ASIA-PACIFIC INTEGRATED MODEL
http://www-iam.nies.go.jp/aim/

Development of Low Carbon Scenarios for Asia Regions
http://www.lowcarbon-asia.jp/


LOW-CARBON ASIA SCENARIOS and ACTIONS
http://2050.nies.go.jp/LCS/

Roles of GHG Inventories at Regional or City Level for Developing Future GHG Emission/Removal Projection

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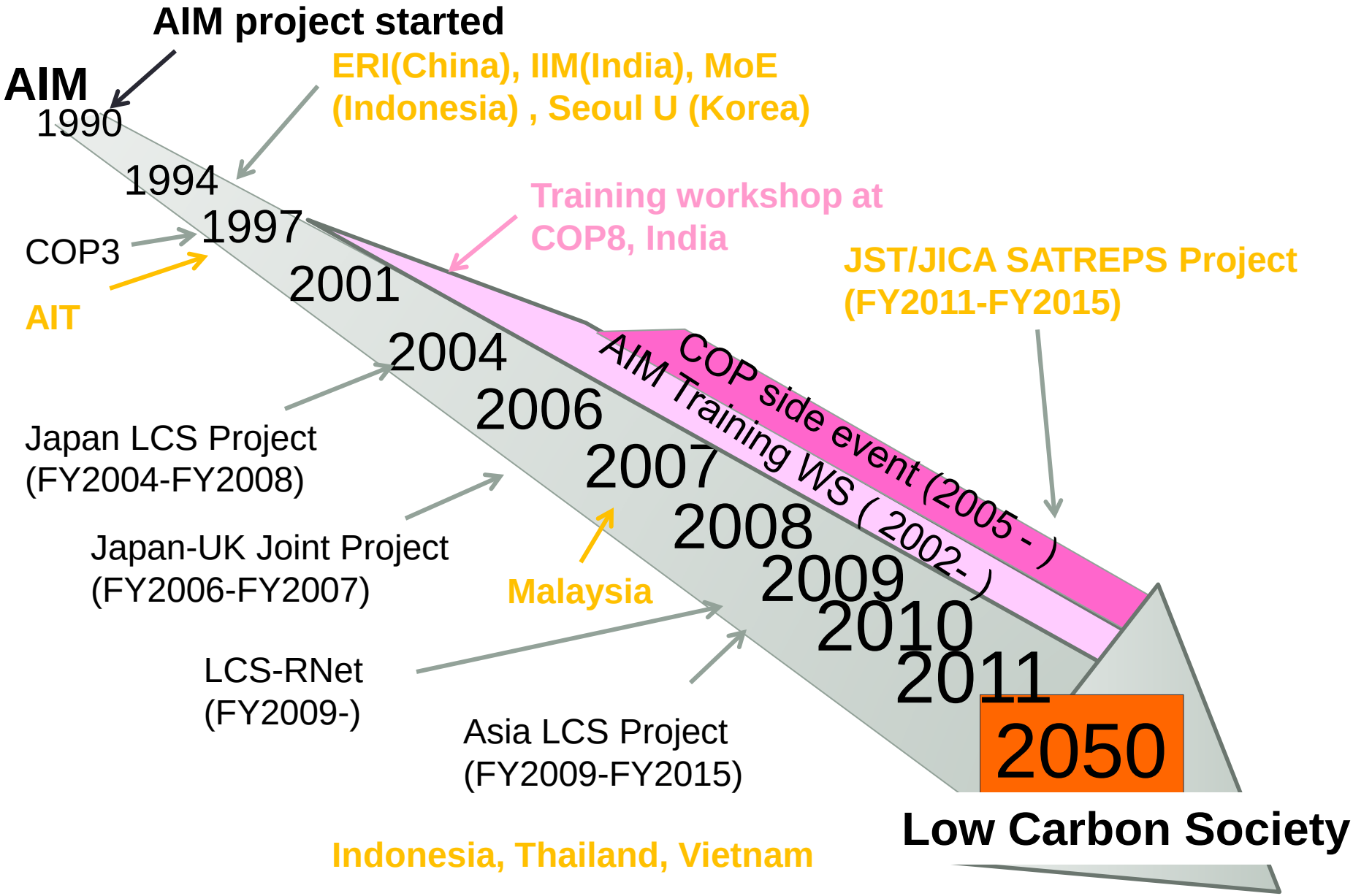
The 12th Workshop on GHG Inventories in Asia (WGIA12)
- Capacity building for measurability, reportability and verifiability –
August 4-6, 2014 at Pullman Bangkok King Power

