Malaysian
>>> Low Carbon Societies
The way forward

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UTM — UNIVERSITI TEKNOLOGI MALAYSIA

SATREPS — Science and Technology Research Partnership for Sustainable Development Program

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Structure of Discussion

1 Introduction

2 Sustainable Development in Malaysia

3 Planning Low Carbon Nation, Region and city

4 Case Study: NC2 Malaysia 2030, Sustainable Iskandar Malaysia 2025 and Cyberjaya Digital Green city,   Putrajaya Green City.
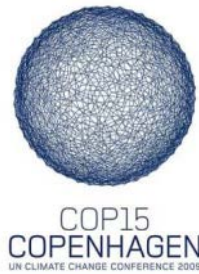
5 Conclusion

Sustainable Development -Integrating 3 main elements

Economic Development

Environmental Protection

Community & Social Development

Environmental Protection
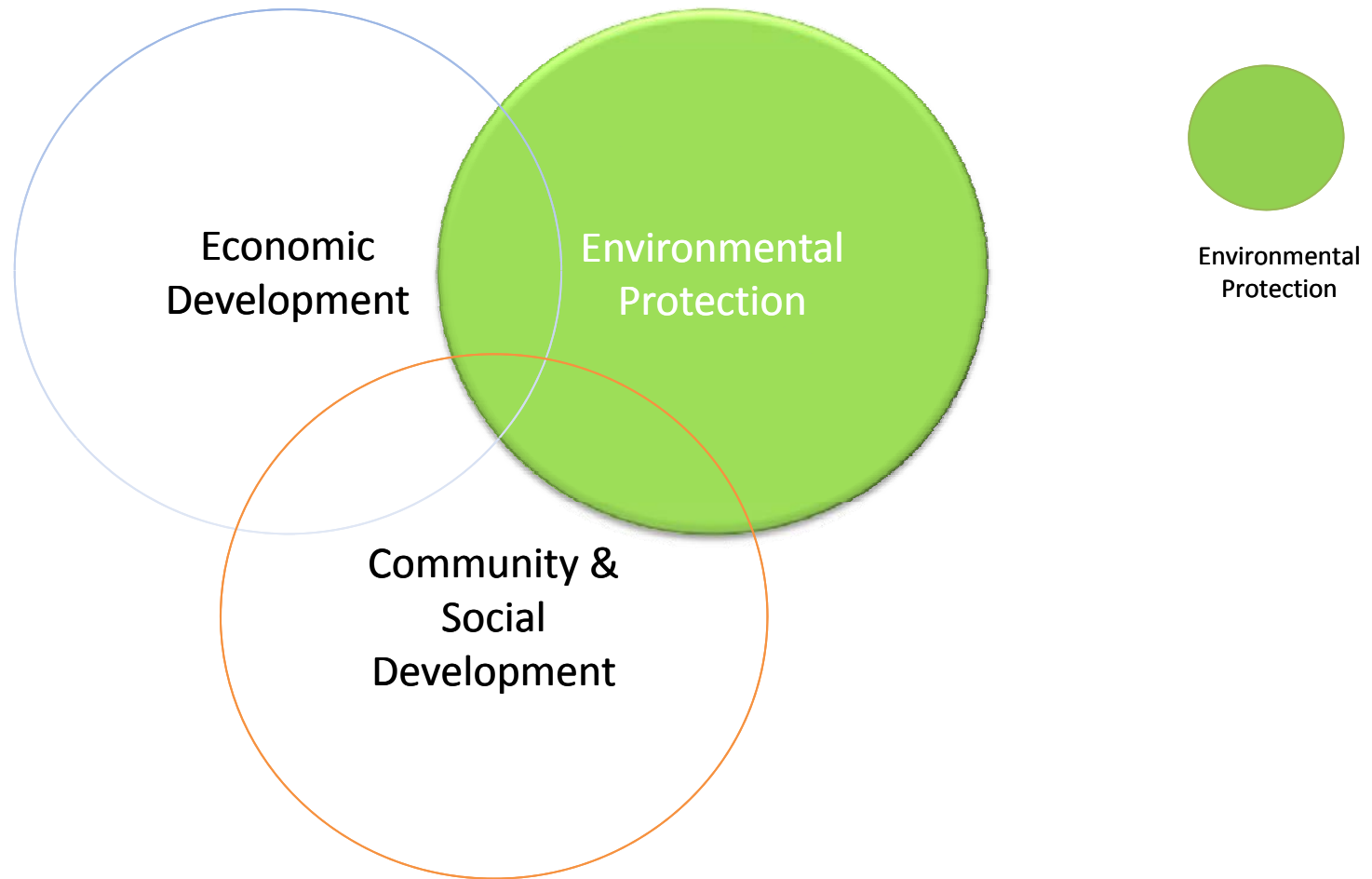
SUSTAINABLE DEVELOPMENT WITHIN THE FRAMEWORK OF DEVELOPMENT

1 Introduction

Importance of Low Carbon Society scenario

Malaysia Commitment

Speech by YAB Datuk Seri Najib Tun Razak, Prime Minister
"… Malaysia is proposed a voluntary reduction up to 40% in terms of emission intensity of GDP by the year 2020 compared to 2005 levels."
17th December 2009

Global Citizens + Responsibilities
For the Earth, for our future generation

Green as New Consumer Culture, New Market, New Growth

Money Saving
Energy conservation and renewable energy

2. Malaysian Outlook

The CO$_2$ emission per capita and emission **intensity** of selected countries in **2007**

Countries	Emission per capita tones of CO2 per capita	Emission Intensity tones of CO2 per US$1000 of GDP
World	**4.35**	**0.73**
United States	19.1	0.5
Singapore	9.8	0.3
Japan	9.7	0.2
United Kingdom	8.6	0.3
Malaysia	**6.7**	**1.3**
China	4.6	2.5
Thailand	3.5	1.3
Indonesia	1.7	1.6
India	1.2	1.7

The 10th Malaysian Plan (2011-2015) has outlined 2 major National Policies on Environmental Protection and conservation :

National Green Technology Policy
• Emphasizes on Sustainable development, development of roadmaps to guide the application of green technologies & establishment of Green Tech Financing Scheme.

National Climate Change Policy
• Coordinate and streamline policy & legislations, stashed inter-ministrial and cross sectoral committee to facilitate implement and also identify options and strategies to achieve a low carbon economy.

2. Malaysian Outlook

In COP15 (2009), Malaysian Prime Minister ; YAB Dato' Seri Mohd Najib Tun Abdul Razak, has pledged a voluntary 40% reduction of CO_2 emission intensity by 2020.
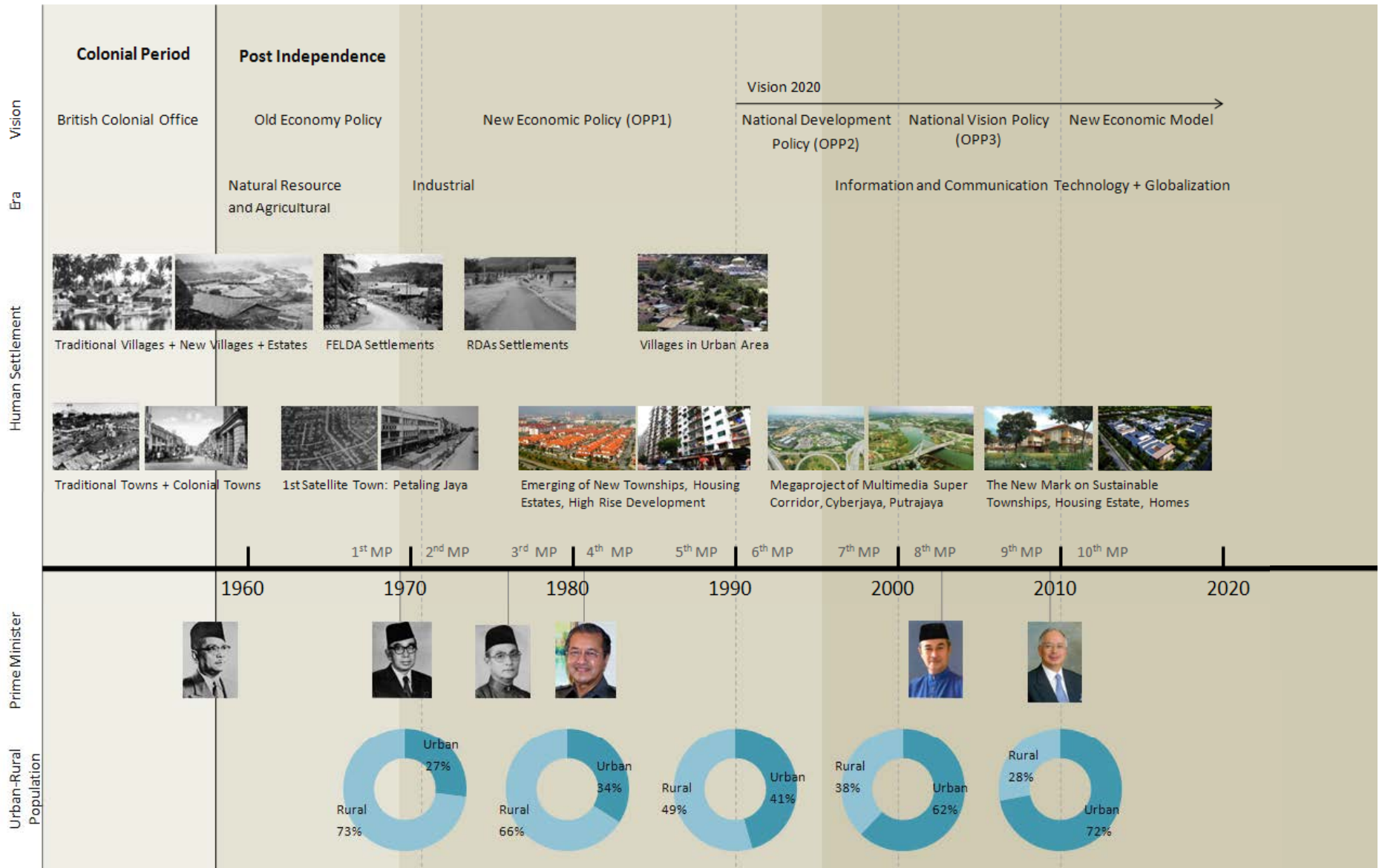
Under the Tenth Malaysia Plan (2011-2015); The Government has intensified effort to reduce emission by climate adaptation and mitigation measures.
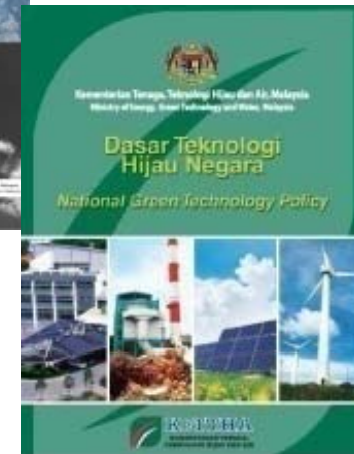
- With this in Focus, We look towards lowering the CO_2 emission intensity in Iskandar Malaysia by 50% by 2025.

- The Tools; (ExSS & Backcasting Model) play an important role in getting the numbers (Facts and Figures) to support in the decision making process when the Local Authorities and Iskandar Regional Development Authority design the Policies & Guidelines towards a Low Carbon Scenario.

