

# Local low carbon development initiatives in Fukushima

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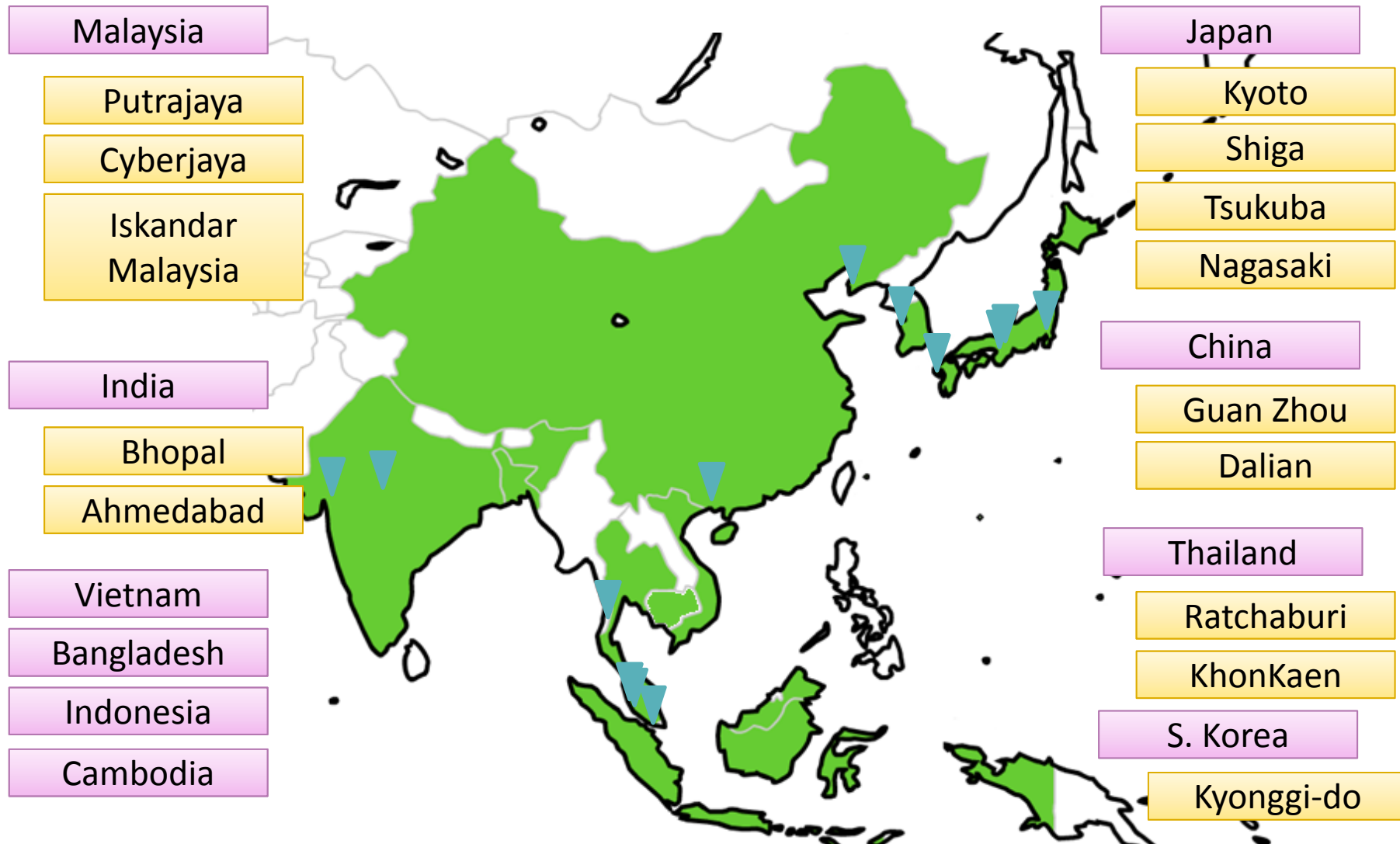
Locarnet 3<sup>rd</sup> Annual Meeting

Bogor, Indonesia

1.

Our approach

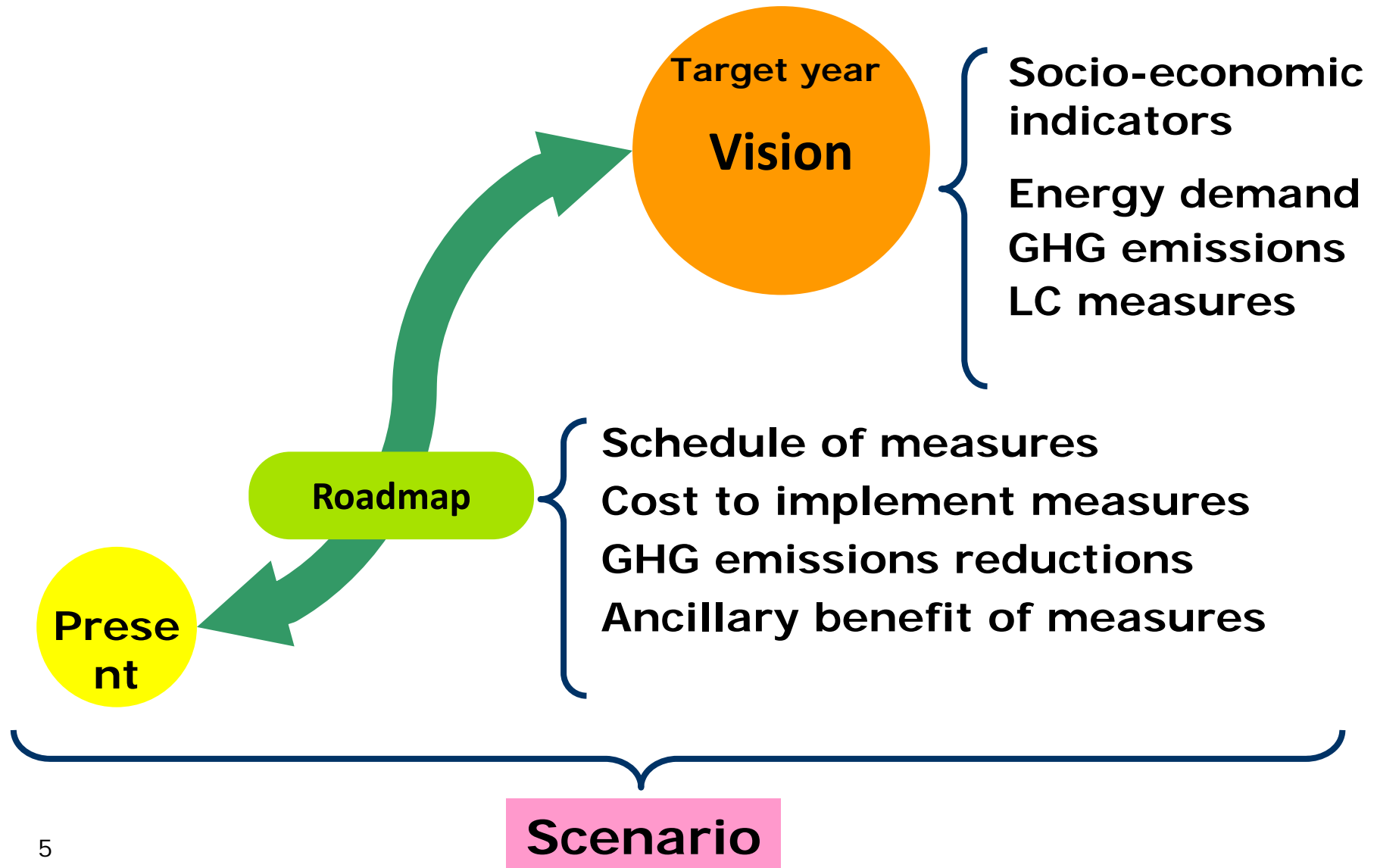
# Experience of LCS scenario development