Brief History of Low Carbon Society Study in AIM



To be, and to be: that is our way

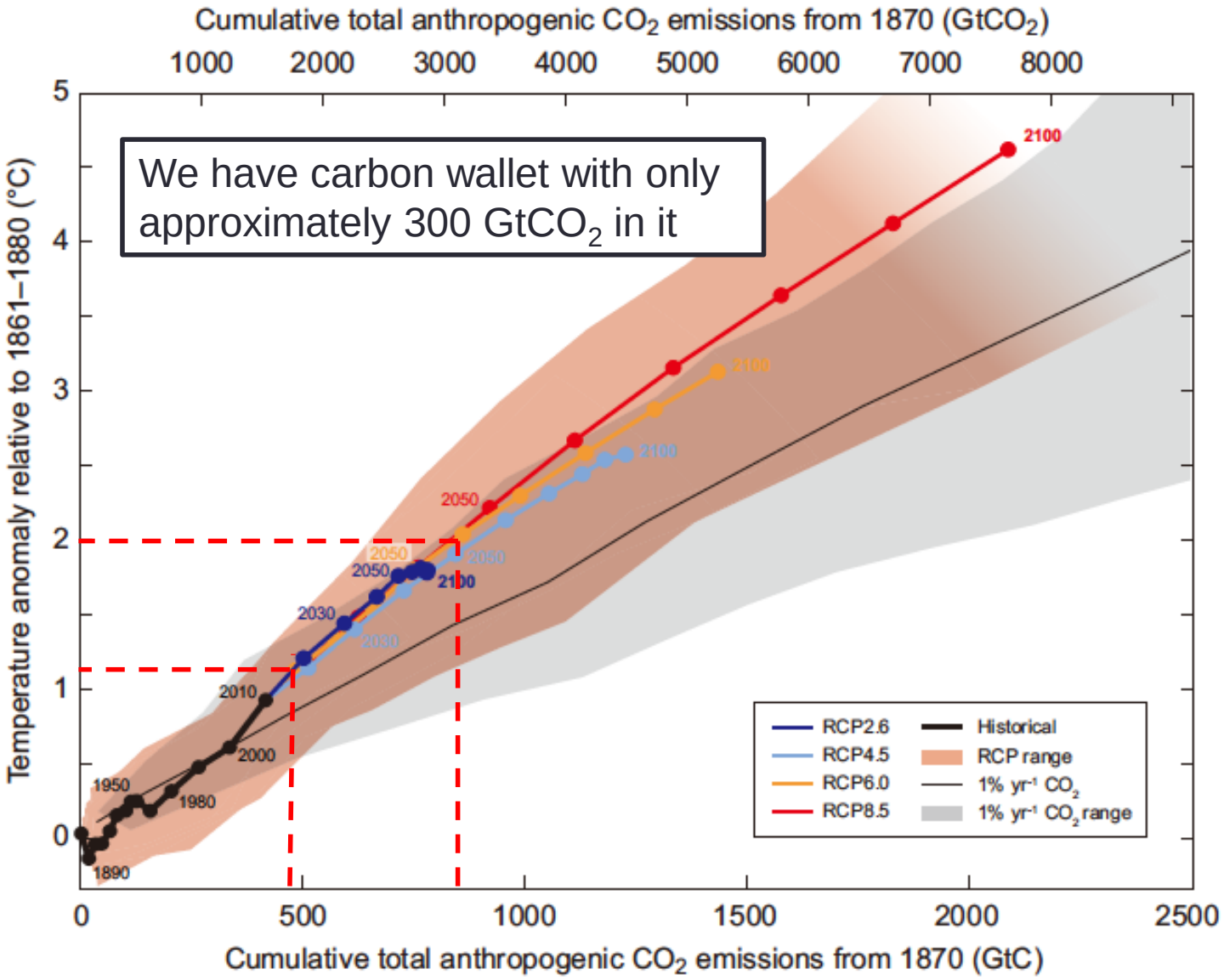
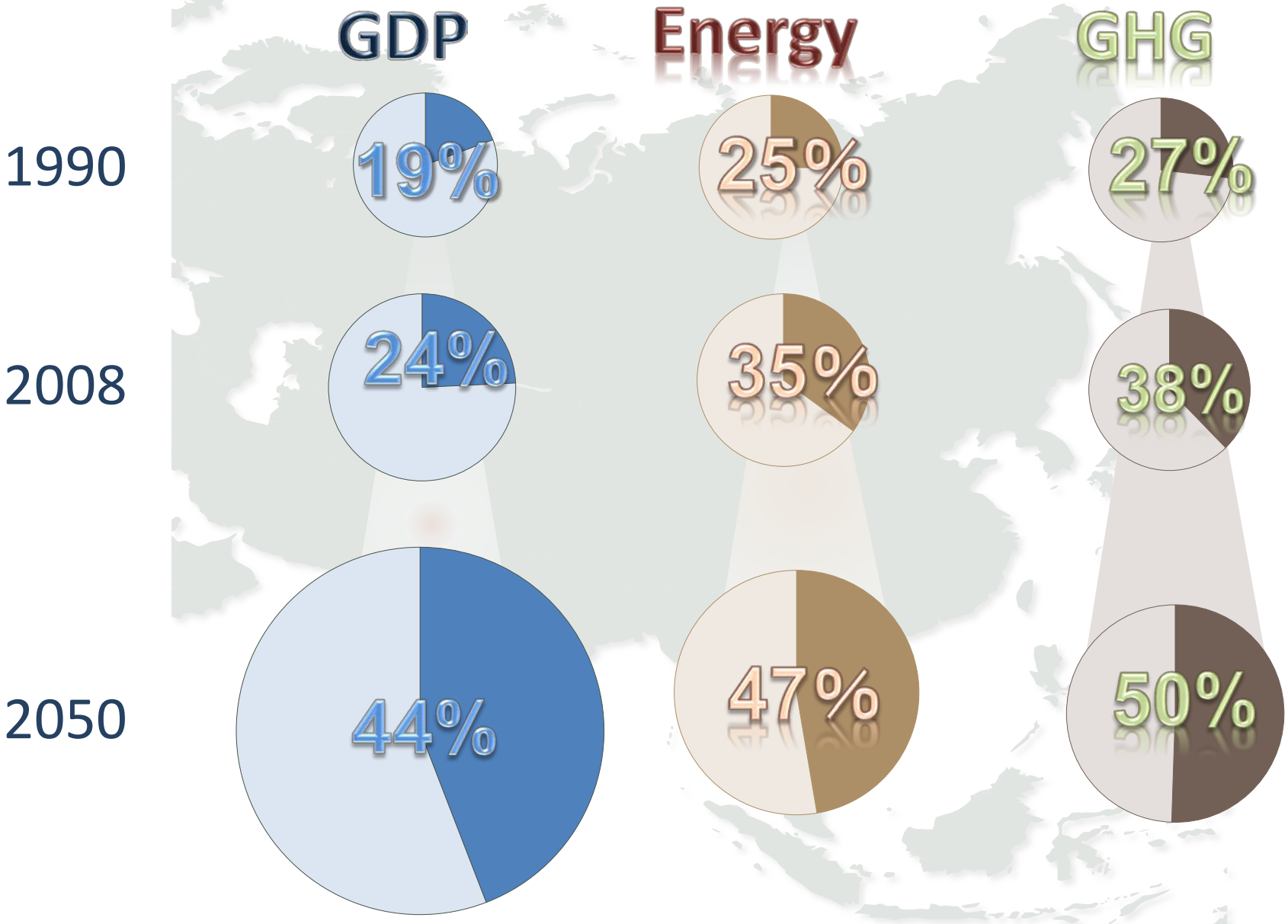