2 Sustainable Development
Moving Towards Sustainable Human Settlement

2 Sustainable Development
Low Carbon Frameworks

Frameworks

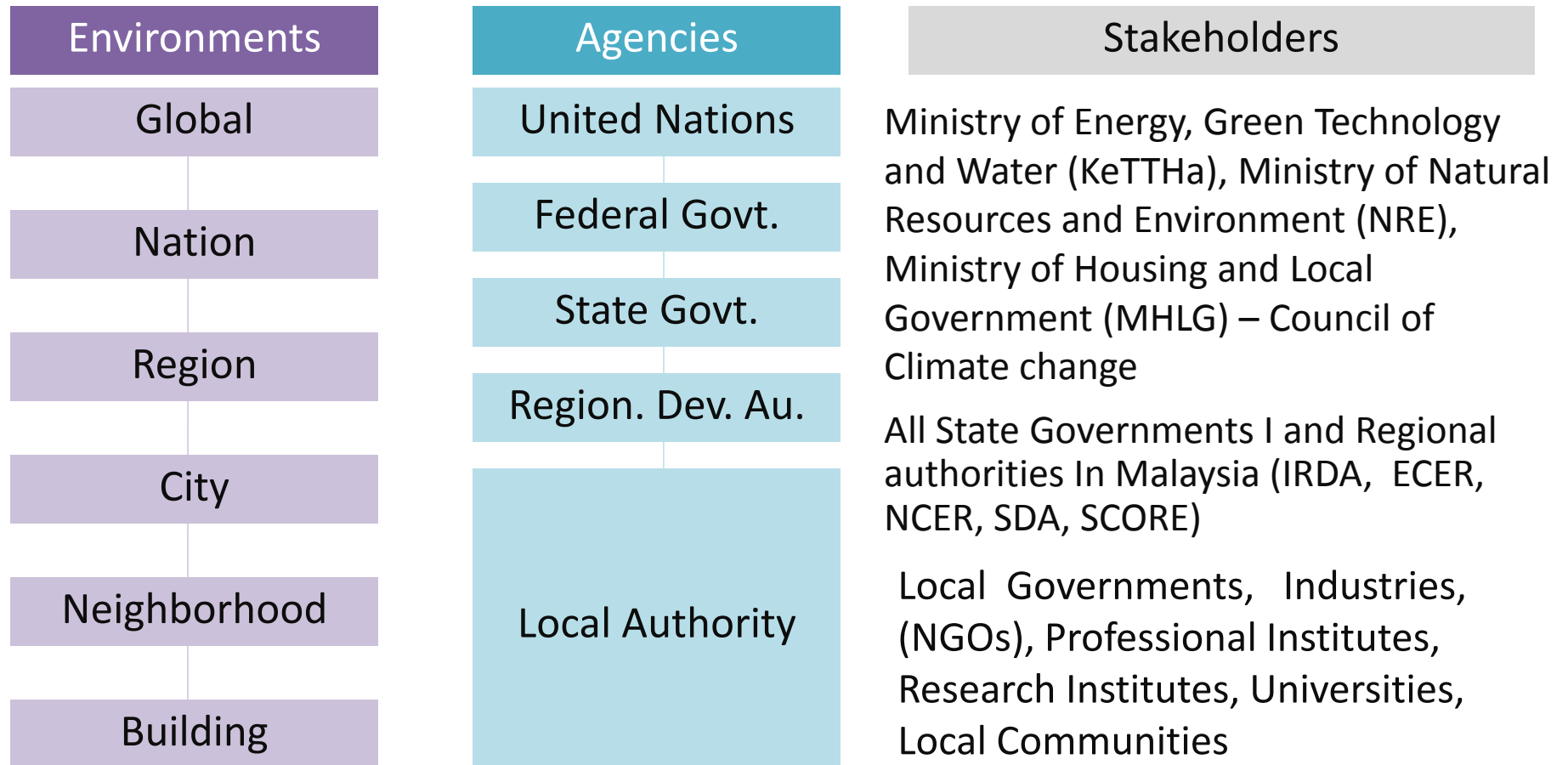| Agencies	Environments	
United Nations	Global	United Nations Climate Change Conference (COP 15), Malaysia committed to reduce 40% carbon emission intensity
Federal Govt.	Nation	Malaysia Plan, Economic Transformation Program, National Policy on Climate Change, National Green Technology Policy, National Policy on the Environment , NPP NUP etc
State Govt.	Region	State Structure Plan, Regional Plan, Economic Region Master Plan
Region. Dev. Au.		Local Plan, Low Carbon Cities Framework and Assessment System
	City	GBI Township Tool
Local Authority	Neighborhood	Green Neighbourhood Planning Guideline
	Building	Green Building Index, Energy Efficiency in Building Guidelines, Design Strategies for Energy Efficiency in New Buildings (Non-Domestic), Malaysia Industrial Energy Audit Guidelines, Energy Efficiency and Conservation Guidelines for Malaysian Industries

(Source: Carbon Dioxide Information A

2 The Rise of Sustainable Development

Low Carbon Frameworks

United Nations Environment Programme (UNEP

Environments	Agencies	Stakeholders
Global	United Nations	Ministry of Energy, Green Technology and Water (KeTTHa), Ministry of Natural Resources and Environment (NRE), Ministry of Housing and Local Government (MHLG) – Council of Climate change
Nation	Federal Govt.	
Region	State Govt.	
City	Region. Dev. Au.	All State Governments I and Regional authorities In Malaysia (IRDA, ECER, NCER, SDA, SCORE)
Neighborhood	Local Authority	Local Governments, Industries, (NGOs), Professional Institutes, Research Institutes, Universities, Local Communities
Building		

(Adapted from: Steve Anthony Lojuntin, Malaysian Institute of Planners)

3 Establishing Low Carbon Society Scenario
On Going Low Carbon Society Research Project at Asia
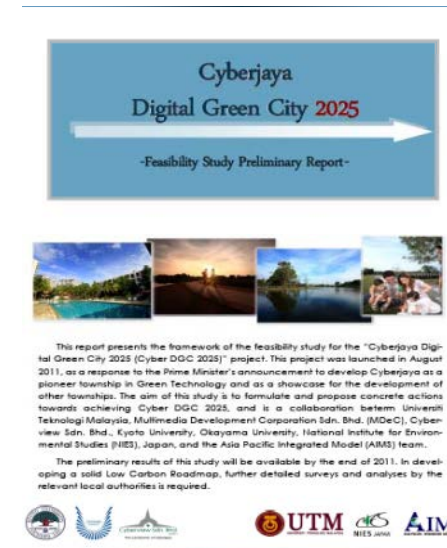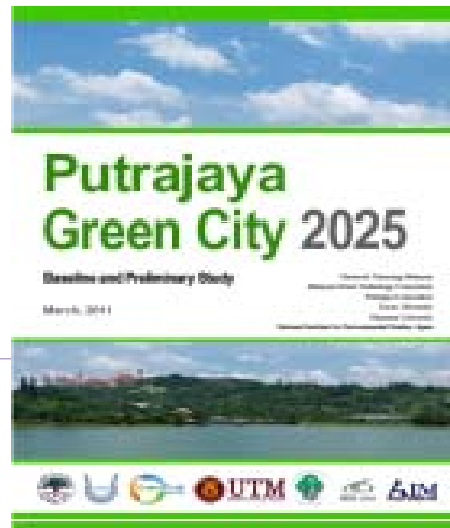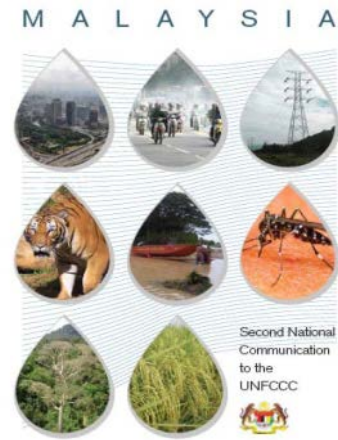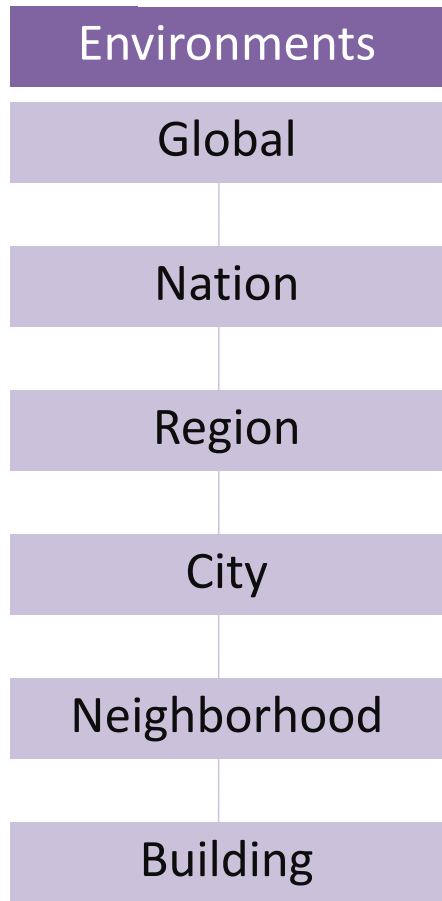

City and Region

National

(Source: National Institute of Environment Studies, Japan)

3 Establishing Low Carbon Society Scenario

Low Carbon Society: Policies + Strategies + Actions
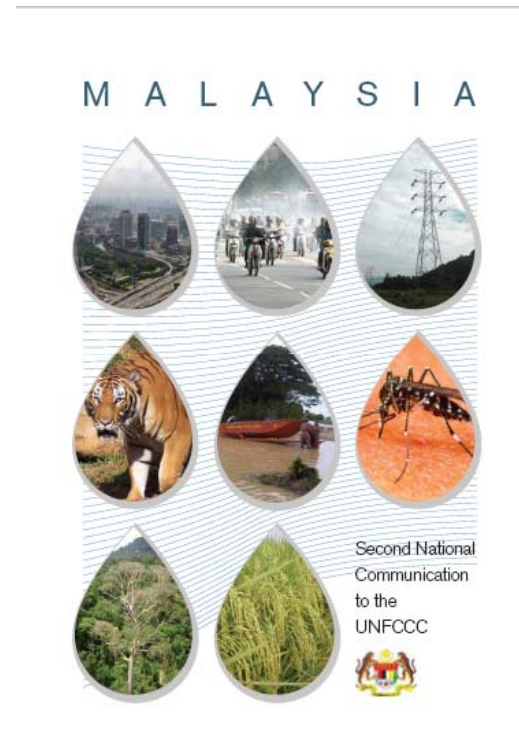
Low Carbon Society Research

Environments
Global
Nation
Region
City
Neighborhood
Building

3 Establishing Low Carbon Society Scenario
Transition to Low Carbon Society

MALAYSIA

Second National
Communication
to the
UNFCCC
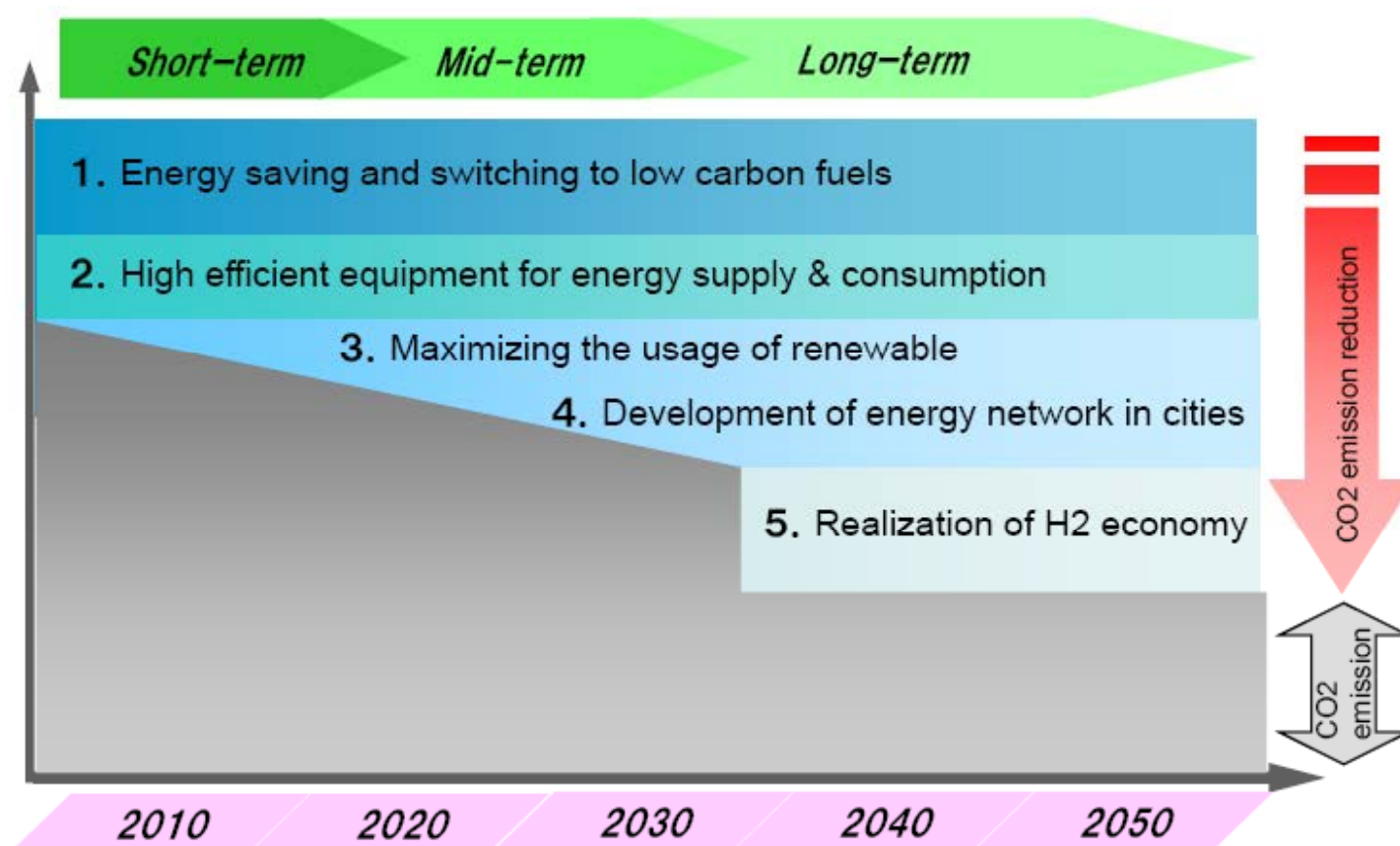
THE CASE OF MALAYSIA
- NC2 DATA-   INTEGRATION WITH AFOLU