# Our Approach

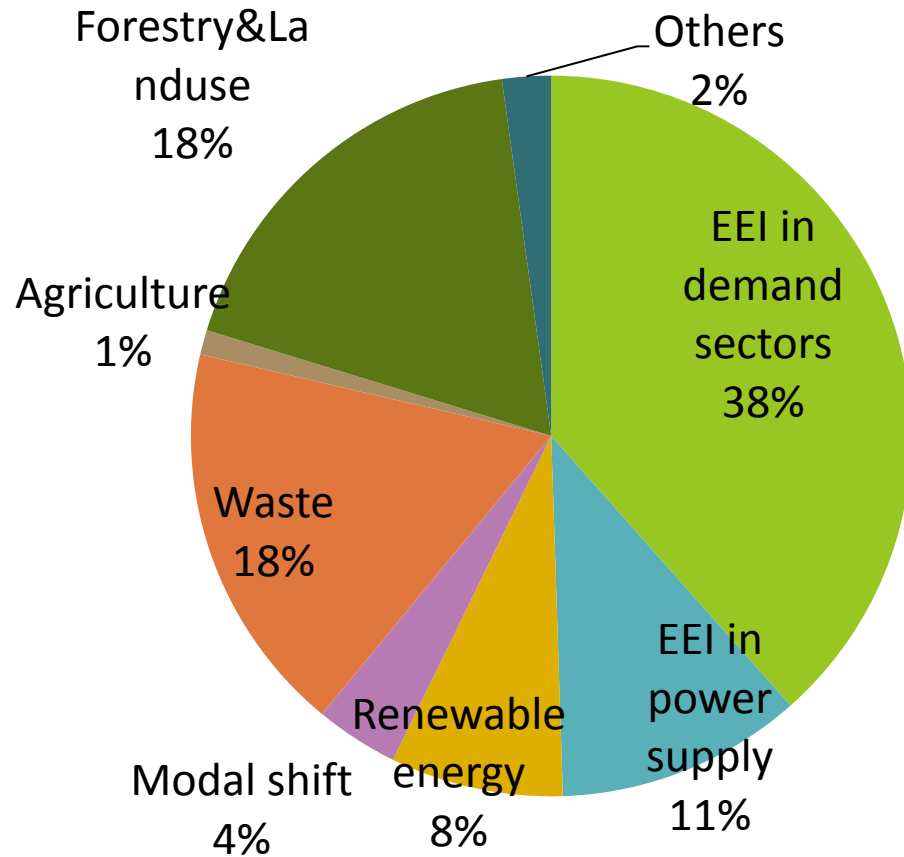
- Developing models to support decision making for low-carbon society
- Problems on policy making and tools to solve the problems
- Backcasting

# Methodology: Backcasting Approach

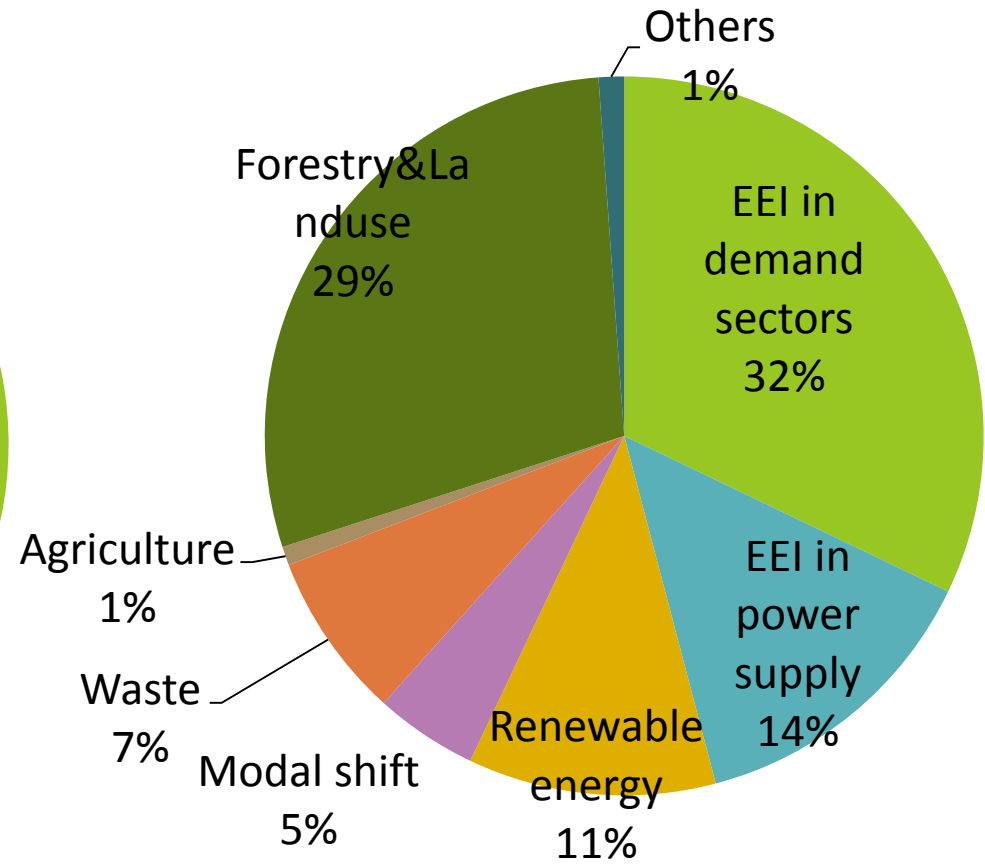


# Contribution to emission reduction in 2020

## CM1



## CM2





# Iskandar Malaysia (IM)



- ❑ Established in 2005
- ❑ Area: 221,634ha
- ❑ Population 1.5 million (2005) --> 3 million (2025)
- ❑ A stable 7-8% annual GDP growth
- ❑ "The largest single development project ever in the Southeast Asia region"
- ❑ "A strong sustainable metropolis of international standing"



# The project

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- Development of low-carbon society scenarios in Asian regions
  
- SATREPS: Science and Technology Research Partnership for Sustainable Development
  
- Joint funding project by JICA and JST
  - JST: Research project
  - JICA: ODA project ← Technology transfer through joint research activity