Figure SPM10: http://www.climatechange2013.org/images/report/WG1AR5_SPM_FINAL.pdf

Growing importance of actions towards low carbon development in Asia



Source: Presentation by Dr. Mikiko Kainuma (Nov. 2011)

Research Project on Asia Low Carbon Society Scenarios toward 2050

Sustainable development through LCS

Future trends on socio-economic conditions, energy, resources, regional diversity, culture, lifestyle, etc.

Institutional design for int'l cooperation

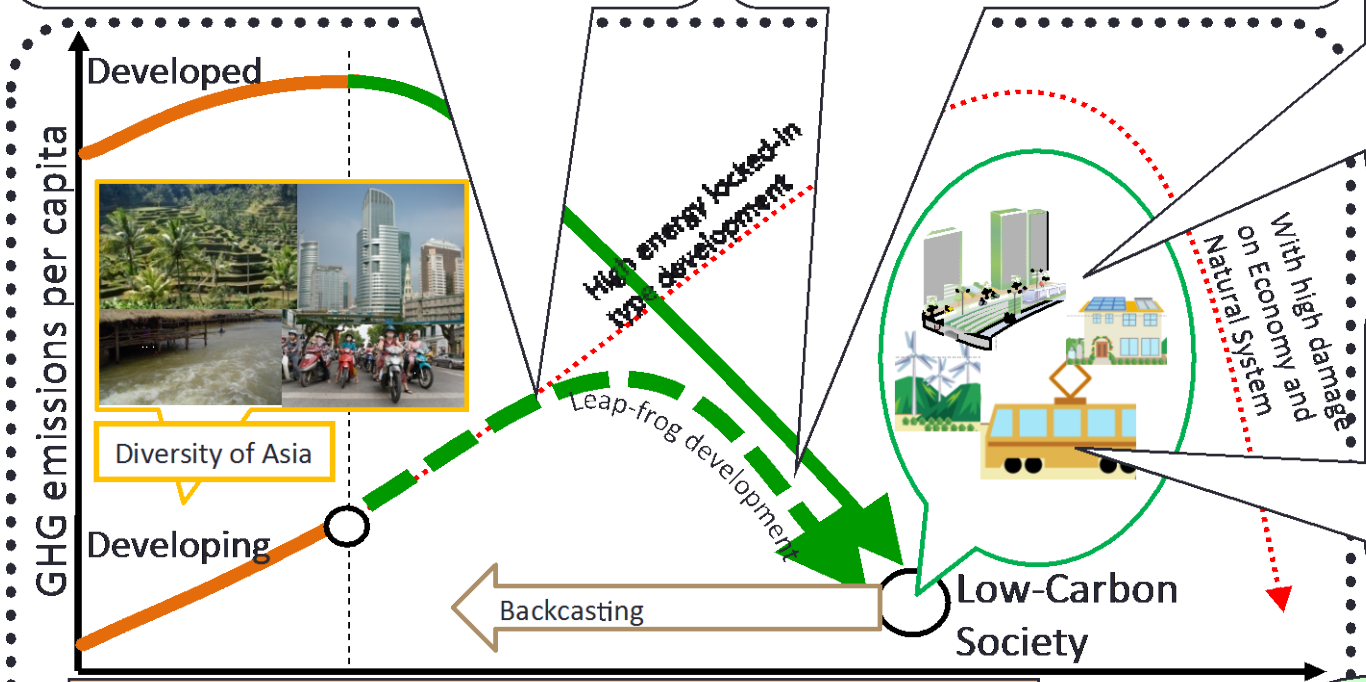
Institutional design for international cooperation, regional regime, etc.

