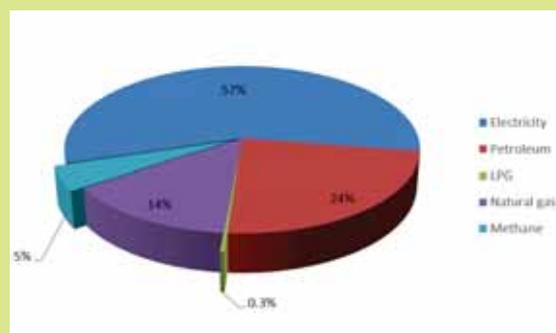


Figure 4: GHG emissions by source

Carbon Emissions from Building Sector

The building sector still remains the highest in terms of energy consumption. The distribution of floor area by building types are as follows; 45.0% residential floor space, 33.6% for government office building space, 8.8% for commercial space and 12.6% for public amenities and facilities

A total of 60% of emissions in the building sector is contributed mainly by operations in government office buildings followed by operations in commercial buildings at 27%.

Carbon Emissions from Transportation Sector

The second highest in terms of carbon emissions is from the transportation sector with 98% coming from the passenger transport. Despite this, there has been a decrease in terms of trip generation indicated by the decrease in in-coming and out-going persons between 2013 and 2014.

Carbon Emissions from Solid Waste Sector

In the waste sector, the inventory result for 2014 indicate an increase in GHG emissions at 72 ktCO₂e_q as compared to 2013 at 51ktCO₂e_q.