# Members

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## □ Japan

- Kyoto University, NIES, Okayama University

## □ Malaysia

- Iskandar Regional Development Authority (IRDA)
- Universiti Teknologi Malaysia

# Problems

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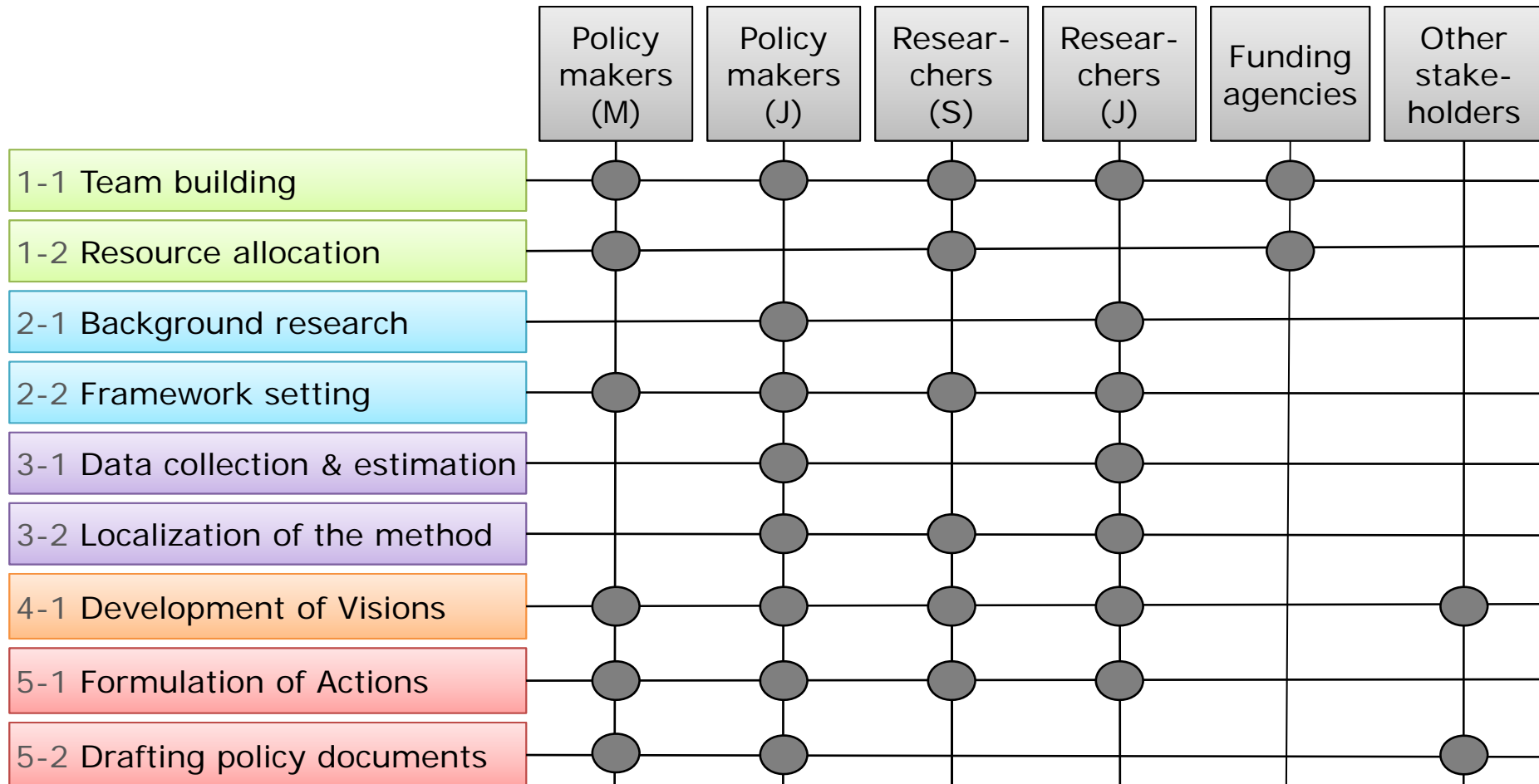
- Capacity of policy makers, knowledge industries and researchers
- Limited availability and accuracy of data
- Lower awareness in both public and private institutions
- Structural difference of GHG emissions and related activities

# Points of the method

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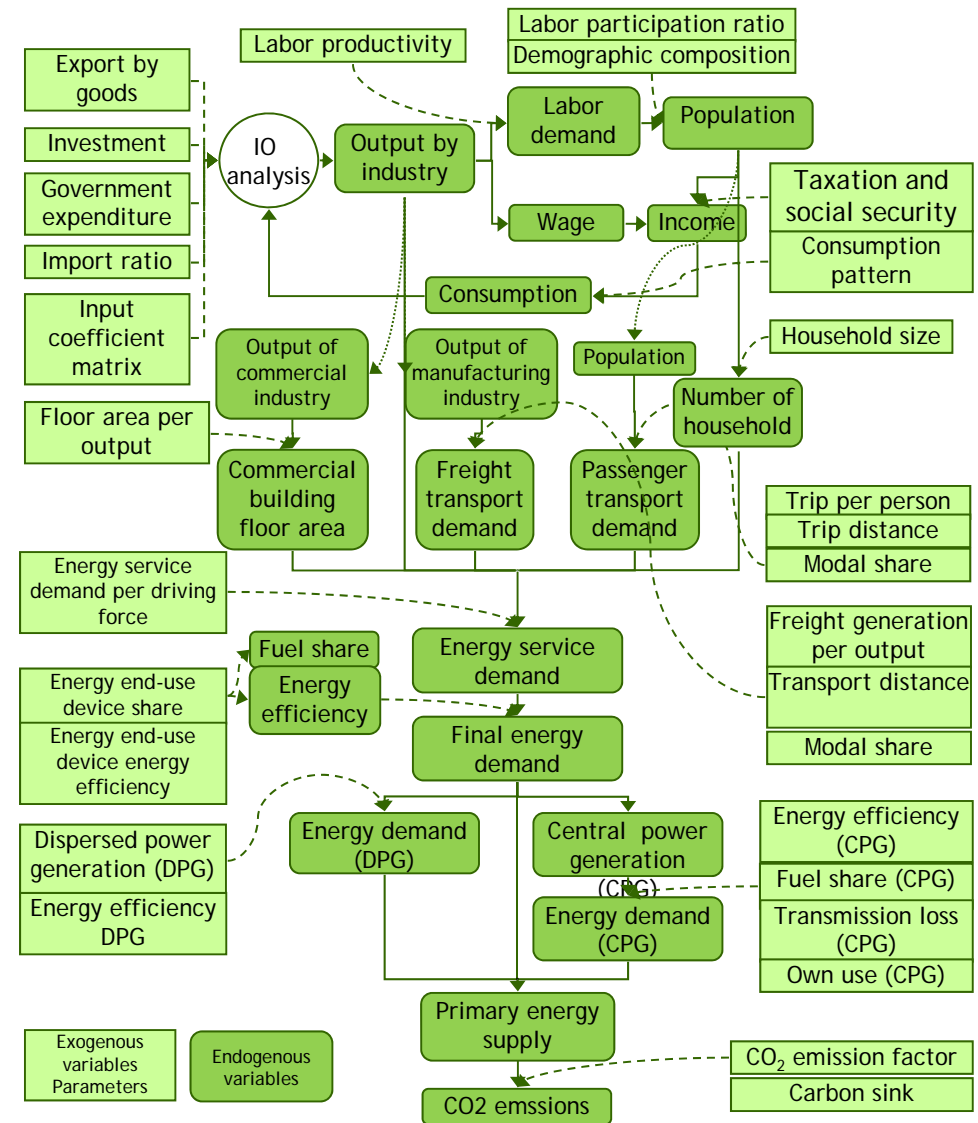
- Management aspects
  - Team building, meeting, resource, etc.
  - Interaction of modeling and policy
  - Training
  
- Modeling with limited data
  - Less data requirement
  - Proxy data without losing persuasiveness
  - “Localization” of the model

# Procedure



# Extended Snapshot Tool (ExSS)

- A design tool of future vision of the region
- A static model (single year) consists of simultaneous equations
- About 6000 endogenous variables
- Formulated by GAMS (general algebraic modeling system)
- Decomposition analysis for contribution of low-carbon options



# Team building & Resource allocation

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## □ Policy makers

- Local Gov. staff: 2 persons, 40% of their effort (= About 80 person-days / year)
- Local Gov. manager:
  - Regular meeting with the staffs (eg. Weekly)
  - Seasonal meeting with researchers

## □ Researchers/consultants

- Modeling: 200 person-days of trained modeler with engineering background
- In IM: more than 10 researchers and 20 assistants were involved