Sustainable resource management

- Constructing material accounts
- Low-Carbonization through improvement resource productivity and material recycle

LC Transportation

- Low-Carbon City with LC transport system
- Grand design for future transport system



Development of Asia LCS Scenarios

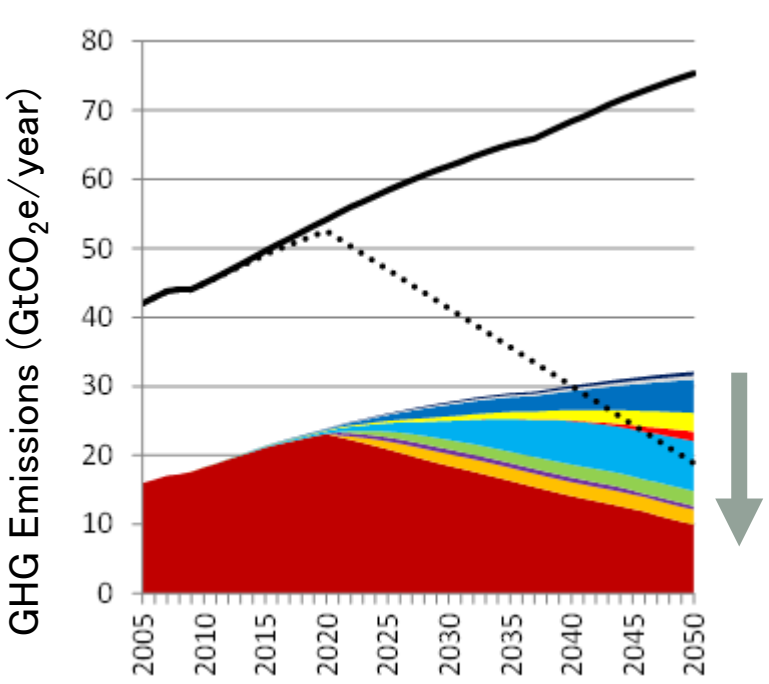
(1) Depicting narrative scenarios for LCS
(2) Quantifying future LCS visions
(3) Developing robust roadmaps by backcasting

Policy Packages for Asia LCS

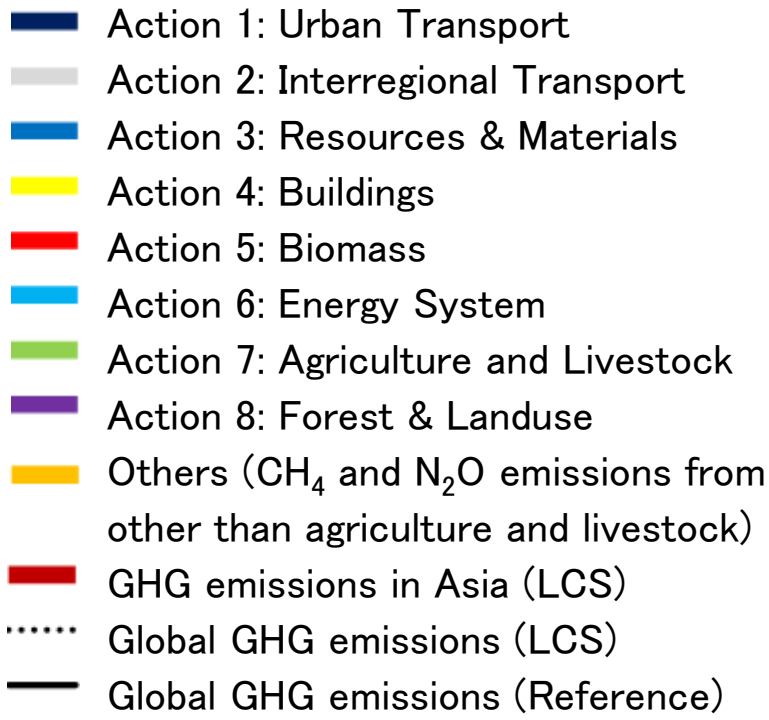
- Encouraging in framing for LC policy in each Asian countries
- Assistance for international negotiations with scientific basis
- Approaches for int'l LCS activity framework
- Networking among LCS research in Asia

There is potential to reduce GHG emissions by 69% compared to the reference case in Asia

- The global emissions will become 1.8 times larger compared to the 2005 level and emissions in Asia will be doubled under the reference scenario.
- It is feasible to reduce GHG emissions in Asia by 69% by introducing ten actions and Others (CH_4 and N_2O emissions from other than agriculture and livestock) appropriately compared to the reference scenario in 2050.