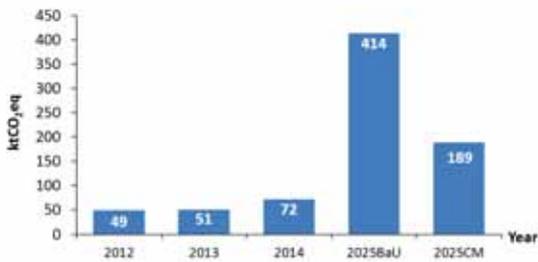


Figure 10: GHG Emissions Comparisons for Waste Sector

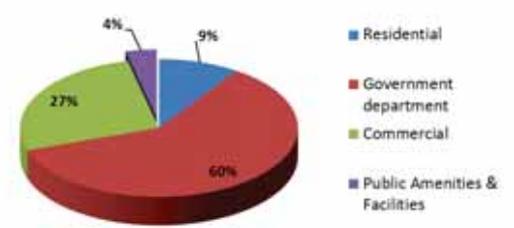


Figure 5: Carbon Emissions from building sector

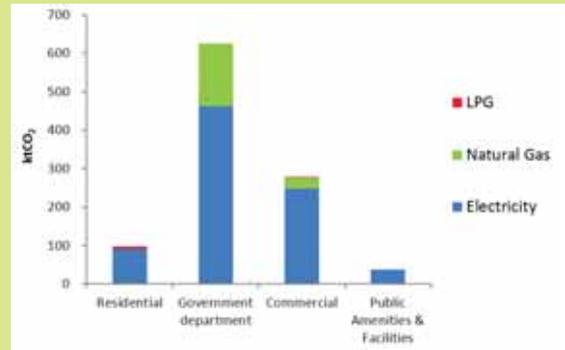


Figure 6: Building Sector Carbon Emissions by source

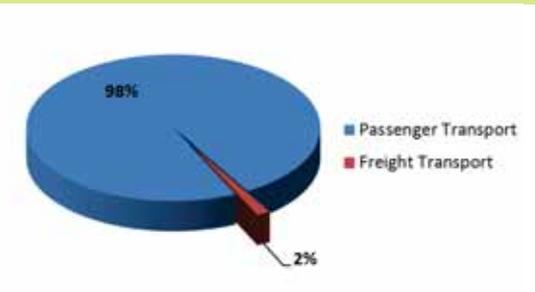


Figure 7: Carbon Emissions from Transportation Sector

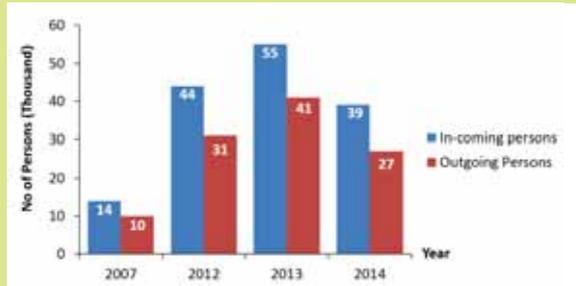


Figure 8: Incoming & Outgoing Persons Comparison

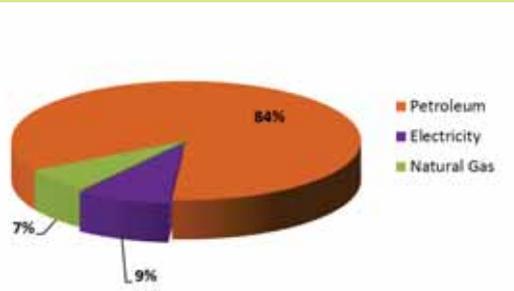
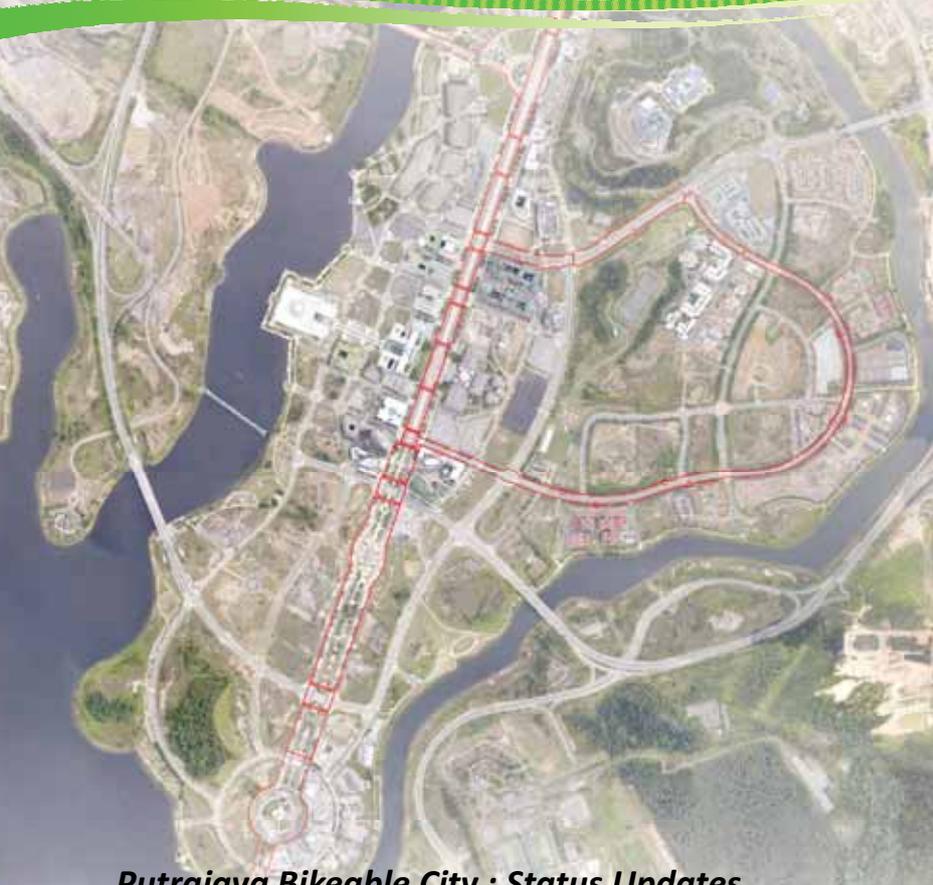


Figure 9: Carbon Emissions from Transportation Sector by Source

UPDATES ON PUTRAJAYA'S INITIATIVES ON TRANSPORTATION AND MOBILITY



Will activities that encourage leisure cycling naturally lead to an increase in commuter cycling?