## □ Financial resource: Travel fee, PC, Data, Software, Meeting venue

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# Background research

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- Development plan of IM
  - Comprehensive Develop Plan (CDP)
  - CDP review
  - “Blueprint” (BP)
    - Environmental BP
    - Energy efficiency and Renewable Energy BP
  
- National Circumstance of Malaysia
  - Target: -40%, GHG emission intensity, 2020 (from 2005)
  - Per capita emission:



# Framework setting

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- Target
  - Year 2025 (Target year of CDP)
  - Emission: 60% of emission intensity reductions (extension of national target)
  
- Area: Iskandar Malaysia
  
- Sectors: Energy, Waste

# Data collection & estimation

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- Estimation from proxy data
  - Top-down: Down-scaling of national data
  - Bottom-up: Parameters from other area
  
- Expert judgment
  
- Possible survey

# Localization

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- Sectors, goods, fuels, etc.
  - Add/remove/aggregate/disaggregate
  
- Low-carbon options
  - Biofuel from palm oil
  - Urban tree planting
  
- Modules
  - Waste module (with decomposition analysis)

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- Development of visions

# Main socio-economic assumptions

Field	Variables	Assumptions	Reference
Demography	Population	3 Million in 2025	CDP
	Household	Reduced to 4.25 from 4.47 (Estimated based on National Census 2010)	–
Economy	GDP	Annual Growth rate of 7.3%	CDP review
	Industrial structure	Growth rate by industry is adopted from CDP review. Higher growth rate for service industries.	CDP review
Transport	Passenger	Share of private transport [private vehicle, motorbike] is increased (80%)	–
		Share of public transport [bus, train] is decreased from base year (15%)	–
	Freight	Increase proportionally to output of secondary industry.	–

# Main result of socio-economic variables

	unit	2005	2025	2025 /2005
Population	1000	1,353	3,000	2.22
Household	1000	303	706	2.33
GDP	Bill. RM	35.7	141.4	3.96
Gross output	Bill. RM	121.4	438.9	3.61
Primary industry		1.5	2.4	1.59
Secondary industry		86.2	274.0	3.18
Tertiary industry		33.7	162.5	4.82
Passenger transport demand	Mill. passenger-km	9,565	59,524	6.22
Freight transport demand	Mill. ton-km	8,269	26,054	3.15

# Energy efficiency (EE)

## 50% diffusion of EE equipment

Efficiency in 2005&2025BaU = 1

### Residential

	Energy source		
	Oil	Electricity	
Air conditioning (cooling)			1.56
Hot water	1.13		1.50
Kitchen	1.11		1.07
Lighting			1.50
Other appliance			1.25

### Commercial

	Energy source			
	Oil	Gas	Electricity	
Air conditioning (cooling)				1.56
Hot water	1.13			1.50
Kitchen	1.11	1.11		
Lighting				1.50
Other appliance				1.56

### Industry

	Energy source			
	Coal	Oil	Gas	Electricity
Furnace	1.21	1.21	1.21	
Boiler	1.06	1.06	1.06	
Motor				1.13
Others	1.05	1.05	1.05	1.05

# Energy service demand reduction in residential and commercial sectors

## Cooling

	Saving rate when applied	Diffusion rate	Effect of reduction in total demand
Energy saving behavior	12%	50%	6%
HEMS/BEMS	12%	33%	4%
Insulation	15%	33%	5%
Shading	10%	50%	5%
Total			20%

## The other services

	Saving rate when applied	Diffusion rate	Effect of reduction in total demand
Energy saving behavior	12%	50%	6%
HEMS/BEMS	12%	33%	4%
Total			10%



# Transport parameters

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Trip generation  
(trip/person/day)

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2005	4.50
2025BaU	4.50
2025CM	4.16

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Modal share of passenger transport

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	Car	Bus	Train	Motorbike	Walking	Bicycle	Total
2005	50%	15%	0%	25%	7%	3%	100%
2025BaU	60%	12%	1%	20%	5%	2%	100%
2025CM	25%	28%	12%	10%	20%	5%	100%

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Average distance (km/trip)

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	Car	Bus	Train	Motorbike	Walking	Bicycle	
2005	10.5	18.8	58	10.3	1	2.5	
2025BaU	12	15	58	12	1	2.5	
2025CM	5	6	30	7	1	2.5	

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# Power supply

## Renewable energy in IM

Generation GWh	
Biomass and biogas	230
MSW	75
Solar PV	368

## Power supply total

	Coal	Oil	Gas	Hydro	Solar	Biomass/ Biogas	MSW	Total
Generation (GWh)								
2005	1,124	391	4,382	379	0	0	0	6,276
2025BaU	5,778	689	11,961	1,845	0	0	0	20,273
2025CM	3,262	267	10,081	1,216	368	230	75	15,499
Share								
2005	18%	6%	70%	6%	0%	0%	0%	100%
2025BaU	29%	3%	59%	9%	0%	0%	0%	100%
2025CM	21%	2%	65%	8%	2%	1%	0%	100%