Developing Malaysia LCS vision in 2020 and 2030 by Extended Snapshot Tool and AIM/AFOLU model

16th Jan. 2012

Unversiti Teknologi Malaysia
Ho Chin Siong

Kyoto University, Japan
Yuzuru MATSUOKA
Kei GOMI
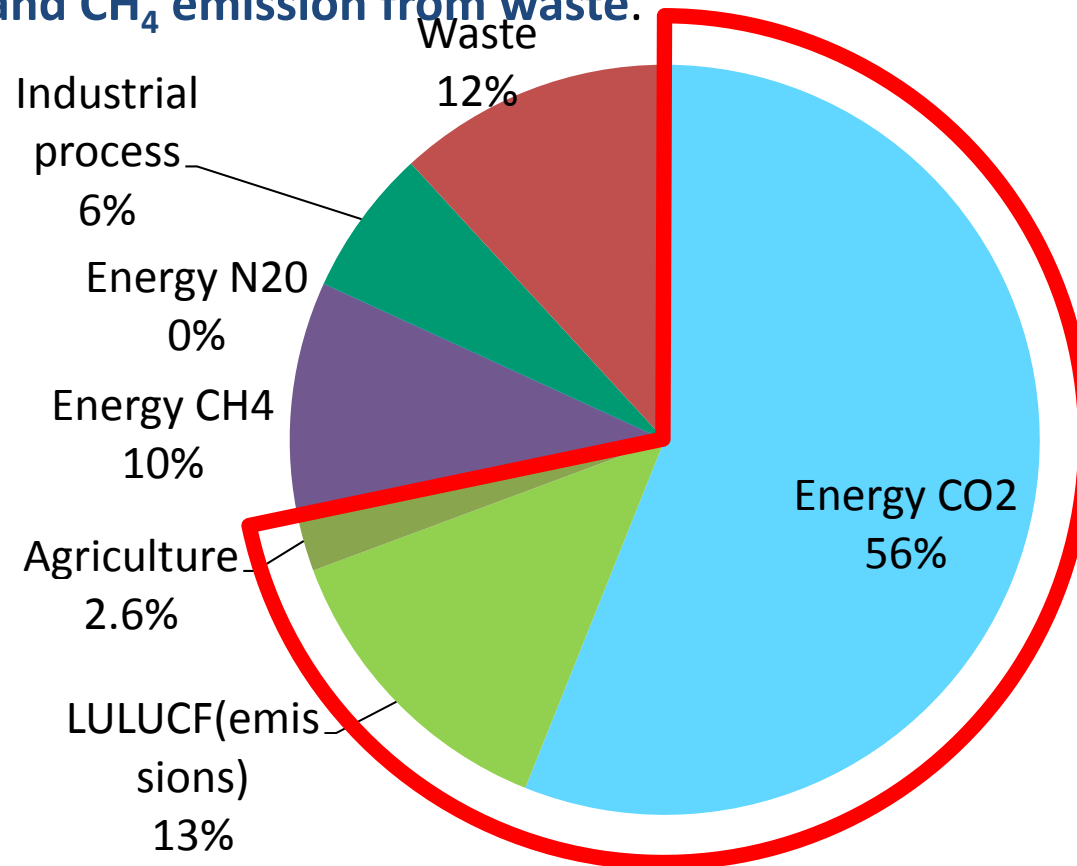Phubalan Karunakaran
Janice Simson
Yuri HAYASHI

National Institute for Environmental Studies, Japan
Mikiko KAINUMA
Junichi FUJINO
Maiko SUDA
Genku KAYO
Shuichi ASHINA
Tomoko HASEGAWA

Approach/Methodology

- Main Findings are based on **quantitative estimation tools - Extended Snapshot Tool (ExSS) and AFOLU model.**

- Major assumption and data are based on **Malaysia Second National Communication (NC2) 2011** submitted to the UNFCCC

- Research Findings adopted **Low-carbon society (LCS) scenario in 2020** and supported with **more quantitative socio-economic scenarios and mitigation option details**.

Target gas: Energy CO_2 and AFOLU

- Among GHGs, this preliminary study **targets only CO_2** from energy use because of time restriction.

- The scope will be extend to other gases, such as **CO_2 emission and sink of LULUCF and CH_4 emission from waste**.

Waste
12%

Industrial
process
6%

Energy N20
0%

Energy CH4
10%

Agriculture
2.6%

Energy CO2
56%

LULUCF(emis
sions)
13%

Covers **72%** of total emissions in 2000

GHG Emission
Composition in
2000
(Source：NC2)

Results of main variables

|	2005	2020	2030	2020 /2005	2030 /2005	
Population	26.1	32.8	37.3	1.3	1.4	Million
Household	5.8	8.2	9.3	1.4	1.6	Million
GDP	509	996	1,601	2.0	3.1	Bill. RM
Per capita GDP	19.5	30.4	43.0	1.6	2.2	1000.RM
Gross output	1,604	3,135	4,929	2.0	3.1	Bill. RM
Primary	55	84	97	1.5	1.8	
Secondary	920	1,507	2,175	1.6	2.4	
Tertiary	629	1,544	2,657	2.5	4.2	
Passenger transport	169	315	359	1.9	2.1	Bill. pass-km
Freight transport	92	150	214	1.6	2.3	Bill. t-km

Projected output by 26 sectors
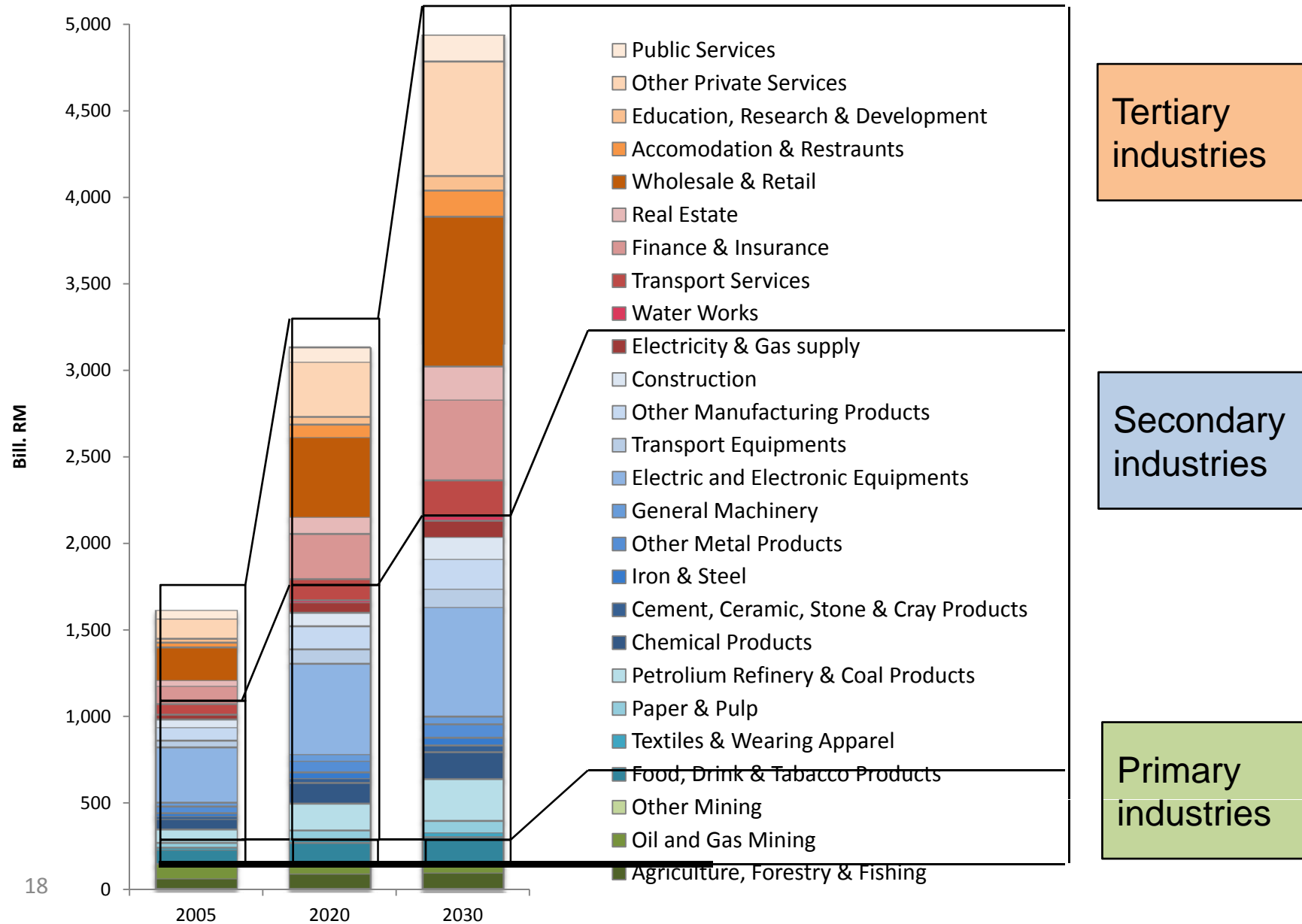
Projected final energy demand by sectors

- Share of each sector is fit to NC2 in 2020BaU scenario
- The largest energy consumer is industry sector
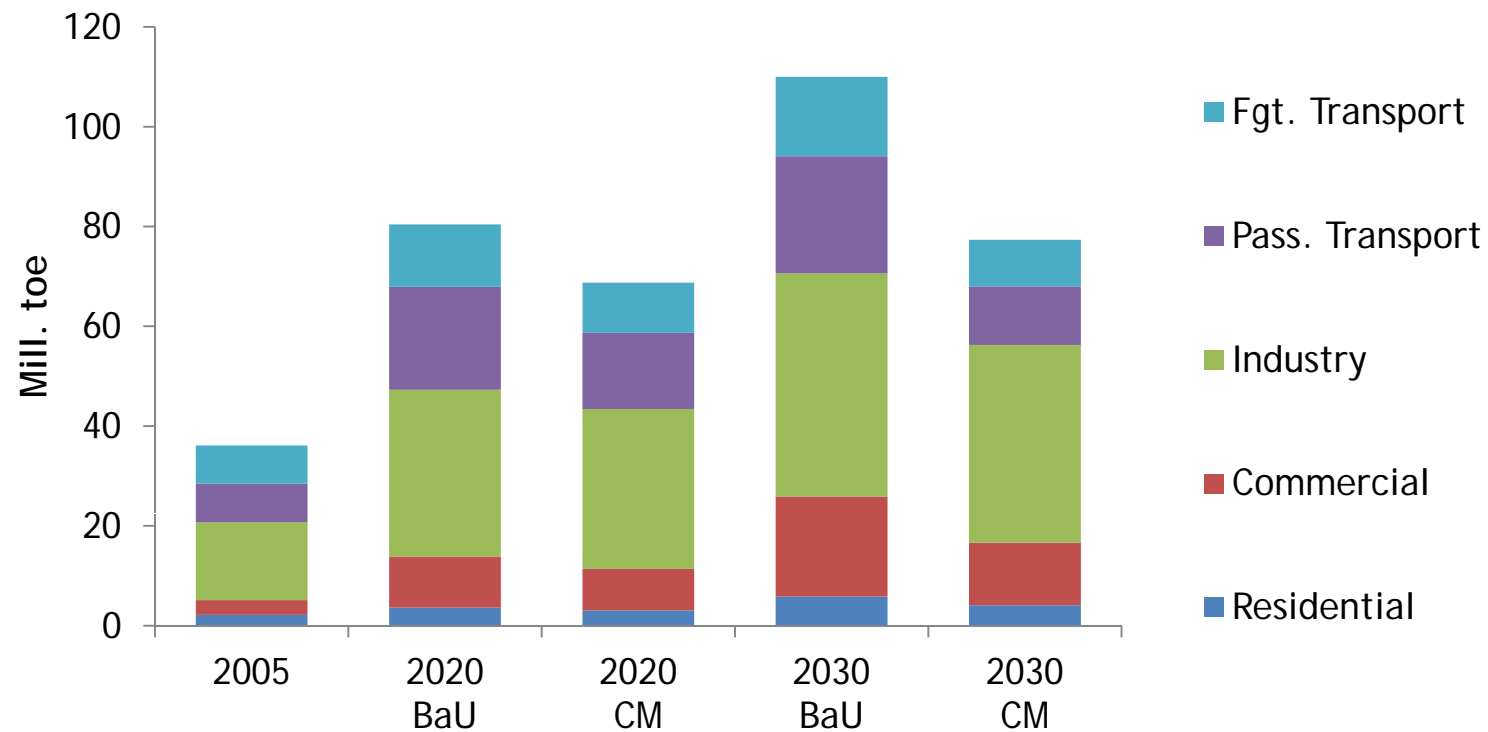
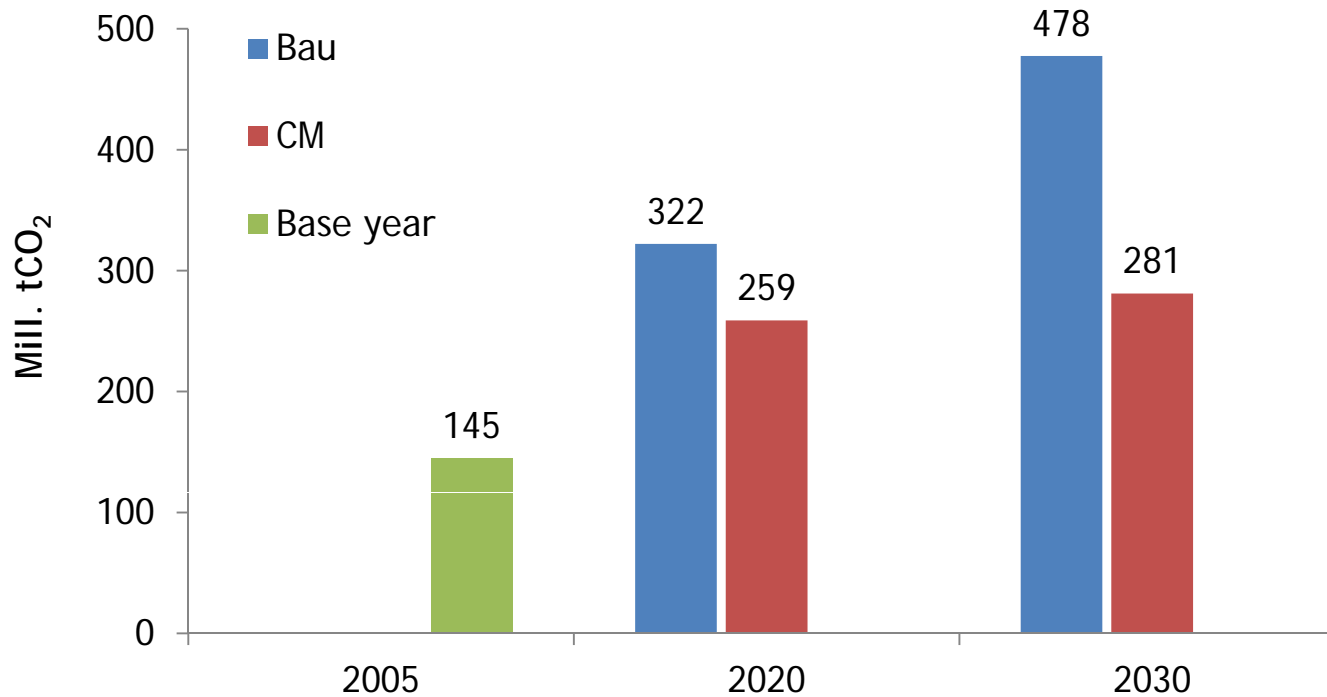# Projected primary energy supply