It is clear that leisure/recreational cycling is, for many, a valid entry point into cycling and initiatives to encourage cycling for leisure, health and fitness should result in longer term increases in utility and commuter cycling. Participation in leisure cycling allows inexperienced cyclists to overcome some of the practical and emotional barriers to cycling (e.g. confidence, fear of traffic, ability) and is therefore an effective means of encouraging non- and infrequent cyclists, particularly those who are not in the 'near market' demographic group, to prepare themselves for cycle commuting.

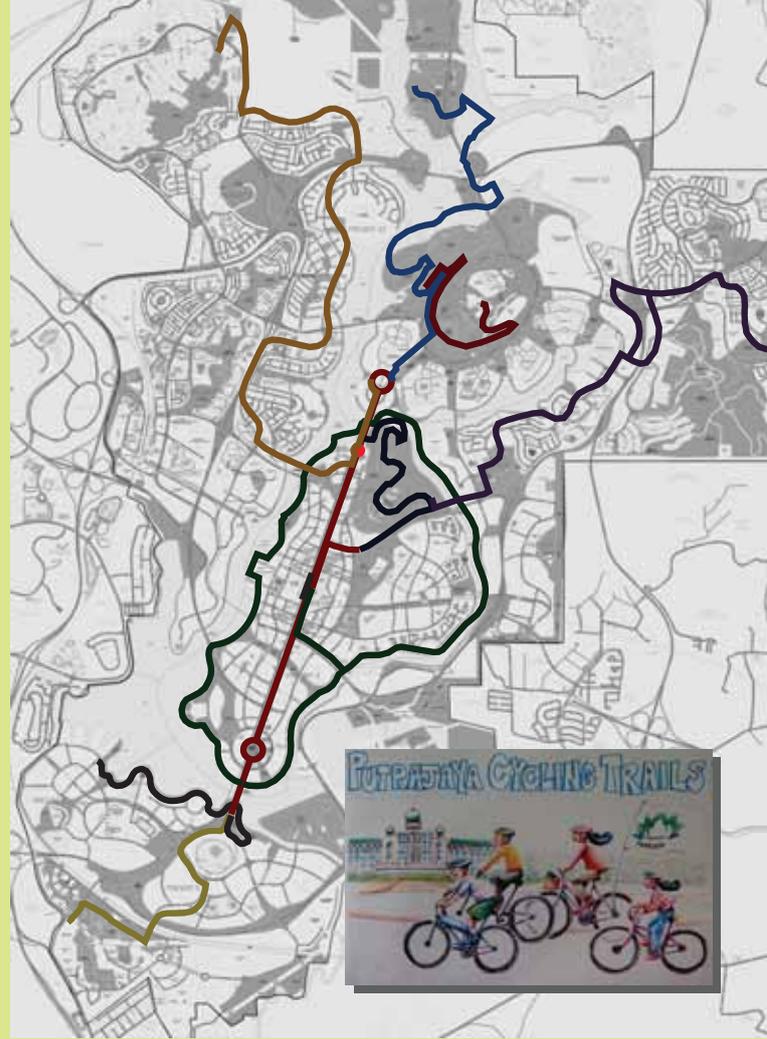
*Source:
Exploring the relationship between leisure and commuter cycling
Policy Analysis Research Summary, October 2011, Transport for London*

Putrajaya Bikeable City : Status Updates

The upgrading of cycling and walking infrastructure in Putrajaya.

The first phase of the programme involves 24km of existing cycleways and walkways in Precinct 1, 2, 3 and 4 of the city centre and part of the residential precincts 8, 9 and 18. The upgrading works is anticipated to be completed by end of 2015 and operational in early 2016. This programme will be extended in phases to cover the main routes linking the residential precincts to the city centre and along the promenade of Putrajaya lake.





Promotion of Putrajaya Cycling Trails

As part of the Putrajaya Bikeable City initiative and to promote cycling as leisure/recreational activity within the city, nine cycling trails has been identified and published in a map. These are categorized by their difficulty levels; easy trails, moderate trails and challenging trails.

Through this promotion activity, PJC hope that cycling for leisure, health and fitness will be encouraged further and ultimately will result in a take up in utility and commuter cycling in the long term.