GHG emissions in Reference and LCS scenarios



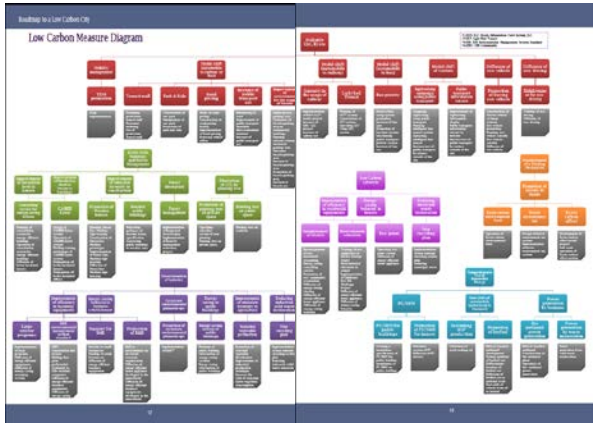
Note: Action 9 and Action 10 affect GHG emission reduction indirectly.

Next Step of LCS Study: How to Mobilize People and Society?

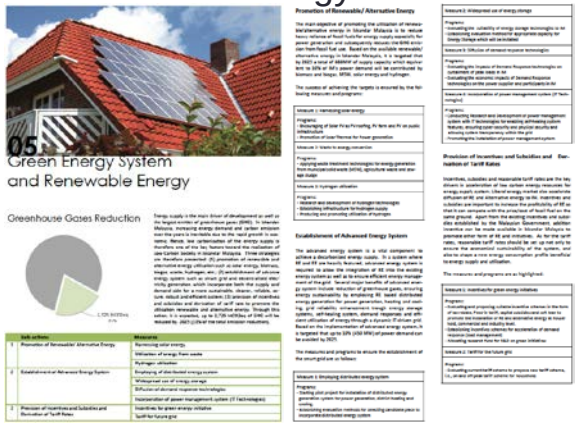
- Transition to the LCS is not an easy task – it is vital to gain the cooperation of a wide range of stakeholders, including policy makers, international aid agencies, private companies, local communities and NGOs.
- In order to mobilize people and society, "Realization of issues and revealing clear answers" are key for getting their continuous concern for achieving LCS.
- Stakeholders are concerned with LCS scenarios and actions in their own region/city/district.

Designing Regional/City LCS Scenarios and its Implementation Strategy

Example of LCS Strategy of City-scale: Kyoto-city



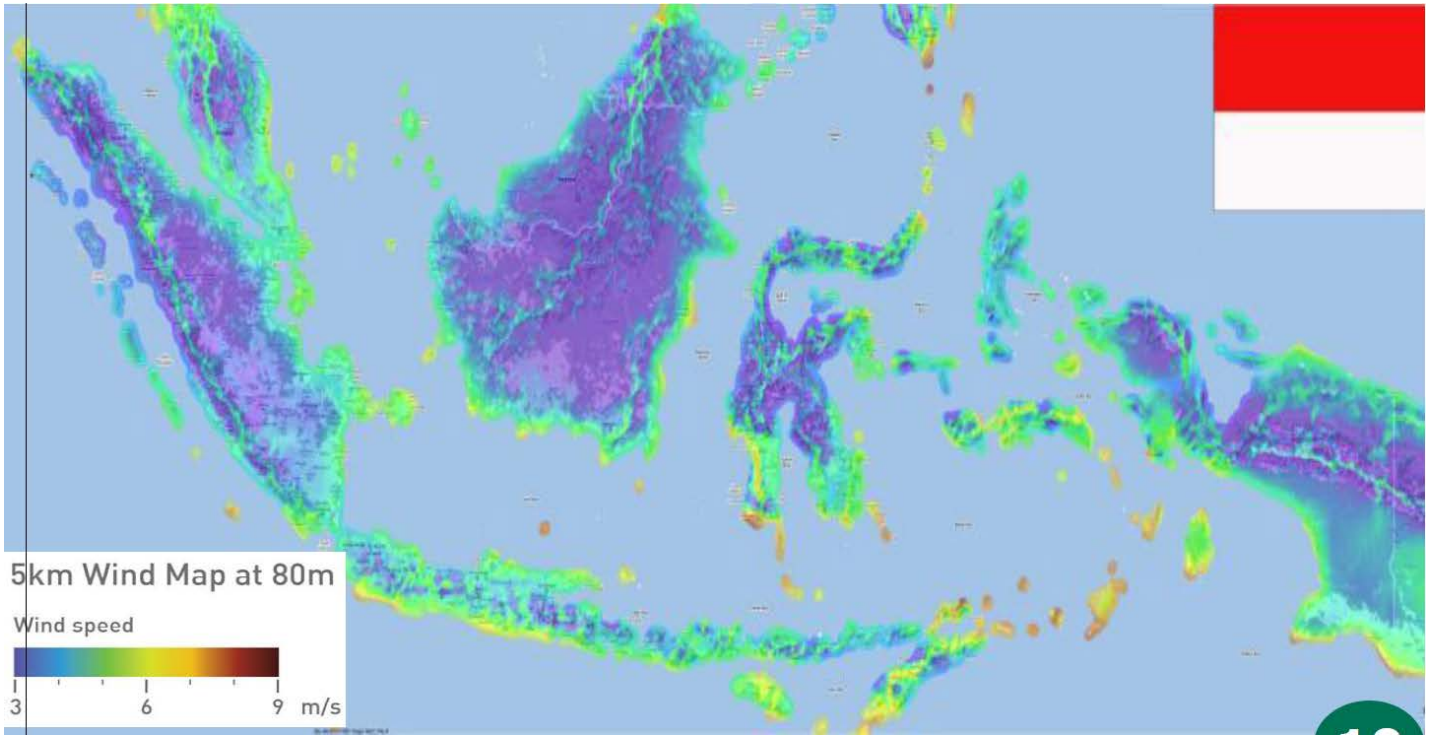
Example of LCS Building Design and its Implementation Strategy: Iskandar Malaysia