# Energy demand & GHG emissions

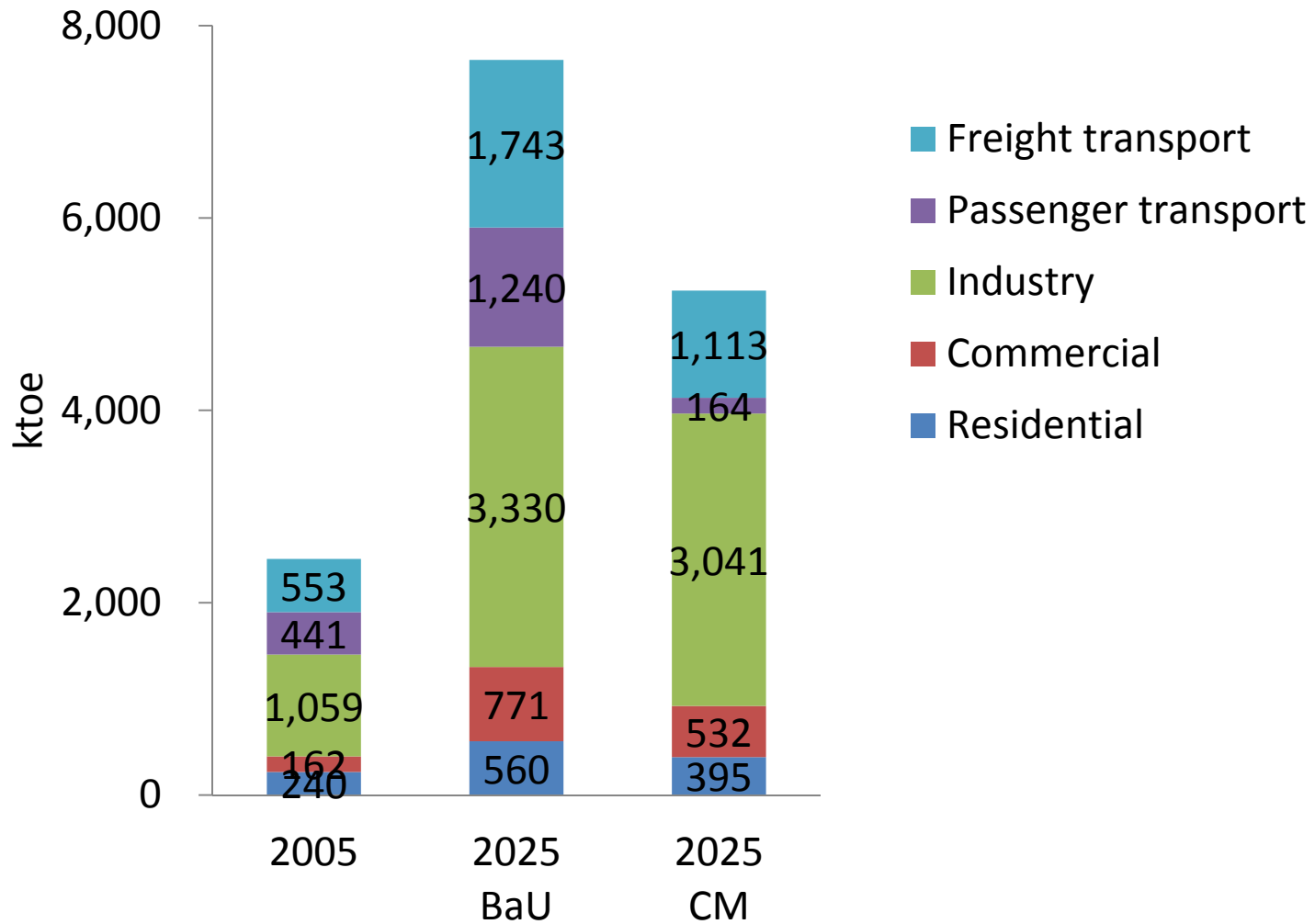
In 2025CM,

41% GHG emission reduction from 2025BaU

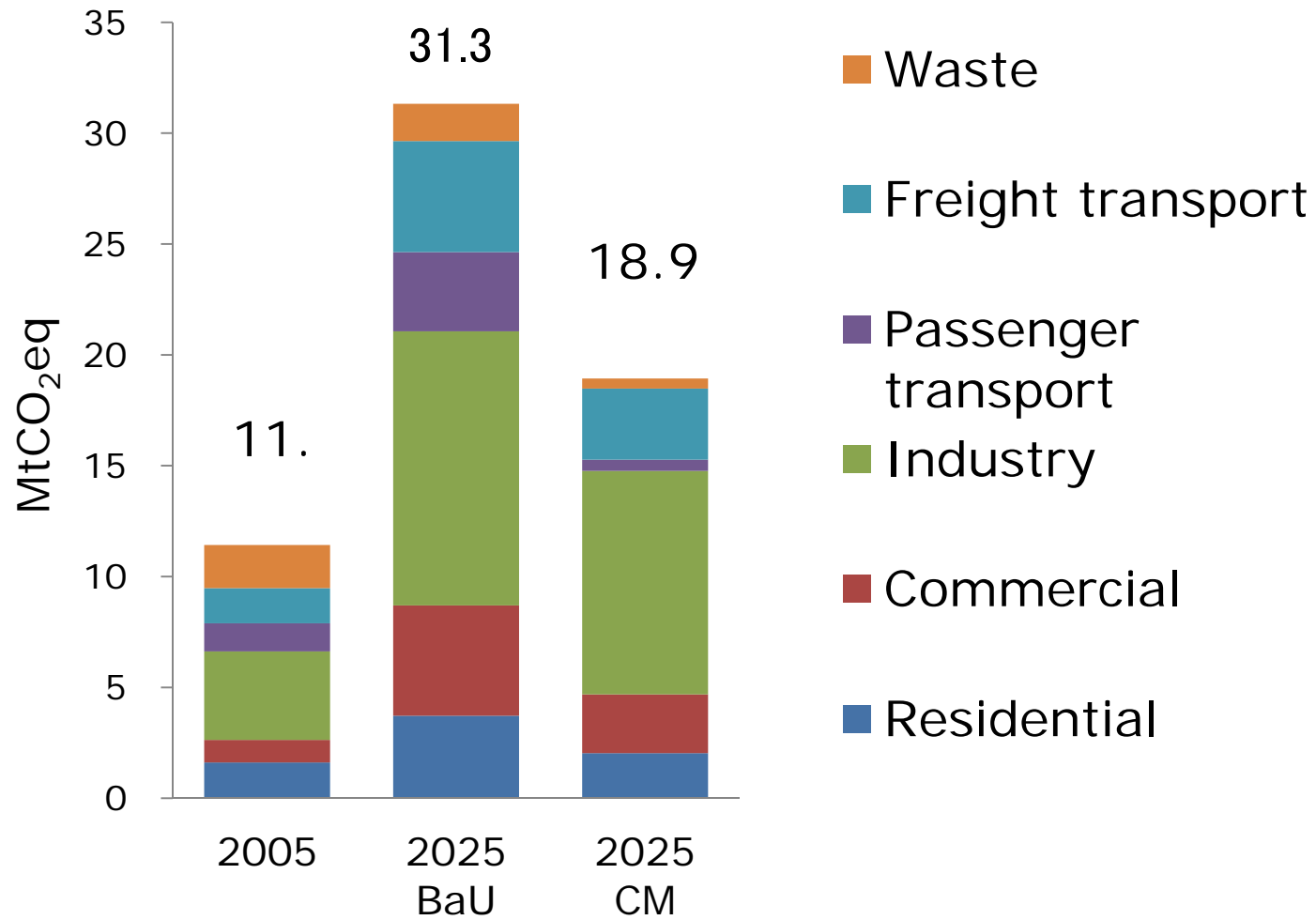
60% GHG emission intensity reduction from 2005

	unit	2005	2025 BaU	2025 CM	2025BaU /2005	2025CM /2005	2025CM/ 2025BaU
Final energy demand	Mtoe	2.5	7.6	5.2	3.11	2.14	0.69
GHG emissions (including waste)	MtCO <sub>2</sub> eq	11.4	31.3	18.9	2.74	1.66	0.60
Per capita GHG emissions	tCO <sub>2</sub> eq	8.4	10.4	6.3	1.24	0.75	0.60
GHG intensity	kgCO <sub>2</sub> eq /RM	0.32	0.22	0.13	0.69	0.42	0.60