The Easy Trails

Sisiran Tasik Trail : 12.1 km along the promenade area of Putrajaya Lake.

Perdana Trail : 5 km trail along the Persiaran Perdana, the main boulevard in the city centre.

Marina Trail : 2.7 km trail along the southern promenade area of Putrajaya lake

The Moderate Trails

Saujana Hijau Trail: 7.2km trail linking the city centre to the residential precincts 8, 10 and 11 ending at the Saujana Hijau metropolitan park in Precinct 11

Wetland Trail : 4km trail linking the city centre and the Putrajaya Botanical Park and the Wetland Metropolitan park in the north of the city.

Putra Perdana Trail : 800m trail in the Putra Perdana Metropolitan Park

The Challenging Trails

Rimba Alam Trail : 5km trail linking the Wawasan Metropolitan Parks in the city centre through the residential precinct 16 up to the Rimba Alam Metropolitan Park of Precinct 15 in the northeast of the city

Cabaran Trail : 2.7 km trail linking the southern part of the city and the Putrajaya Challenge Park.

Wawasan Trail : 3.6 km trail winding through the Wawasan Metropolitan Park in Precinct 2



International Demonstration Project for EV Buses with super quick charging system in Putrajaya

In line with the Malaysian Government aspiration for Putrajaya to transform into a green technology city, PJC has formulated PGC2025 in which the “Low Carbon Transportation” initiative has been identified for implementation as an effort to reduce the city's carbon emissions by 2025, particularly from the transportation sector. One of the programme identified is to encourage the use of hybrid and electric vehicles by the government.

The Government's Economic Transformation Programme (ETP) under the National Key Economic Area (NKEA) Electrical & Electronics – Entry Point Projects (EPP) 18: Enabling Electric Vehicle Component Manufacturing, particularly EPP 18.1: Public Transportation has the target of introducing 2000 EV buses by 2020. By implementing this demonstration project in Putrajaya, Malaysia is one step closer towards achieving this aim.

Since year 2000, Putrajaya Corporation (PJC) has operated its own public bus services for the city and its vicinity. The public bus service is operated by Perbadanan Putrajaya's subsidiary company, Pengangkutan Awam Putrajaya Sdn. Bhd. using 171 environmental friendly NGV buses and 4 Diesel buses. The service operates along 48 routes within the city and its vicinity.



Existing NGV bus fleet operating along the intra-city bus route in Putrajaya

The number of passengers has been increasing steadily. In 2014, the intra city bus service records 5.2 million passengers.

The proposal for the implementation of the demonstration project was initiated by the New Energy and Industrial Technology Development Organization (NEDO) of Japan and a Consortium of Japanese Companies namely, Toshiba Corporation, PUES Corporation, Hasetec Corporation and Oriental Consultants Global Co. Ltd. as early as April 2014. In May 2014, PJC issued a letter of intent agreeing to cooperate in the project.

As an agency under the Ministry of Federal Territories, PJC has sought advice from the ministry before proceeding further. The ministry has brought the matter up to the attention of the cabinet of the government of Malaysia for decision and approval. The cabinet has given the approval on 18 June 2015 for a Memorandum of Understanding (MOU) to be signed between PJC and NEDO.



On the 1st of July 2015, the MOU and a subsequent document, “Specific Arrangements (SA) to the MOU” were signed between Perbadanan and NEDO. These were followed by signing of the Implementation Document between Japanese Consortium namely Toshiba Corporation, PUES Corporation, Hasetec Corporation and Oriental Consultants Global Co. Ltd and PAPSB on the 28 July 2015.

To implement the project, a steering committee was established on 6 November 2015, with the main aim to oversee the implementation of the demonstration project. The member of the committee is consisted of 2 representatives of PPj, 2 representatives of NEDO and representatives from the Ministry of Federal Territories (KWP), Ministry of Energy, Green Technology and Water (KeTTHA), the Department of Road Transport (JPJ) and the Land Public Transport Commission (SPAD).