Methodology for Designing Regional/City LCS Scenarios: New Paradigm should be proposed

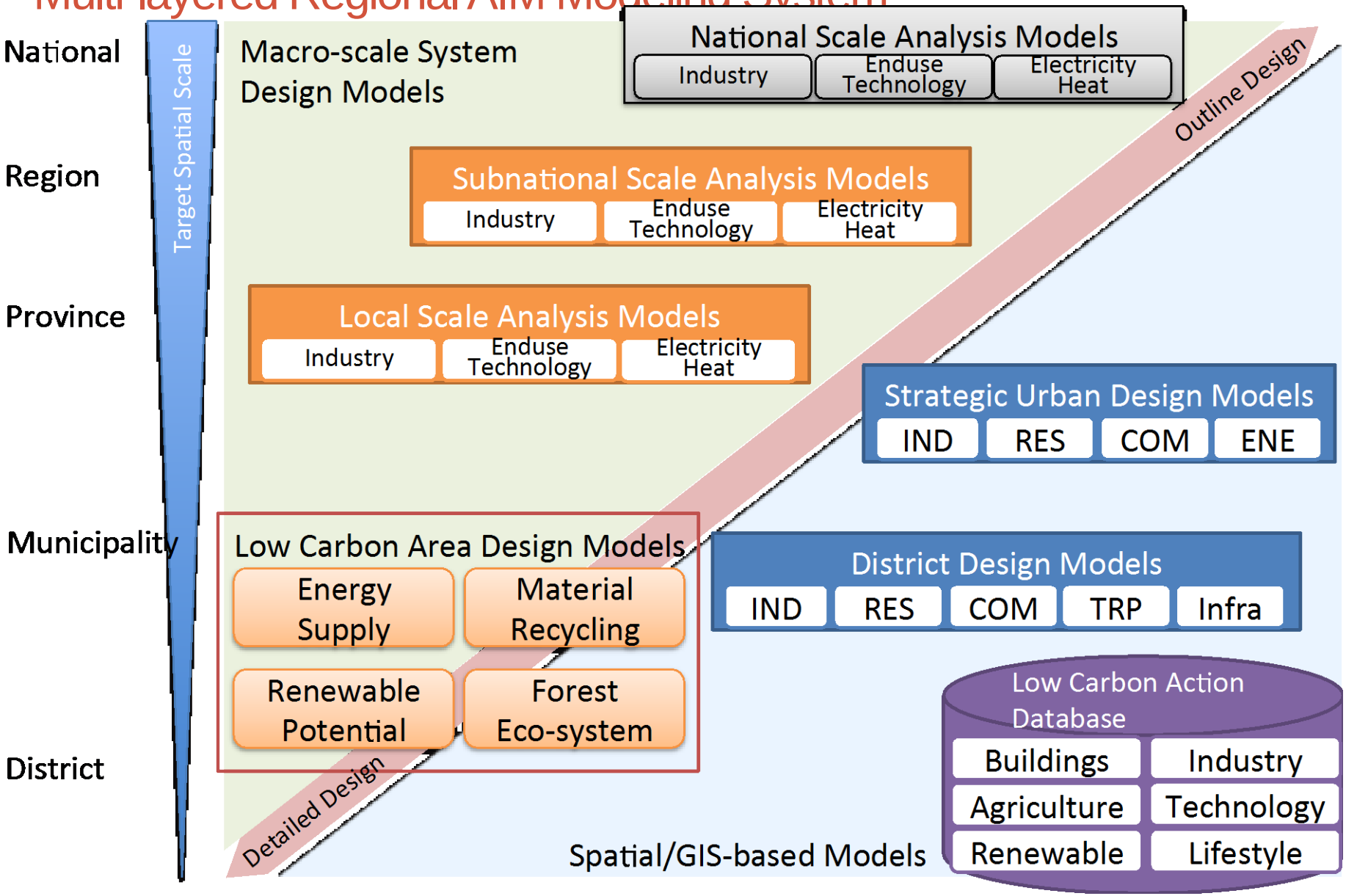
- Region/Subnational is *NOT* miniature version of national situation.
- Regional characteristics should be considered for designing regional/city low carbon society scenarios.