# Final Energy demand



# GHG emissions



# Emission reduction decomposition

EEI: energy efficiency improvement

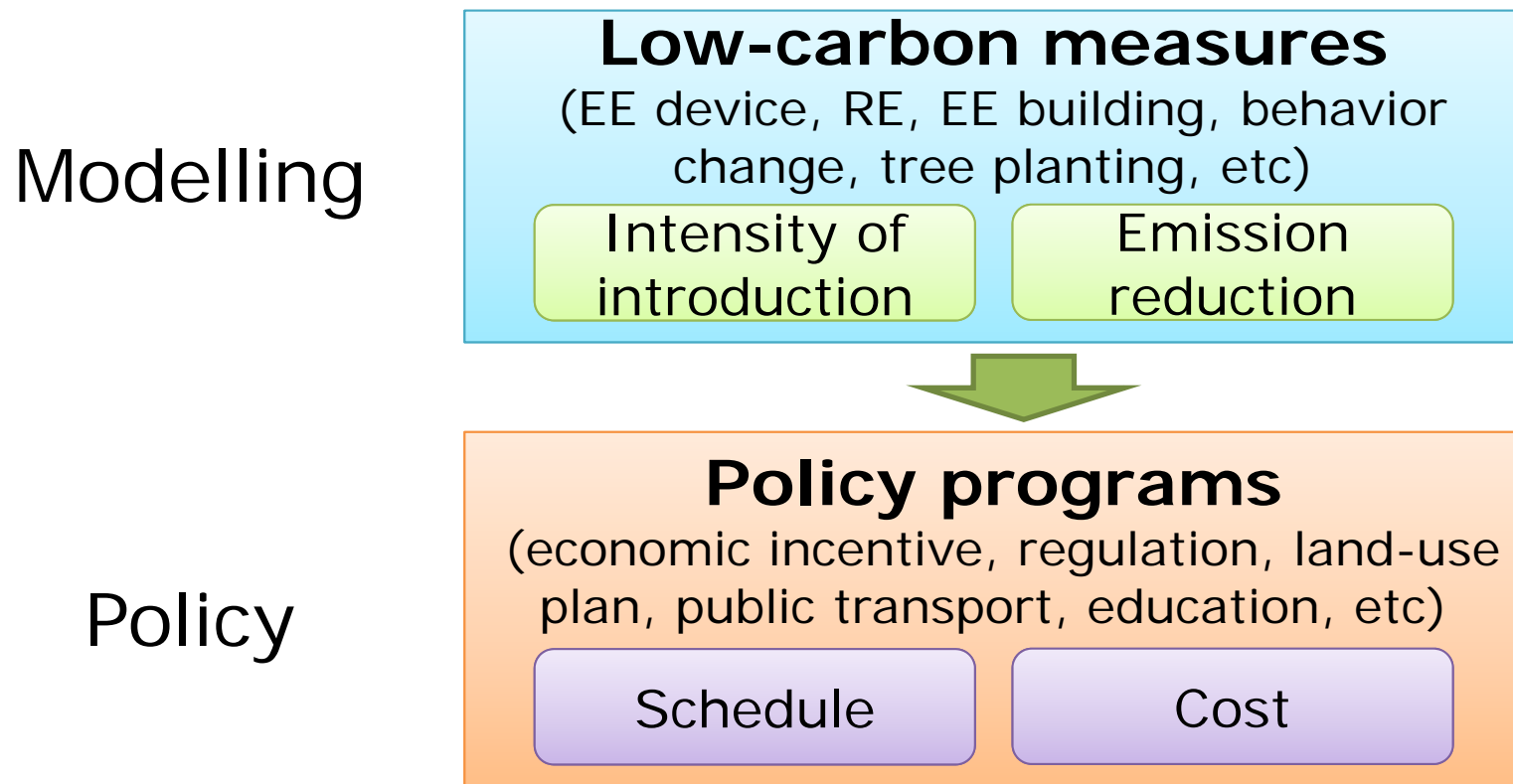
ESR: energy service reduction

Residential	EEI of appliance	690	Freight transport	EEI of vehicles	1,632
	ESR – Air conditioning	52		Modal shift	167
	ESR – Others	271	Power sector	PV	193
Commercial	EEI of appliance	1,019		Biomass	121
	ESR – Air conditioning	106		SWM	39
	ESR – Others	340		EEI (national grid)	2,371
Industry	EEI of appliance	1,094	Waste management		1,224
Passenger transport	EEI of vehicles	587	Carbon sink		353
	EEI by TDM	188			
	Modal shift	877			
	Trip reduction	268			
	Compact city	1,127			

ktCO<sub>2</sub>eq

# Formulation of Actions

- List all necessary policy programs to implement low-carbon measures and make a table to show correspondence.
- Make groups of policy programs and low-carbon measures according to their policy-topics.



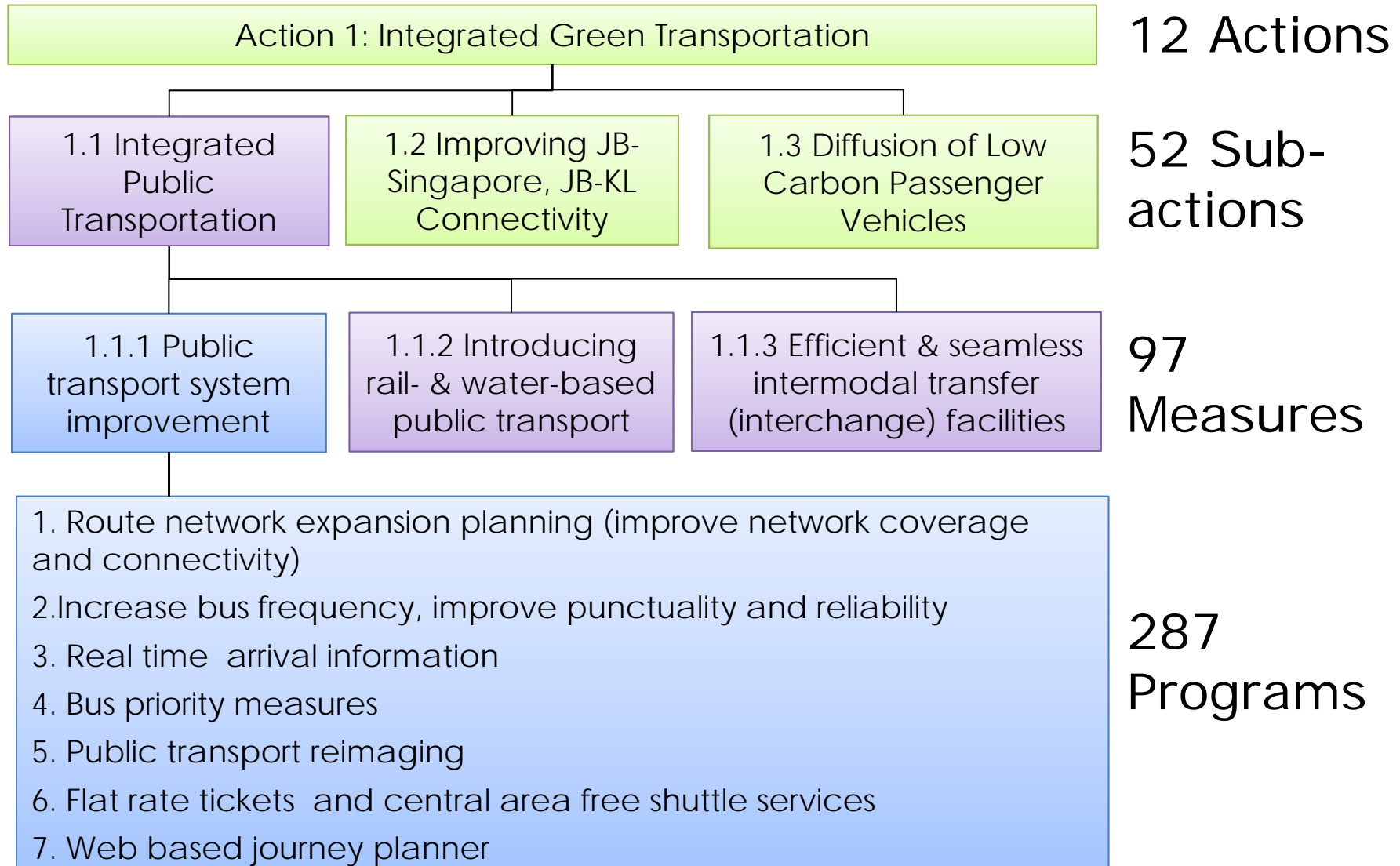
# Action Breakdown Structure

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- An application of “work breakdown structure” used in project management
  
- Hierarchical structure of LCS policies
  - **Action**: The largest group of policies. 5 to 12.
  - **Sub-action**
  - **Measure**
  - **Program**: Implementable activity
  
- “MECE”: Mutually exclusive and correctly exhaustive
  - Duplication must be avoided
  - It must cover all of the activities which should be implemented to achieve LCS goal