MOU signing ceremony at PJC complex

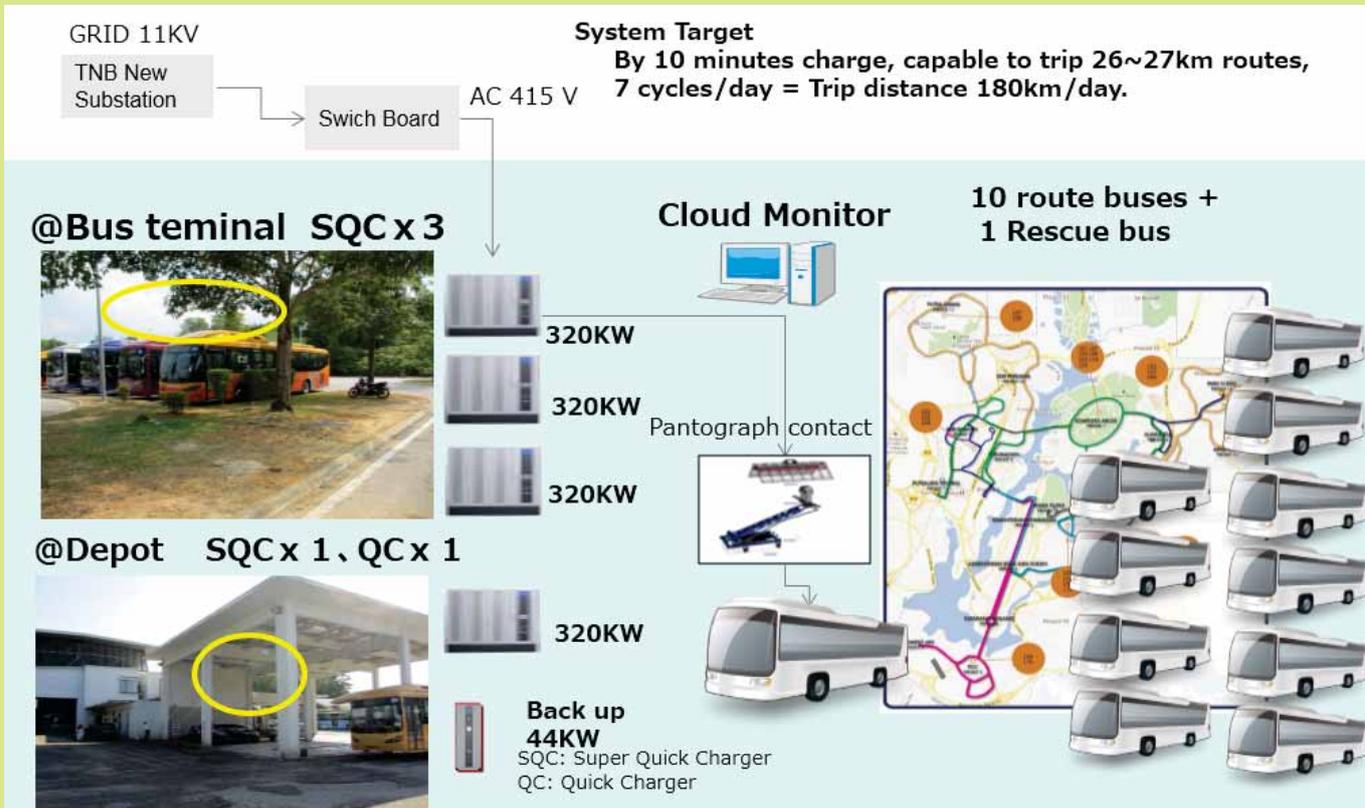


First project steering committee meeting

The project is one of the first implemented in the ASEAN region comprising the demonstration use of EV buses with Super Quick Charging (SQC) Technology. The project is expected to utilise 10 large EV buses operating along the existing 30km bus routes in Putrajaya with 10 minutes charging at the terminal. Its operation is anticipated to begin by the end of 2016 and will involve the collaboration between the Japanese Consortium and local companies to realise the ultimate aim of establishing an ASEAN EV Hub in Malaysia.



Solution for the Demonstration Project for EV Buses with SQC system in Putrajaya



Components of Demonstration Project for EV Buses with SQC system in Putrajaya



SQC charging facilities at the bus terminal



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