Example: Wind situation differs island and island, and area by area.



Source: http://energy-indonesia.com/03dge/Soeripno%20Martosaputro.pdf

Approach for Designing Regional/City LCS Sceanarios: Multi-layered Regional AIM Modeling System

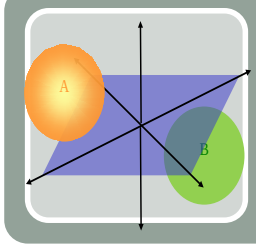


Methodology for Designing LCS Scenarios and Actions

Process

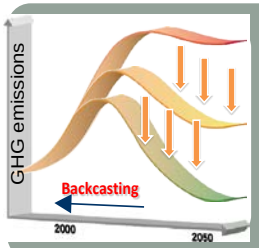
Information and Data Collection

- **Formulating GHG Inventory**
- Identification of data sources
- preliminary data formation



Synthesis and Preliminary Analysis

- Information collection for present practices and policies



Modeling and Analysis

- Development of storylines
- Quantification scenarios

Developing LCS Action Plan

- Quantification of LCS action plans
- Development of roadmaps

Objectives/Outputs

- Identify emission reduction potentials and its co-benefit
- Estimate the cost of policy measures
- Provide incentives for use of innovative technologies
- Prioritize investments
- Promote behavioral and lifestyle changes
- Monitor performance

Situation around Regional/City GHG Inventory from viewpoint of Energy Balance Table

- IEA annually releases Energy Balance Tables for OECD/Non-OECD Countries (OECD: 1960-2012, Non-OECD: 1971-2012).

- In Japan, Agency for Natural Resources and Energy (ANRE) releases national energy balance table from 1953-2013.
- ANRE also releases energy balance tables for prefecture from 1990 to 2011.
- For regional/city scale, we have some experience in Higashi-matsushima (2013), Kuwana (2013), Tome (2009), Kooriyama (2007), Joetsu (2006) and so on.

- Japan has some regional/city energy balance table – but not enough for designing regional/city low carbon society scenarios in the whole country.
- Situation is exactly similar for other Asian countries.

Establishing methodology for estimating/formulating regional/city Energy Balance Table (and GHG inventory) is essential for designing LCS Scenarios in such area.

Estimation Step for Regional/City Energy Balance Table (1)

Basic Idea: Proportional Distribution by using Statistics

Breakdown

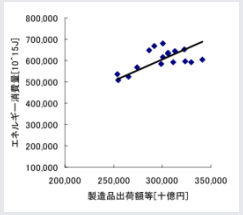
Manufacturing	Non Manufacturing	Commercial	Residential