# Action Breakdown Structure



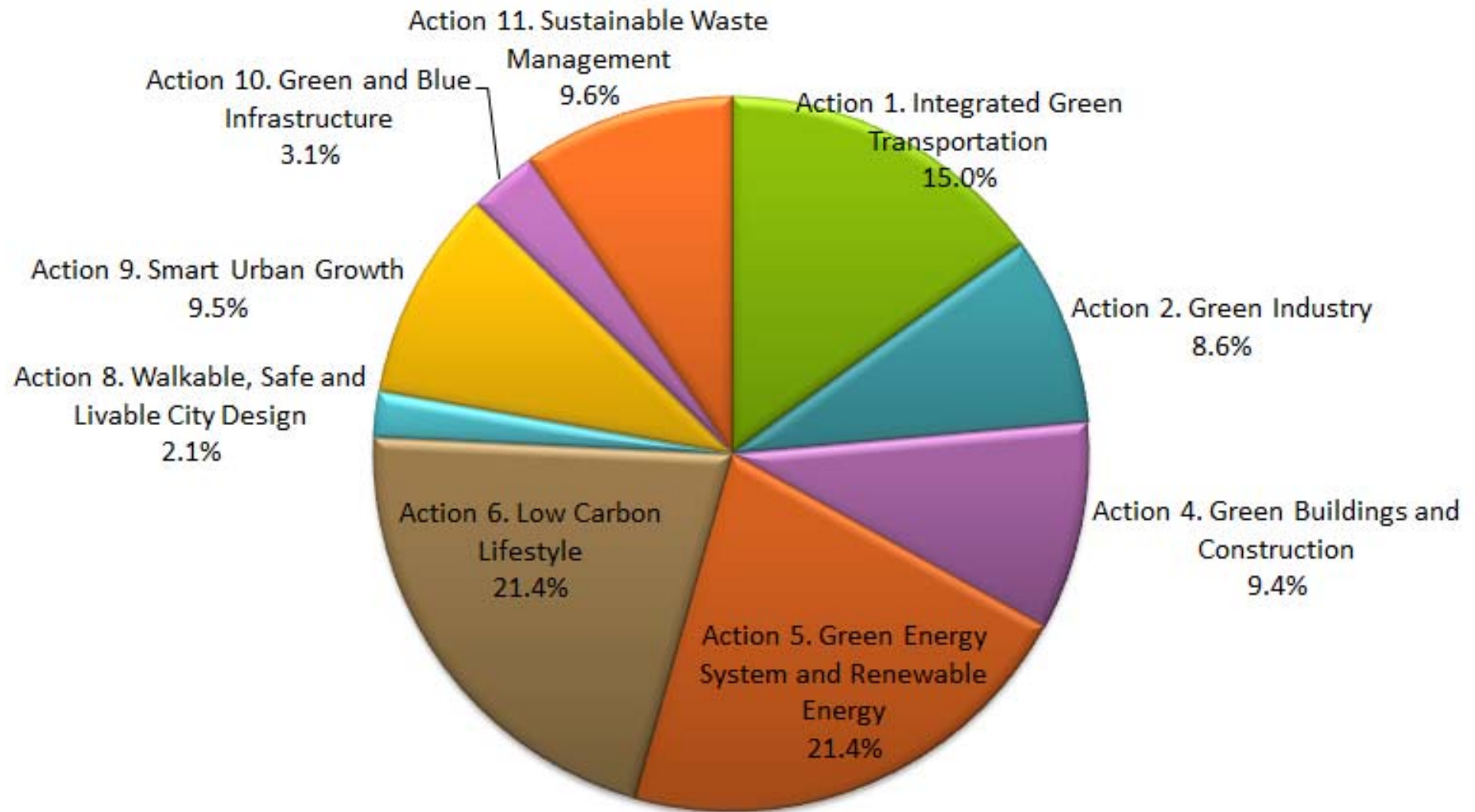
# 12 Actions

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- Action 1. Integrated Green Transportation
- Action 2. Green Industry
- Action 3. Low Carbon Urban Governance
- Action 4. Green Buildings and Construction
- Action 5. Green Energy System and Renewable Energy
- Action 6. Low Carbon Lifestyle
- Action 7. Community Engagement and Consensus Building
- Action 8. Walkable, Safe and Livable City Design
- Action 9. Smart Urban Growth
- Action 10. Green and Blue Infrastructure
- Action 11. Sustainable Waste Management
- Action 12. Clean Air Environment

# Contribution of the Actions

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# Programs to implement immediately

- ❑ Mobility management system
- ❑ Green economy guidelines
- ❑ Eco-life challenge schools project
- ❑ Green portal for Iskandar Malaysia
- ❑ Trees for urban parks
- ❑ Responsible tourism and biodiversity conservation
- ❑ Bukit Batu eco-community
- ❑ Green accord initiative award (GAIA)
- ❑ Low-carbon village Felda Taib Andak

4.

## Local Application of the Tools

# Toward Local Society Design

- Planning of relatively small municipality
- Population reduction in rural area in Japan
  - Shinchi Town, Fukushima Pref.
- Population ↔ Industry
- North Hamado-ri Snapshot Model

## Application in Shinchi town, Fukushima Pref.

- Shinchi town
  - Rural area in Tohoku
  - North most of Fukushima pref. (50km north from Fukushima-daiichi power plant)
  - 50km south from Sendai city
  - Population: 8000
- 2011. 3. 11:
  - 116 were killed by Tsunami
  - Coast area was completely destroyed