- In 2030BaU, total **primary energy supply** increased more than **3 times of 2005**

- **Oil increases** its share in future mainly due to increase **of fuel use by transport sectors**
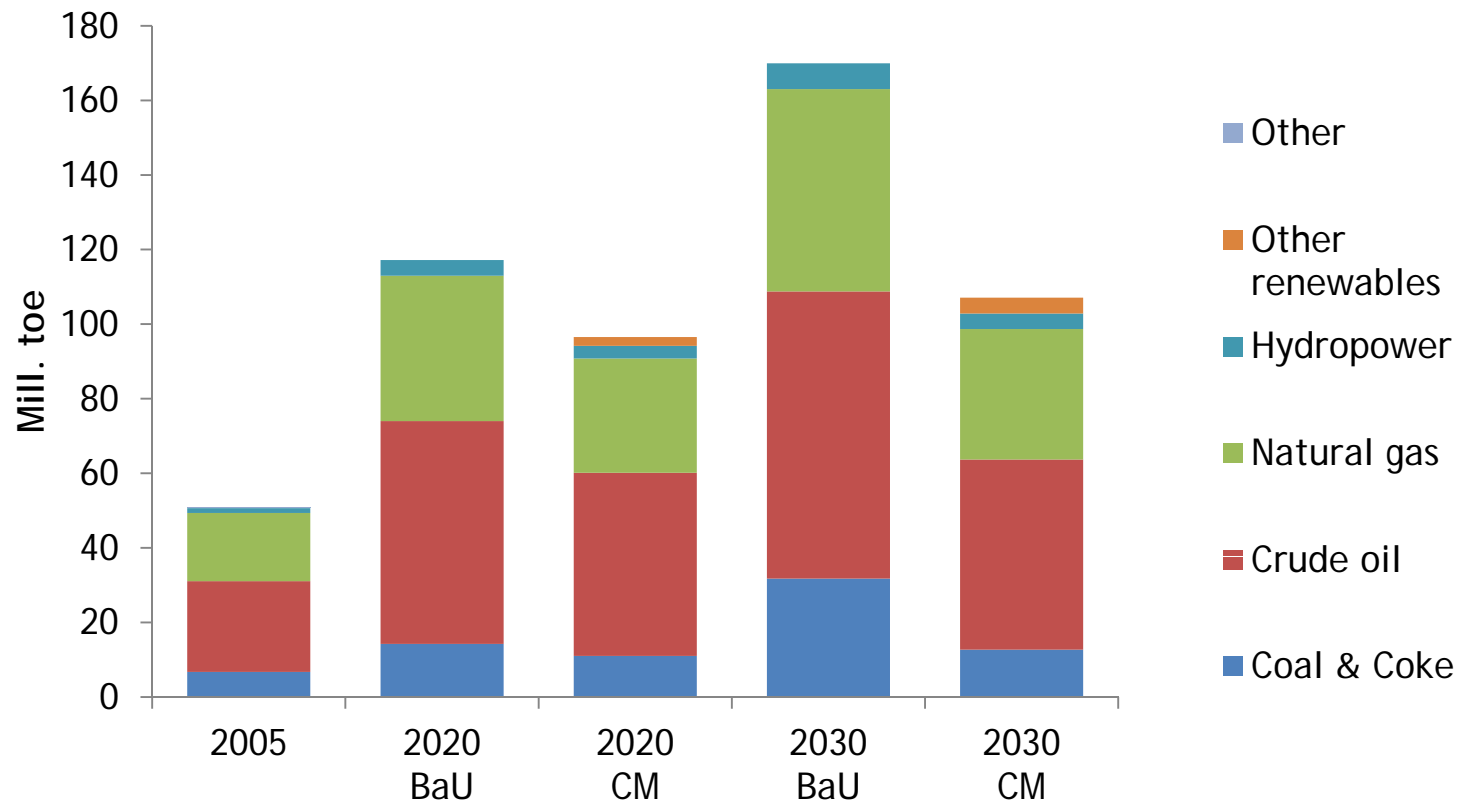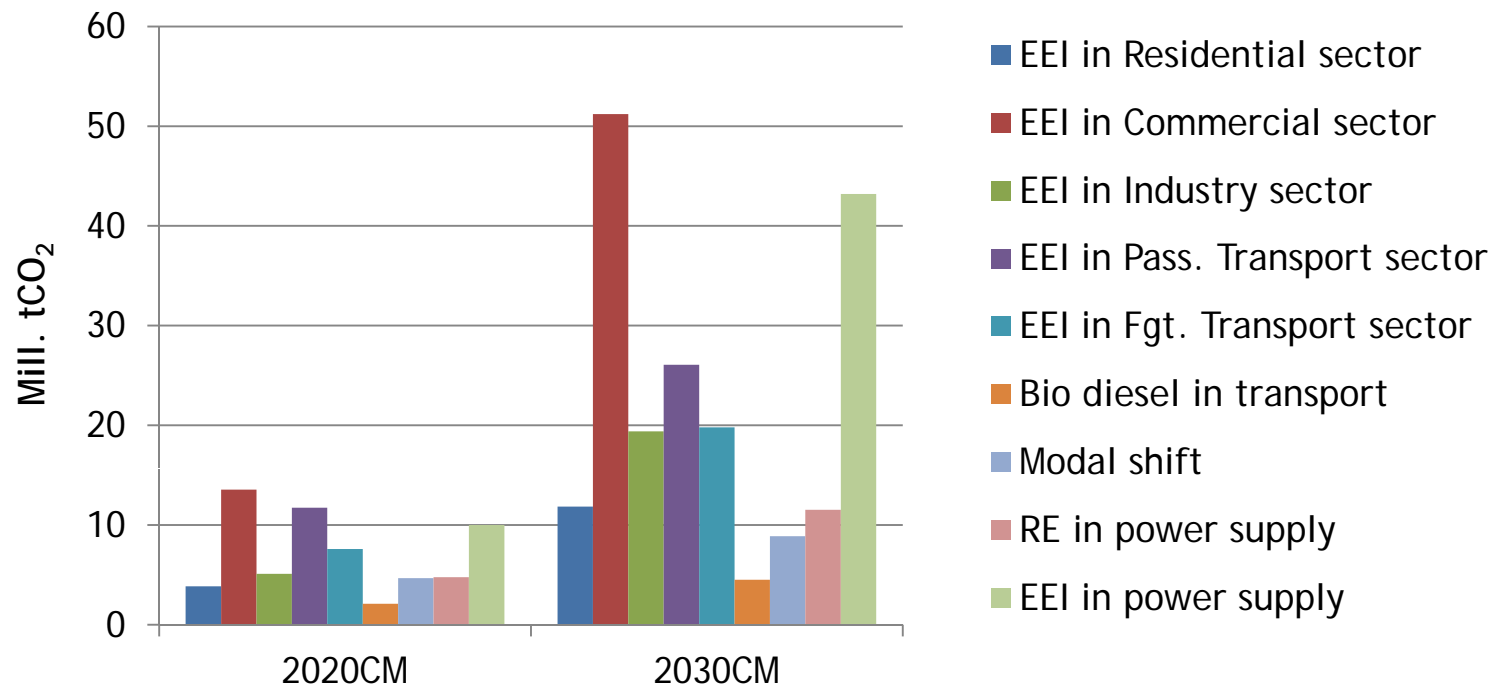
Projected CO_2 emissions

- In 2020BaU, CO_2 emissions doubled from 2005, and tripled in 2030BaU.
- In CM scenarios, they were reduced by 16% and 36% from BaU scenarios.

Contribution of mitigation options

- Both in 2020CM and 2030CM, **energy efficiency improvement** of **commercial sector** has the largest share.

- In 2030CM, **energy efficiency improvement** in **power supply** is second largest.

Emission reduction from BaU scenarios

Legend:
- EEI in Residential sector
- EEI in Commercial sector
- EEI in Industry sector
- EEI in Pass. Transport sector
- EEI in Fgt. Transport sector
- Bio diesel in transport
- Modal shift
- RE in power supply
- EEI in power supply

EEI: energy efficiency improvement
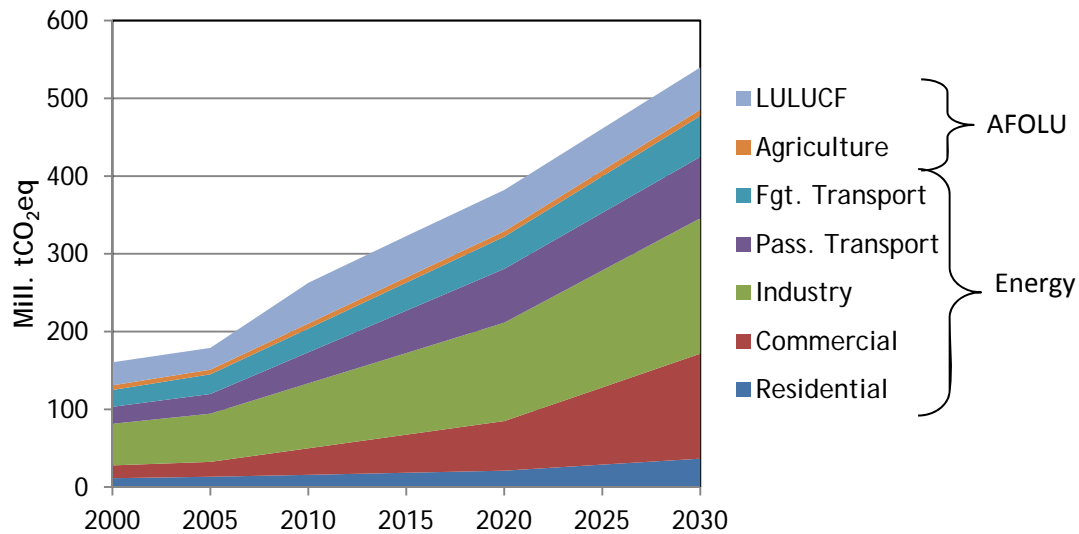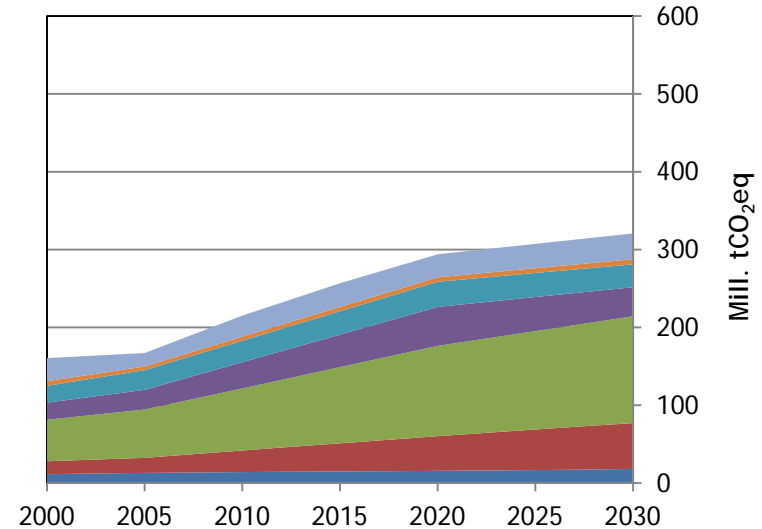
GHG emissions (Energy CO_2 and AFOLU)

- Periods between projected years were interpolated linearly.
- Energy dominates in both scnearios

BaU scenarios

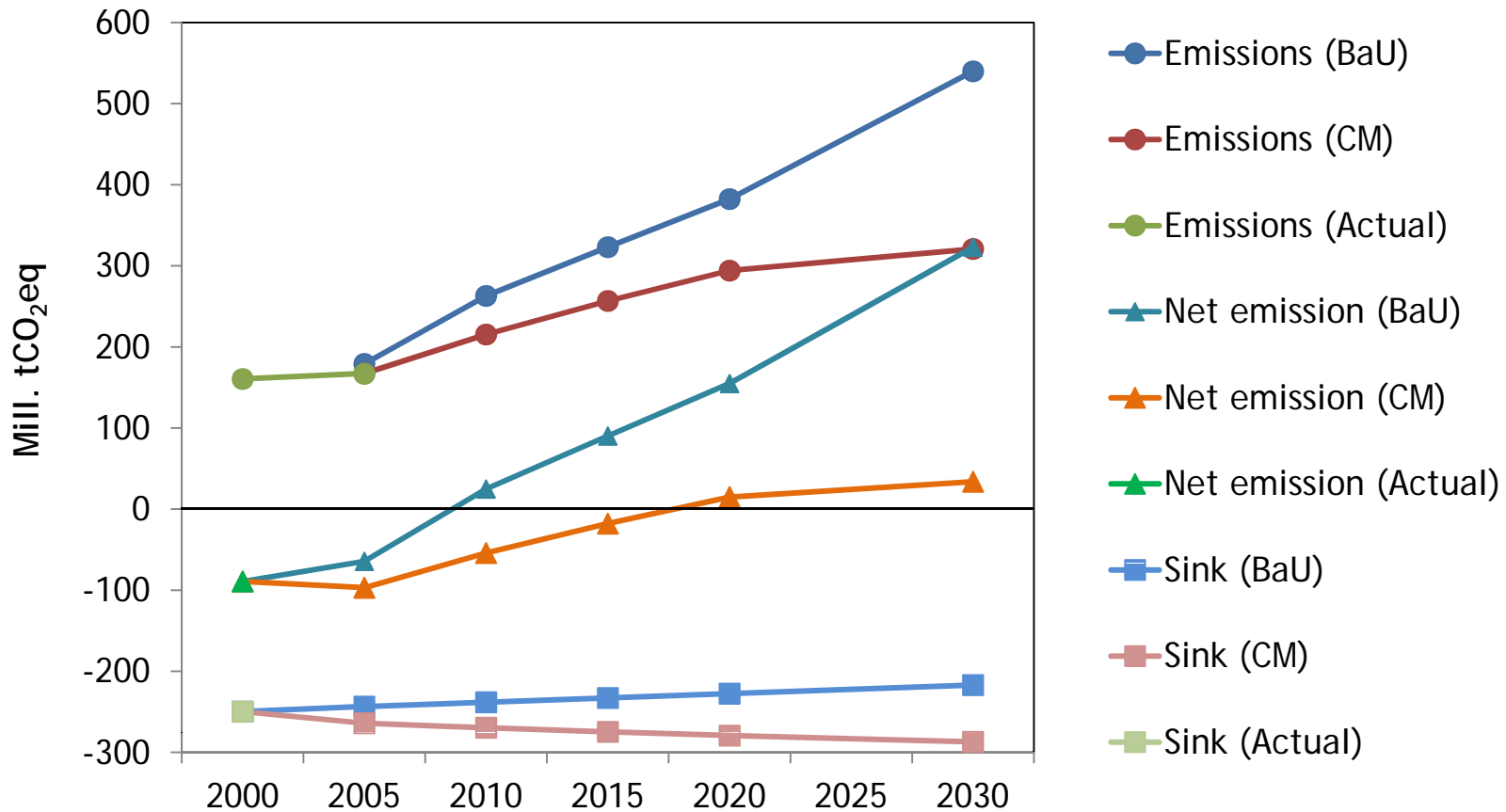## CM scenarios

Emissions, sink, and net emissions

- After 2010, net emission is projected to be positive in BaU scenarios.

Per capita emission and emission intensity

Per capita emission
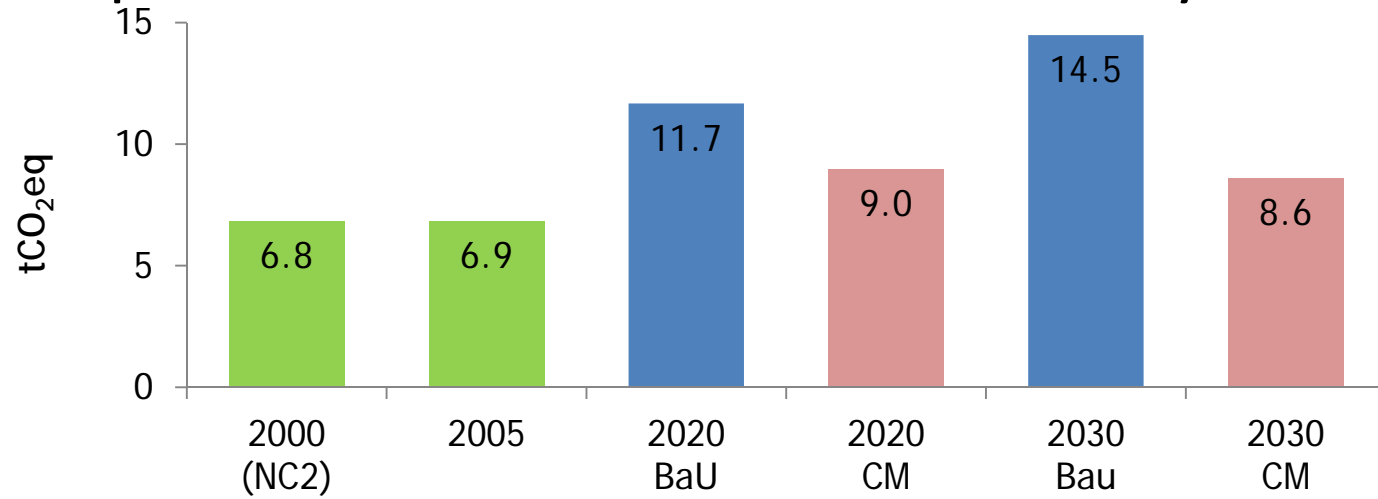
Emission intensity
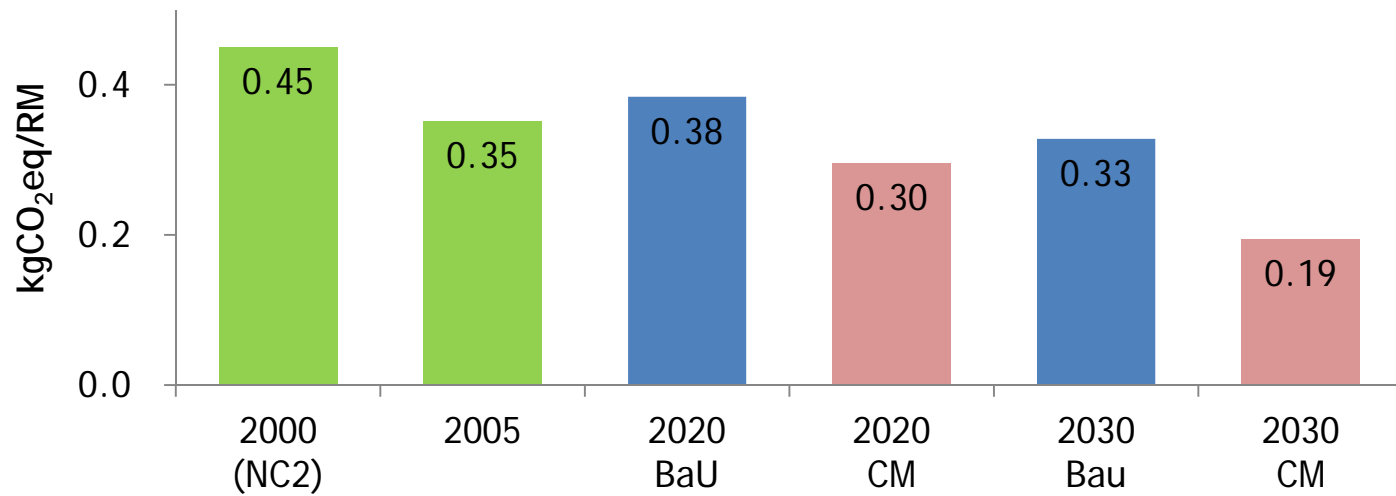
Conclusion

- Using ExSS and AIM/AFOLU model, Malaysia LCS scenarios in 2020 and 2030 were projected.

- Target GHGs are: CO_2 from energy use, CO_2, CH_4 and N2O in AFOLU sectors

- In 2020BaU scenario, GHG emission was **doubled from 2005.**

- In 2020CM scenario, GHG emission was **reduced by 23% from BaU**. Emission intensity was reduced **by 16% from 2005.**

- In 2030CM scenario, emission intensity was reduced by 45% from 2005.

- In all scenarios, net emissions turned positive after 2015.

- If all GHGs, especially emission from waste and industrial process, are considered, more reduction potential might be found.
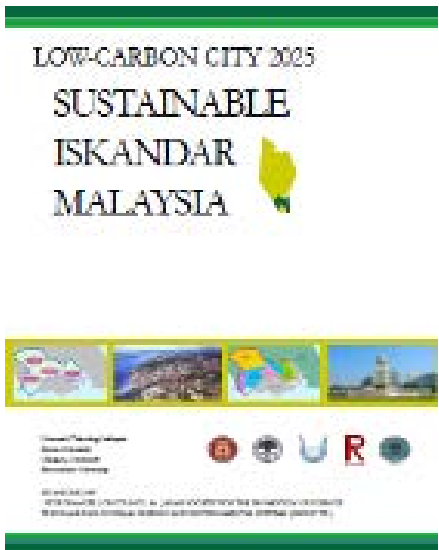
THE CASE OF ISKANDAR MALAYSIA