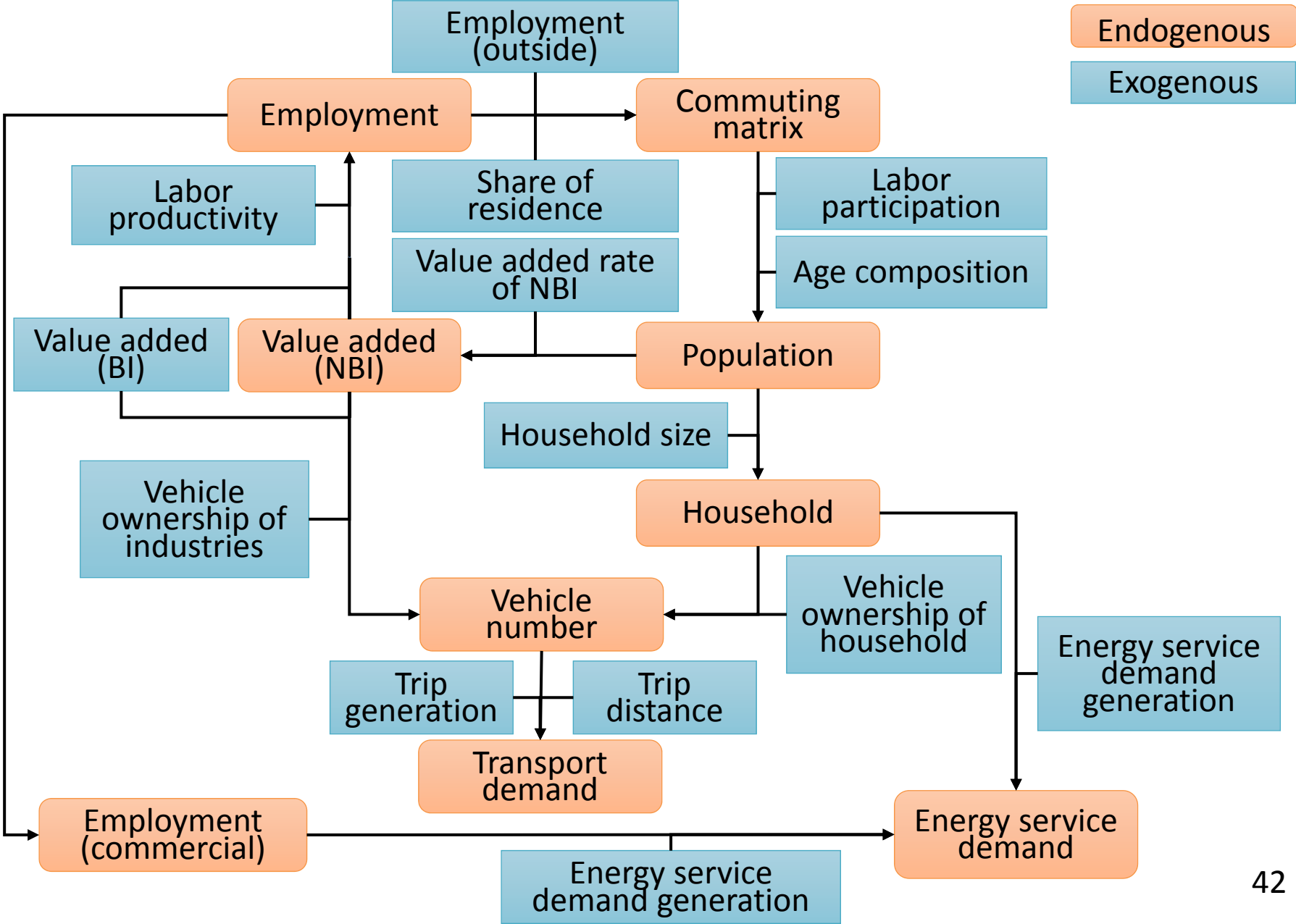




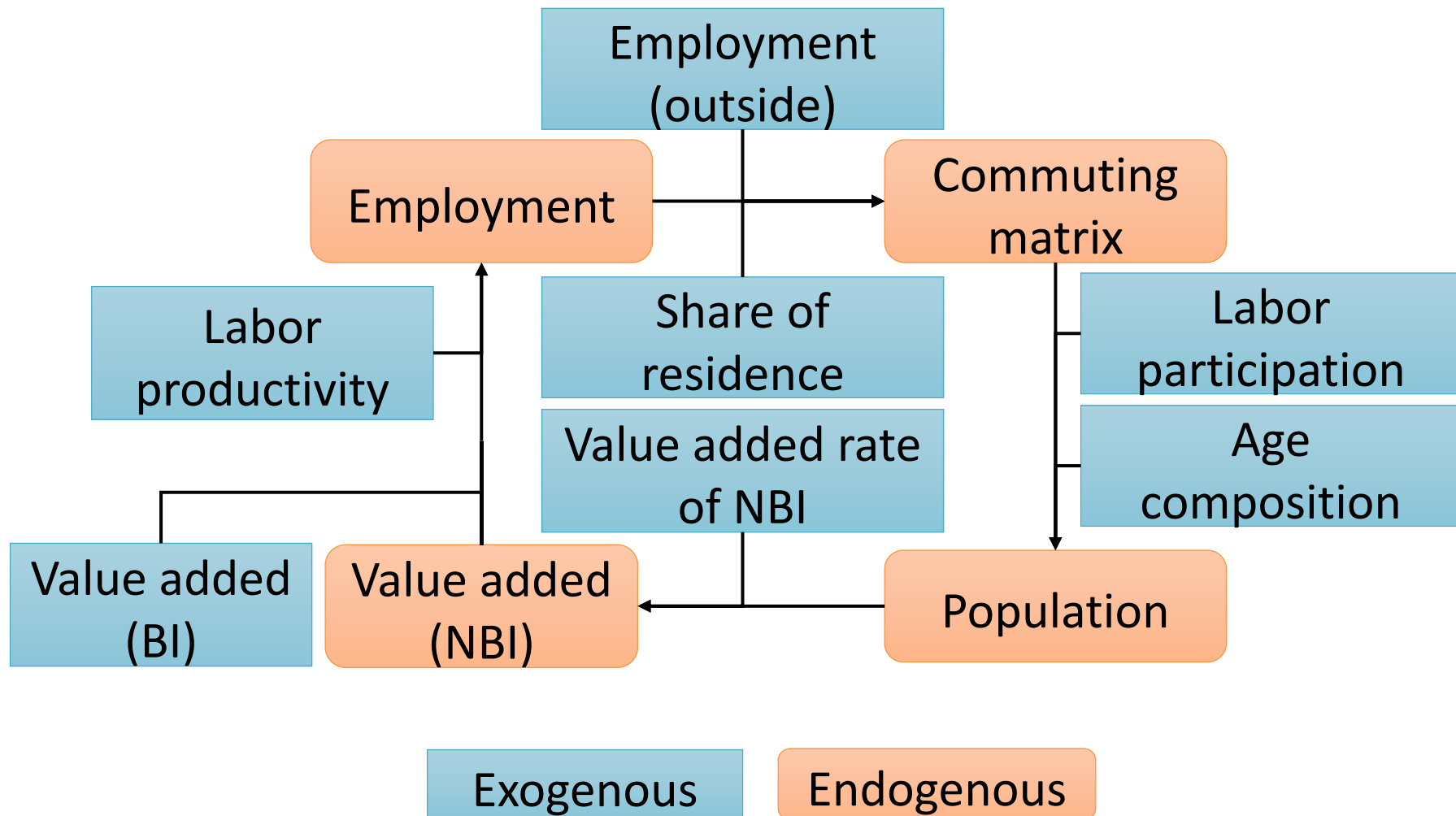
## Problems

- Population decrease
- Industries (manufacturing)
- Agriculture : lack of workforce
- Aged society
- Planned LNG facility













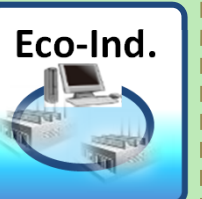



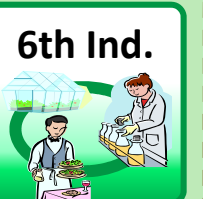
# North Hamado-ri Snapshot Model



# North Hamado-ri Snapshot Model



# 4 Scenarios in Shinchi Town

	Industry		Residence		Agriculture		
<b>BaU</b>							
<b>LNG</b>							
<b>Industry</b>							
<b>Eco-industry</b>							

## Remarks

### Our approach

- Modeling for policy making of climate change mitigation
- Society design & roadmap projections

### Future works

- Local application: “Localization” method of the models
- Analysis of the planning process with the models
- Integration with other dimensions:
  - Disaster prevention
  - Impact and adaptation of climate change
  - Resource use

For more information

- Visit our website to see publications:

<http://2050.nies.go.jp/>

The screenshot shows the website 'Low-Carbon Society Scenarios towards 2050'. The main content area is titled 'Report' and 'Asia Low-Carbon Society Scenarios'. It features a grid of report covers with the following details:

Report Title	Date	Download Link
Putrajaya Green City 2025 Baseline and Preliminary Study	March, 2011	Download
Low Carbon Society Scenario Toward 2050 INDONESIA Energy Sector	October, 2010	Download
Low-Carbon Society Vision 2030: Thailand	November, 2010	Download
Preliminary study on Sustainable Low-Carbon Development towards 2030 in Vietnam	February, 2010	Download
Low-Carbon City 2025: Sustainable Iskandar Malaysia	January, 2009	Download
Low-Carbon Society Vision 2035: Ahmedabad	October, 2009	Download
Low-Carbon Society Vision 2050: India		
Scenario Analysis on Low-Carbon Economy		

The sidebar on the right contains a 'Report' section with links to 'Asia LCS Scenarios', 'Japan LCS Scenarios', 'Outcomes from the Japan-UK Joint Research Project', 'LCS Research Booklet', and 'Other reports'. Below this is a 'News' section with a link to a symposium on 'Asia LCS scenarios and actions -How to achieve sustainable low-carbon society-' held on February 22, 2011. Further down, there are links to COP16/CMF6 side events in November 2010 and October 2010. At the bottom, a 'Symposium / Workshop' section mentions that reports on 'Putrajaya Green City 2025' are available on the website.