Iskandar Malaysia, Johor

Case study

Iskandar Malaysia

2,217 km^2

Pop.1.3m (2010)
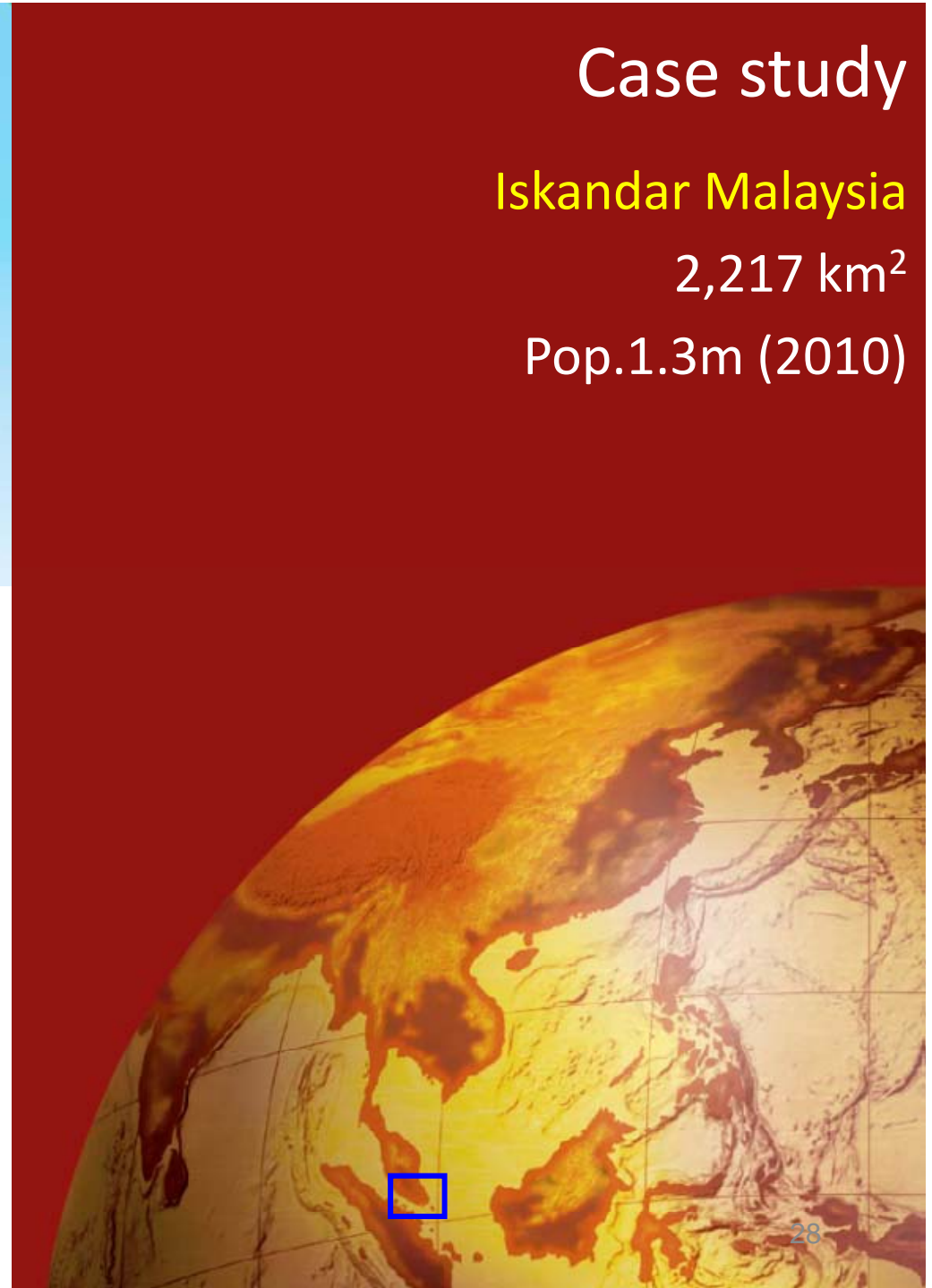
Location of Iskandar Malaysia

29

Iskandar Malaysia at a Glance

A

B

C

D

E

Senai-Skudai

JB City Centre

Eastern Gate Development

Nusajaya

Western Gate Development
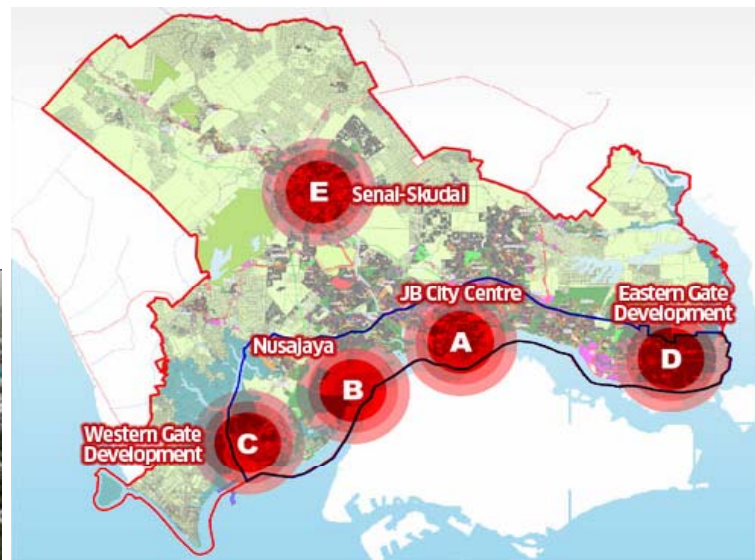
Socio Economic Scenario of IM

	2005	2025	2025/ 2005
Population	1,353,200	3,005,815	2.2
No. of households	317,762	751,454	2.4
GDP (mil RM)	37,641	176,224	4.7
GDP per capita (RM/capita)	27,817	58,628	2.1
Gross output (mil RM)	121,431	474,129	3.9
Primary industry (mil RM)	1,860	5,375	2.9
Secondary industry (mil RM)	83,502	263,444	3.2
Tertiary industry (mil RM)	36,069	205,309	5.7
Floor space for commercial (mil m^2)	6.8	19.3	2.8
Offices	1.3	1.7	2.9
Shops	5.7	16.3	2.9
Hospitals & Schools	0.6	1.2	2.1
Passenger transport demand (mil p-km)	3,816	8,677	2.3
Freight transport demand (mil t-km)	1,652	5,303	3.1

Energy Demand By Sector

Energy demand (ktoe)

Legend:
- Freight transport
- Passenger transport
- Industry
- Commercial
- Residential

2005: 572, 359, 1,733, 382, 240 — Total 3,286

2025 BaU: 1,442, 790, 6,635, 978, 1,091 — Total 10,936

2025 CM: 834, 253, 3,494, 685, 649 — Total 5,915

232%
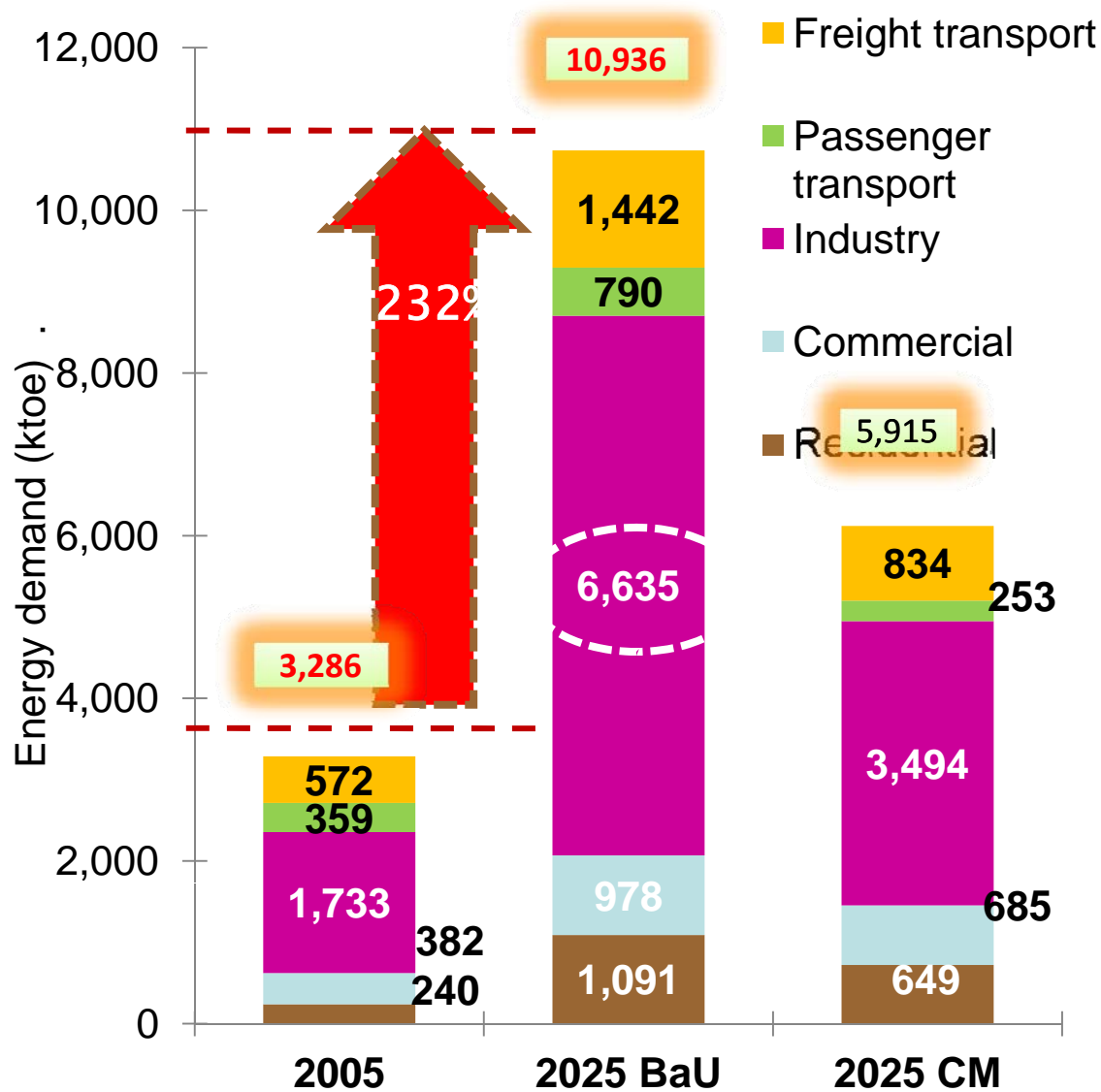
Energy demand in IM is projected to increase from **3,286 ktoe** (toe: tonne oil equivalent) in 2005 to **10,936 ktoe** in 2025 for the BaU case *(BaU: business as usual)*

Industry is expected to be 6,635 ktoe and will maintain the largest share of 61%.

GHG Emission By Sector

Legend:
- Freight transport
- Passenger transport
- Industry
- Commercial
- Residential

Y-axis: GHG emissions (ktCO2)

2005 (Total: 12,552)
- Residential: 1,468
- Commercial: 2,419
- Industry: 6,035
- Passenger transport: 1,015
- Freight transport: 1,615

2025 BaU (Total: 45,484)
- Residential: 7,715
- Commercial: 7,195
- Industry: 24,832
- Passenger transport: 1,672
- Freight transport: 4,070

2025 CM (Total: 19,589)
- Residential: 2,972
- Commercial: 3,802
- Industry: 10,897
- Passenger transport: 447
- Freight transport: 1,481

GHG Emissions in IM are projected to increase from 12,552 ktoe CO2 (2005) to 45,484 ktoe CO2 (2025 BaU)

Industry Sector will increase 4.1 times in total as compared to 2004 in GHG emission . (54%of total GHG emission in 2025 BaU)

GHG emissions per capital : 9.3 tonnes of CO_2 /capita (2005) to 15.1 tonnes /capita (2025 BaU), with CM will be reduced to 6.5 tonnes of CO_2/capita.

Potential Mitigation in IM

Low Carbon Cities Policy Package

Buildings

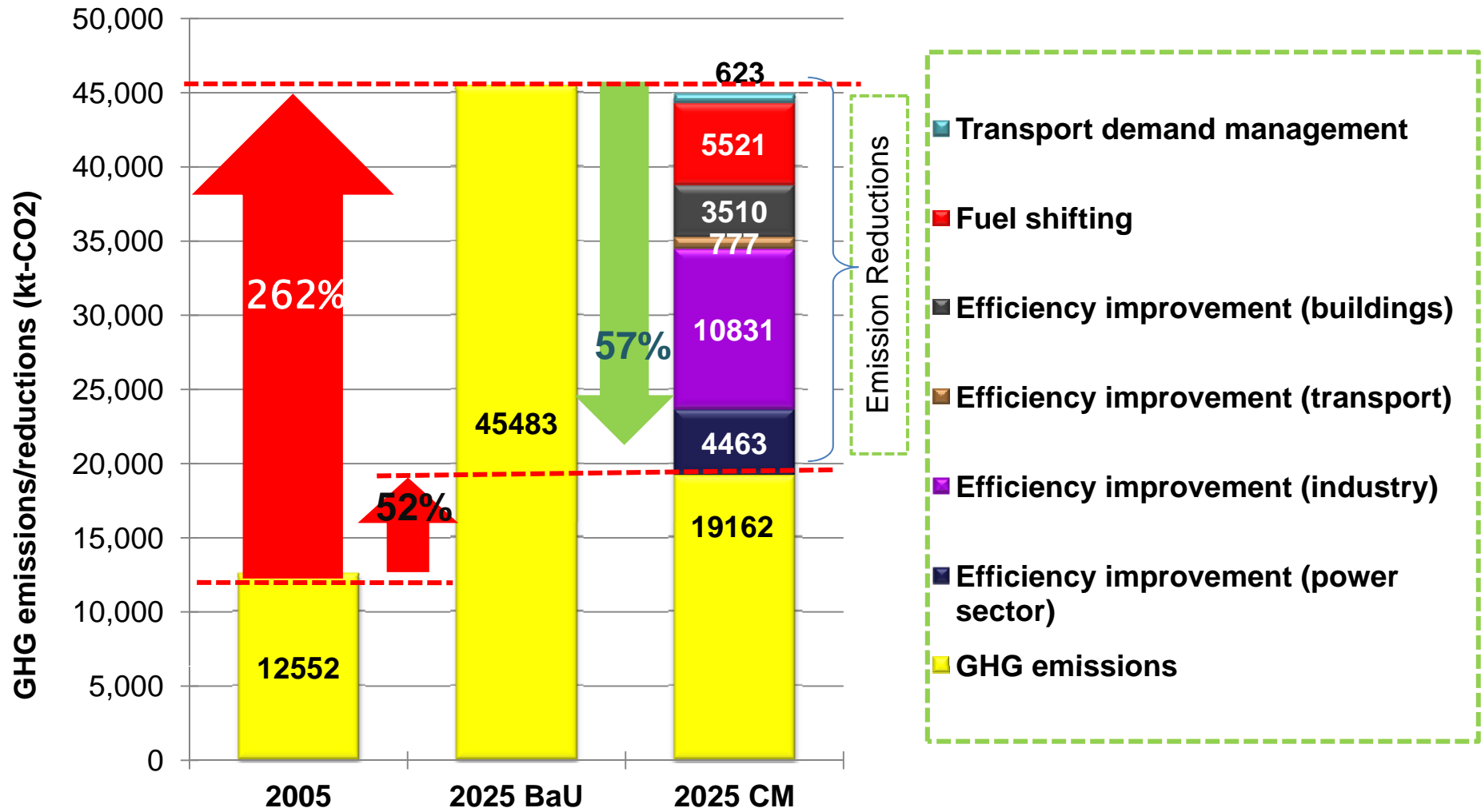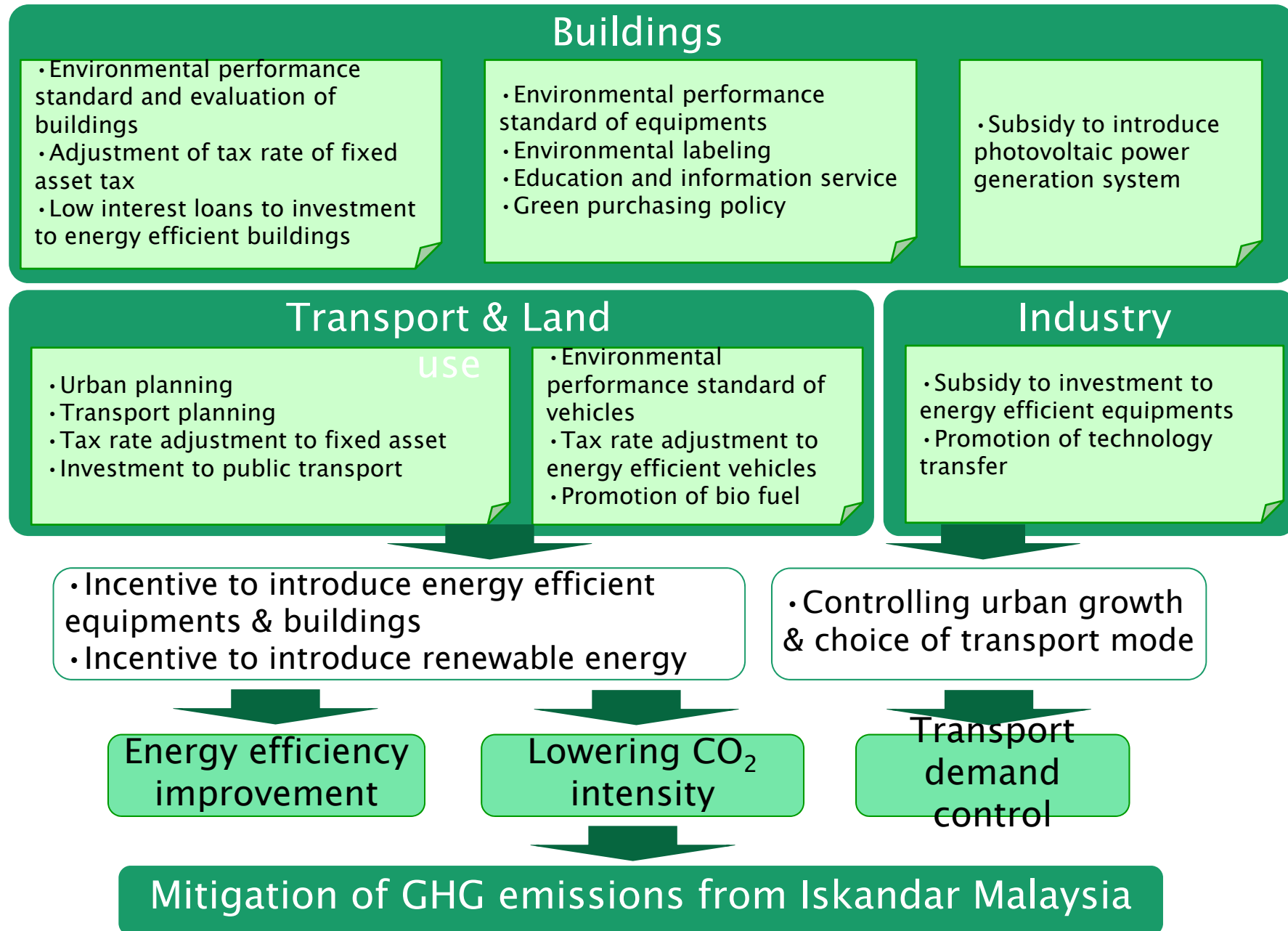- Environmental performance standard and evaluation of buildings
- Adjustment of tax rate of fixed asset tax
- Low interest loans to investment to energy efficient buildings

- Environmental performance standard of equipments
- Environmental labeling
- Education and information service
- Green purchasing policy

- Subsidy to introduce photovoltaic power generation system

Transport & Land use

- Urban planning
- Transport planning
- Tax rate adjustment to fixed asset
- Investment to public transport

- Environmental performance standard of vehicles
- Tax rate adjustment to energy efficient vehicles
- Promotion of bio fuel

Industry

- Subsidy to investment to energy efficient equipments
- Promotion of technology transfer

- Incentive to introduce energy efficient equipments & buildings
- Incentive to introduce renewable energy

- Controlling urban growth & choice of transport mode

Energy efficiency improvement

Lowering CO_2 intensity

Transport demand control

Mitigation of GHG emissions from Iskandar Malaysia

IRDA Blueprints that promote LCS
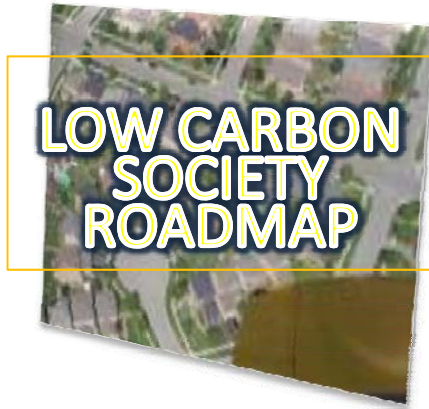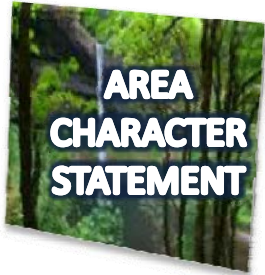
A Dozen Actions - Low Carbon IM

Action	Dozen Actions
1	Walkable, Safe, Livable City Design
2	Integrated Green Passenger Transportation
3	Green Economy
4	Low Carbon Lifestyle
5	Smart Growth
6	Green and Blue Network/Infrastructure
7	Green Buildings and Construction
8	Green Energy System
9	Sustainable Solid Waste Management
10	Community Engagement & Consensus
11	Green & Clean Environment
12	Low Carbon Urban & Regional Planning Institution
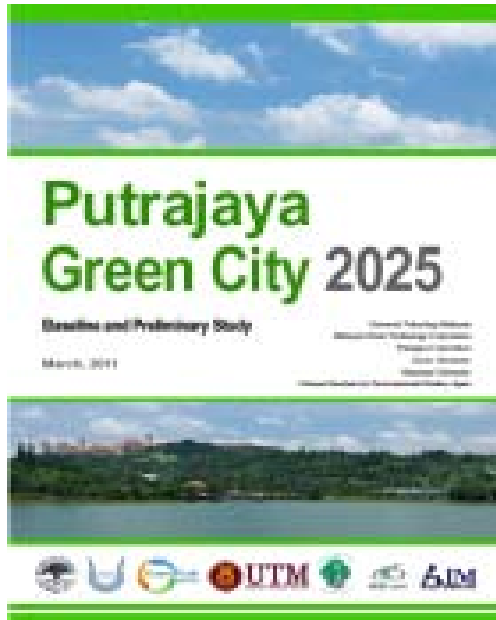
THE CASE OF PUTRAJAYA
- BASELINE STUDY

3 Case Study: Putrajaya Green City 2025
Introduction

Putrajaya, new Federal Government Administrative Centre is a planned driven city based on two underlying concept, city in the garden and intelligent city.

Size: 4,931 hectares

Population: 49,452

Gross Domestic Product: RM 23,605 million

Land Use	Hectares	Percentage [%]
Government	225	4.6%
Residential	711	14.4%
Commercial	139	2.8%
Mixed Use	41	0.8%
Special Use	138	2.8%
Service Industry	11	0.2%
Public Amenity	344	7.0%
Open Space	1930	39.2%
Infrastructure & Utility	483	9.8%
Road	908	18.4%
Total	**4931**	**100%**

(Source: Putrajaya Green City 2025, Laporan Pemeriksan Rancangan Struktur Putrajaya)

3 Case Study: Putrajaya Green City 2025

Three Environmental Targets

Low-carbon Putrajaya	Cooler Putrajaya	3R Putrajaya
CO_2 emission −60%	−2℃	Final disposal & GHG emission -50%

Low-Carbon Putrajaya

60% reduction in CO_2 emission intensity. 2025CM (Countermeasure) Compared with 2007

Cooler Putrajaya

Reduction of 2°C from peak temperature. 2025CM (Countermeasure) Compared with 2007

3R Putrajaya

50% Reduction in the Final Disposal of Solid waste & GHG Emission. 2025CM Compared with 2025BaU (Business as Usual)
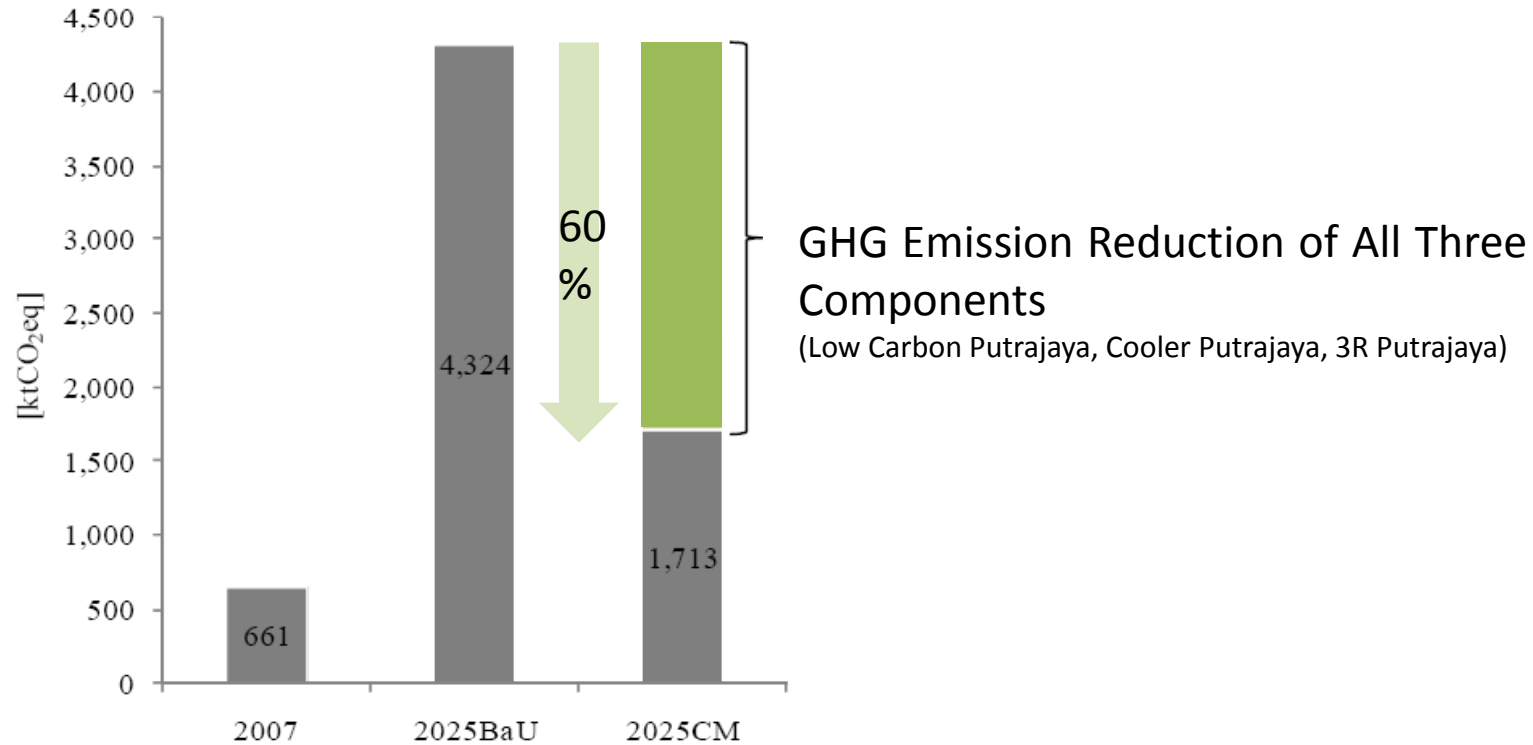
(Source: Putrajaya Green City 2025)

3 Case Study: Putrajaya Green City 2025
Summary of Scenario

	2007	2025BaU	2025CM	2025BaU /2007	2025CM/ 2007	2025CM/ 2025BaU
Population [no.]	49,452	347,700	347,700	7.0	7.0	1.0
Employment [no.]	45,000	164,500	164,500	3.7	3.7	1.0
Per capita GDP in Malaysia [Mill.RM/capita]	23,605	50,337	50,337	2.1	2.1	1.0
Economic activity (2007=1)	1	7.8	7.8	7.8	7.8	1.0
Passenger transport demand [Mill.pass-km]	571	4149	3646	7.3	6.4	0.9
Freight transport demand [Mill.t-km]	109	851	681	7.8	6.2	0.8
Final energy demand [ktoe]	134	899	407	6.7	3.0	0.5
GHG emission [$ktCO_2eq$]	661	4324	1713	7	3	0

(Source: Putrajaya Green City 2025)

3 Case Study: Putrajaya Green City 2025
Summary of Scenario

60 %

GHG Emission Reduction of All Three Components
(Low Carbon Putrajaya, Cooler Putrajaya, 3R Putrajaya)

*It includes contribution from freight transport (2.7 %) and central power generation (13.5 %).
**GHG emission and emission reduction of solid waste management in 2025CM is that of "Separate collection with thermal treatment".(See also page 43.)
***Action 12 does not have its emission reduction.

(Source: Putrajaya Green City 2025)

3 Case Study: Putrajaya Green City 2025
A Dozen Actions Towards Green City

No	Action Names	Category
1	Integrated City Planning & Management	
2	Low Carbon Transportation	
3	Cutting Edge Sustainable Buildings	
4	Low Carbon Lifestyle	Low Carbon Putrajaya
5	More and More Renewable Energy	
6	The Green Lung of Putrajaya	
7	Cooler Urban Structure and Buildings	A Cooler Putrajaya
8	Community & Individual Actions to Reduce Urban Temperature	
9	Use Less Consume Less	
10	Think Before You Throw	3R Putrajaya
11	Integrated Waste Treatment	
12	Green Incentives & Capacity Building	Inter –Category

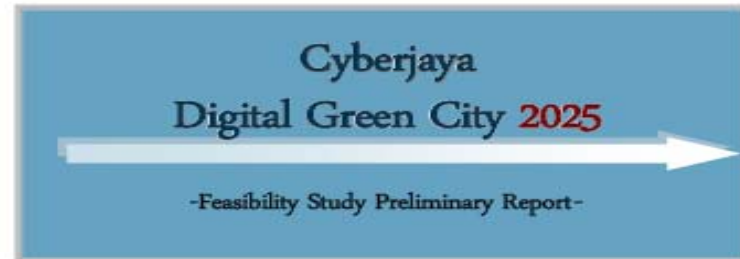(Source: Putrajaya Green City 2025)
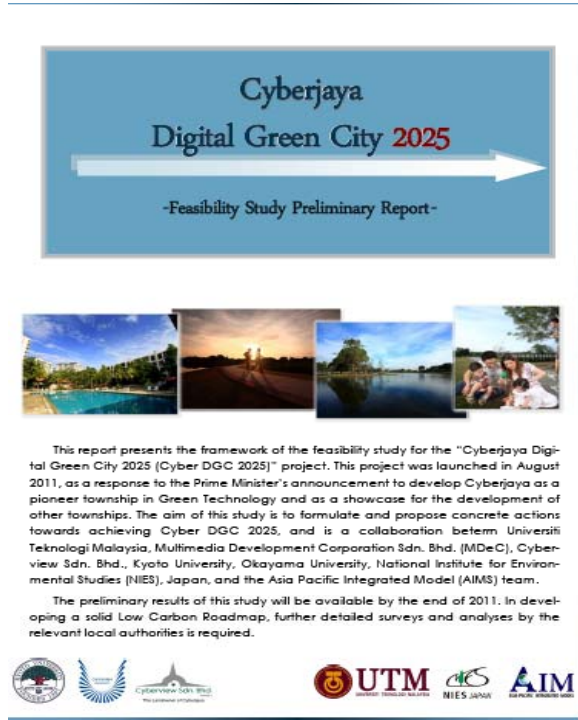
THE CASE OF CYBERJAYA
- TENTATIVE CALCULATION

Cyberjaya stakeholder discussion

Meeting with Cyberjaya on Sept 28, 2011 at IGREET and Jan 7 2012

Feasibility preliminary report

Cyberjaya Digital Green City 2025

Low-Carbon Cyberjaya

50- 60% reduction in CO_2 emission intensity. 2025CM (Countermeasure)
Compared with 2007

3 R Carbon Cyberjaya

Reduce, Reuse and recycle and Smart management

Livable and Vibrant city

Co benefit – green healthy lifestyle/ e entertainment (akibahara/ segaworld/joypolis

Smart Digital network city

Co benefit- e and digital technology

(Source: Putrajaya Green City 2025)

DOZEN ACTIONS- Digital Green City

	Actions	
Action 1	Eco City	**LOW CARBON CYBERJAYA**
Action 2	Green transportation	
Action 3	Environment friendly Building and Houses	
Action 4	Local production and Consumption & RE	
Action 5	Urban energy system	
Action 6	Green incentives and Education	
Action 7	Reduce, reuse, Recycle and Smart management	3 R CYBERJAYA
Action 8	Livable community	LIVABLE & VIBRANT CITY
Action 9	Vibrant Urban space	
Action 10	Smart Community	SMART DIGITAL NETWORK CITY
Action 11	Intra Digital Network	
Action 12	Innovative Green Business	

Result: Socio-economic indicators

Indicators	Sector	Unit	**Cyberjaya (2010)**	Putrajaya (2007)	CJ/PJ
Nighttime population	-	person	**13,353**	49,452	0.27
Daytime population	-	person	**41,759**	52,926	0.79
No. of Household	-	household	**3,338**	11,239	0.30
Household size	-	person/household	**4.0**	4.4	0.91
Floor area	Commercial	Thousand m^2	**96**	-	-
	Enterprise		**559**	-	-
	Institution		**328**	-	-
	Residential		**334**	-	-
	Total		**1,316**	4,603	0.29
Employment	Commercial	person	**1,360**	-	-
	Enterprise		**9,478**	-	-
	Institution		**2,000**	-	-
	Total		**12,838**	45,000	0.29
Student	-	person	**20,221**	-	-
In-coming persons	-	person	**28,000**	13,633	2.05
Economic activity*	-	Mill.RM	**1,183**	1,062	1.11

Result: Energy demand

Total energy demand and comparison with Putrajaya

Variable	Unit	Cyberjaya (2010)	Putrajaya (2007)	CJ/PJ
Energy demand	ktoe	**99**	135	0.73

Energy demand by fuel

[ktoe]	Electricity	Petroleum	LPG	Natural gas	Total
Commercial	3.27	0.00	0.12	0.00	**3.4**
Enterprise	32.54	0.00	0.82	0.00	**33.4**
Institution	19.08	0.00	0.17	0.00	**19.3**
Residential	0.89	0.00	0.43	0.00	**1.3**
Passenger transport	0.11	33.87	0.00	0.47	**34.5**
Freight transport	0.00	7.08	0.00	0.00	**7.1**
Total	**55.89**	**40.95**	**1.54**	**0.47**	**98.9**

Result: CO$_2$ emission

CO$_2$ emission and comparison with Putrajaya

Variable	Unit	Cyberjaya (2010)	Putrajaya (2007)	CJ/PJ
CO$_2$ emission	ktCO$_2$	**485**	516	0.94
CO$_2$ accumulation (Carbon sink)	ktCO$_2$	**-2.4**	-21	-
Total CO$_2$ emission	ktCO$_2$	**483**	495	0.94
CO$_2$ emission per Economic activity	ktCO$_2$/Mill.RM	**0.41**	0.49	0.84
CO$_2$ emission per capita(day time population)	tCO$_2$/capita	**11.6**	9.8	1.19

CO$_2$ emission by sector in Cyberjaya (2010)

- Commercial
- Enterprise
- Institution
- Residential
- Passenger transport
- Freight transport

4% 5%
20%
1%
26%
44%
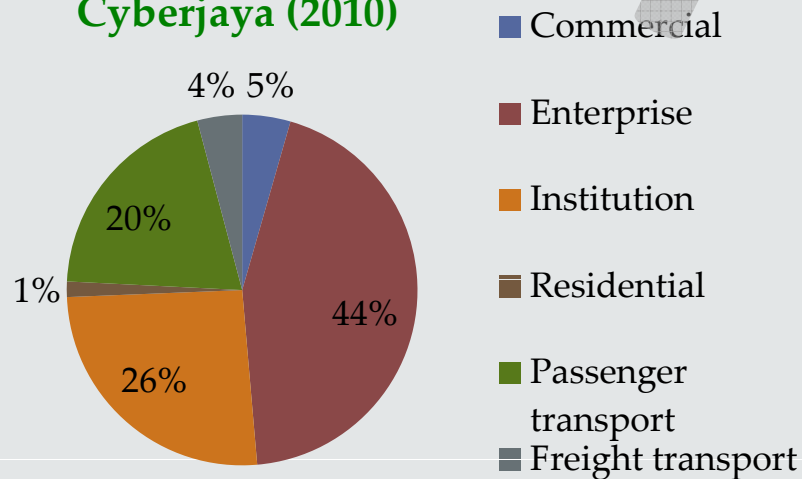
CO$_2$ emission by sector in Putrajaya (2007)

- Commercial
- Public amenities & facilities
- Government departments
- Residential
- Passenger transport
- Freight transport

4%
12%
13%
31%
35%
5%
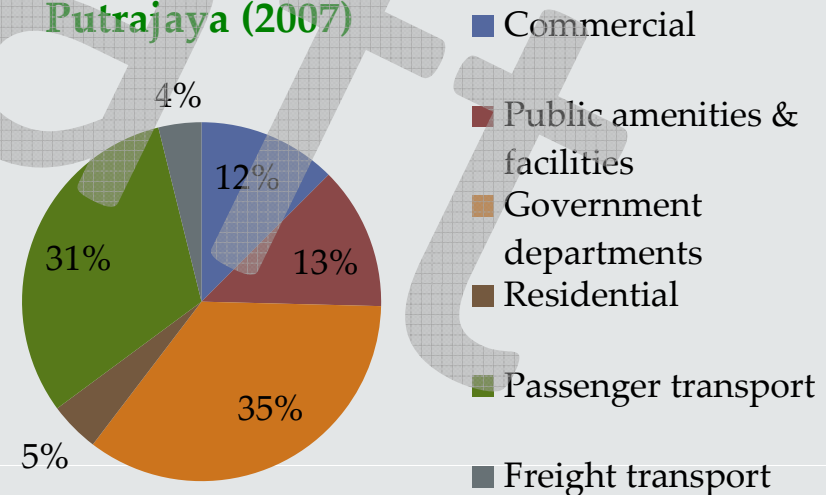
5 Conclusion
The Way Forward

Quantification from LCS modeling assist better understanding on impact of proposed actions, sub actions and programs.

Green cities or Local carbon cities need to have a LOW CARBON SOCIETIES mindset/ behavior.

Joint effort between different professions   (Planners, architect, engineer and related environmental profession)

Important to have a Asian (eg IGES & AIM workshop) and International platform   for research collaboration between researchers in LCS

Thank You! Terima Kasih! 谢谢！ धन्यवाद!