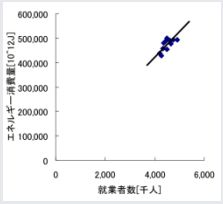
National Energy Statistics

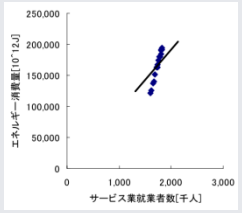
Collection of Individual Company Info

Proportional Distribution based on Economic Activity Index

Proportional Distribution by Households



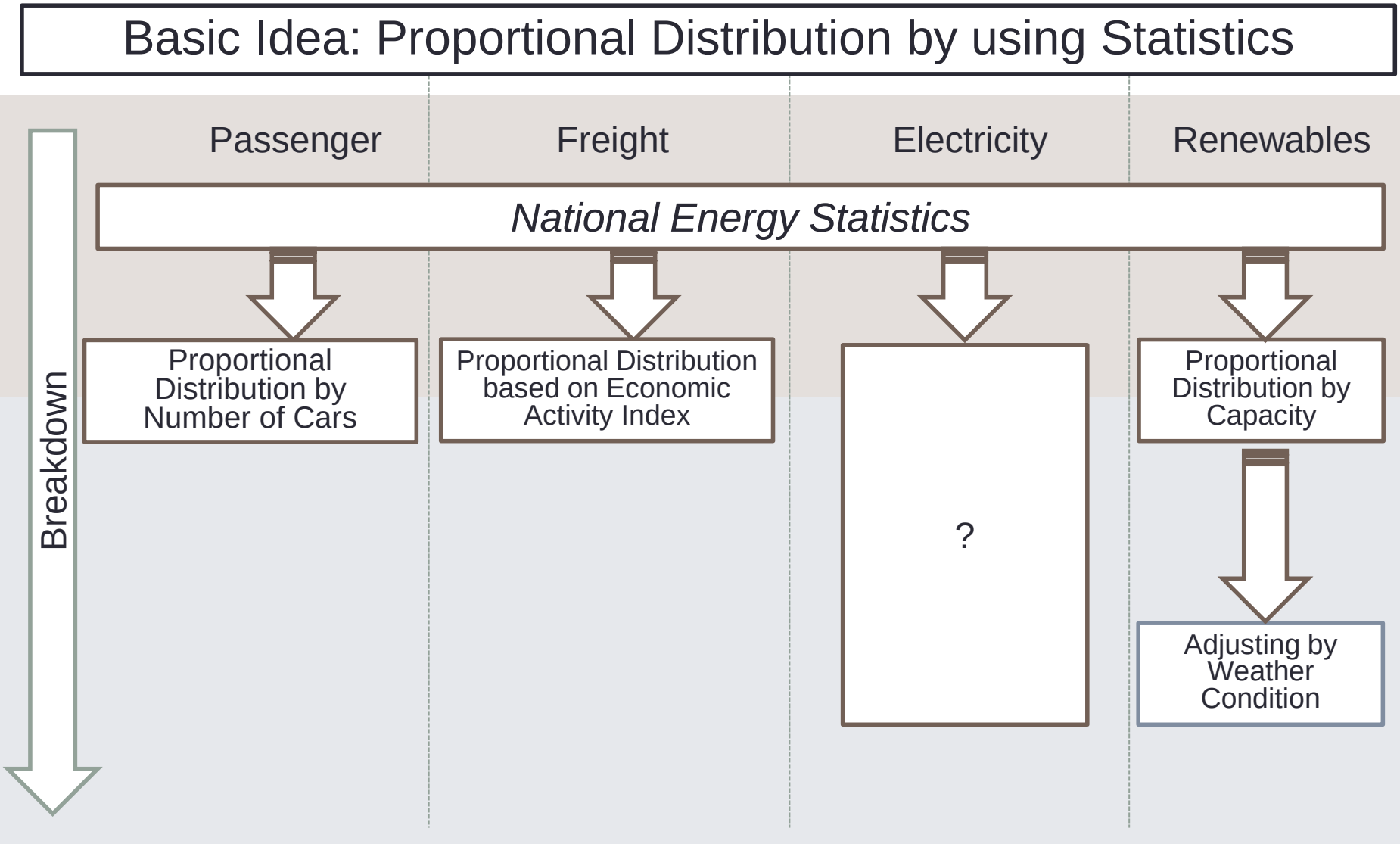




Adjusting by Labor Force

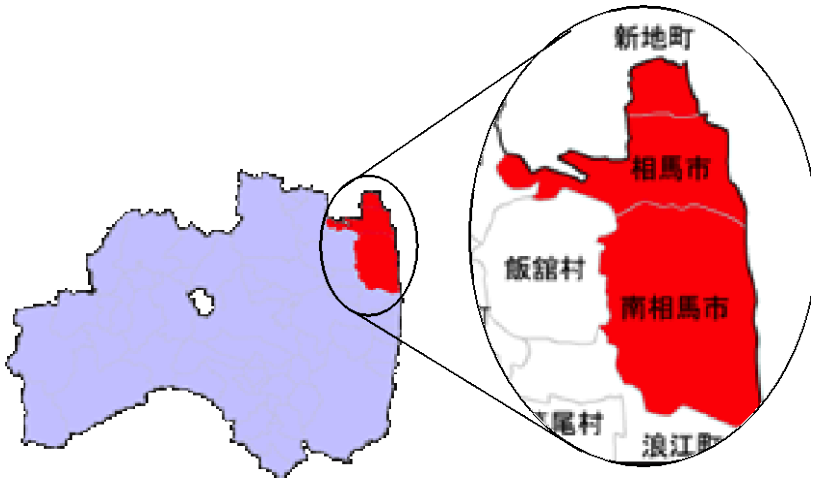
Adjusting by Weather Condition

Estimation Step for Regional/City Energy Balance Table (2)



Regional/City LCS design experience: In Japan and Asia

- Japan: So-so area in Fukushima prefecture
  - South part of the area are connected to Fukushima Daiichi Site
  - Target year: 2050
- Asia: Iskandar Malaysia
  - Just north of Singapore
  - Target year: 2025



FLAGSHIP A
JOHOR BAHRU CITY CENTRE
- Central Business District (CBD) as heritage and cultural city
- Customs, Immigration and Quarantine Complex (CIQ)
- Johor – Singapore Causeway

FLAGSHIP B
NUSAJAYA
- Kota Iskandar
- EduCity
- Medical Park
- International Destination Resort
- Southern Industrial & Logistics Clusters (SILC)
- Puteri Harbour

FLAGSHIP C
WESTERN GATE DEVELOPMENT
- Port of Tanjung Pelepas (PTP)
- Tanjung Bin Power Plant
- 2nd Link Access to Singapore
- RAMSAR World Heritage Park
- Tanjung Piai – Southernmost Tip of Mainland Asia
- Maritime Centre

FLAGSHIP D
EASTERN GATE DEVELOPMENT
- Tanjung Langsat Industrial Complex
- Johor Port
- Tanjung Langsat Port
- Pasir Gudang Industrial Park

FLAGSHIP E
SENAI-SKUDAI
- Senai Airport City
- Senai High-Tech Park
- Sedenak Industrial Park
- MSC Cyberport City
- Johor Technology Park
- University Technology Malaysia (UTM)

(Iskandar Regional Development Authority)

Experience in IM: National vs. Iskandar Malaysia

Malaysia LCS Scenario

	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

Iskandar Malaysia LCS Scenario

	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

Example of Estimation: Energy Consumption in Industrial Sector

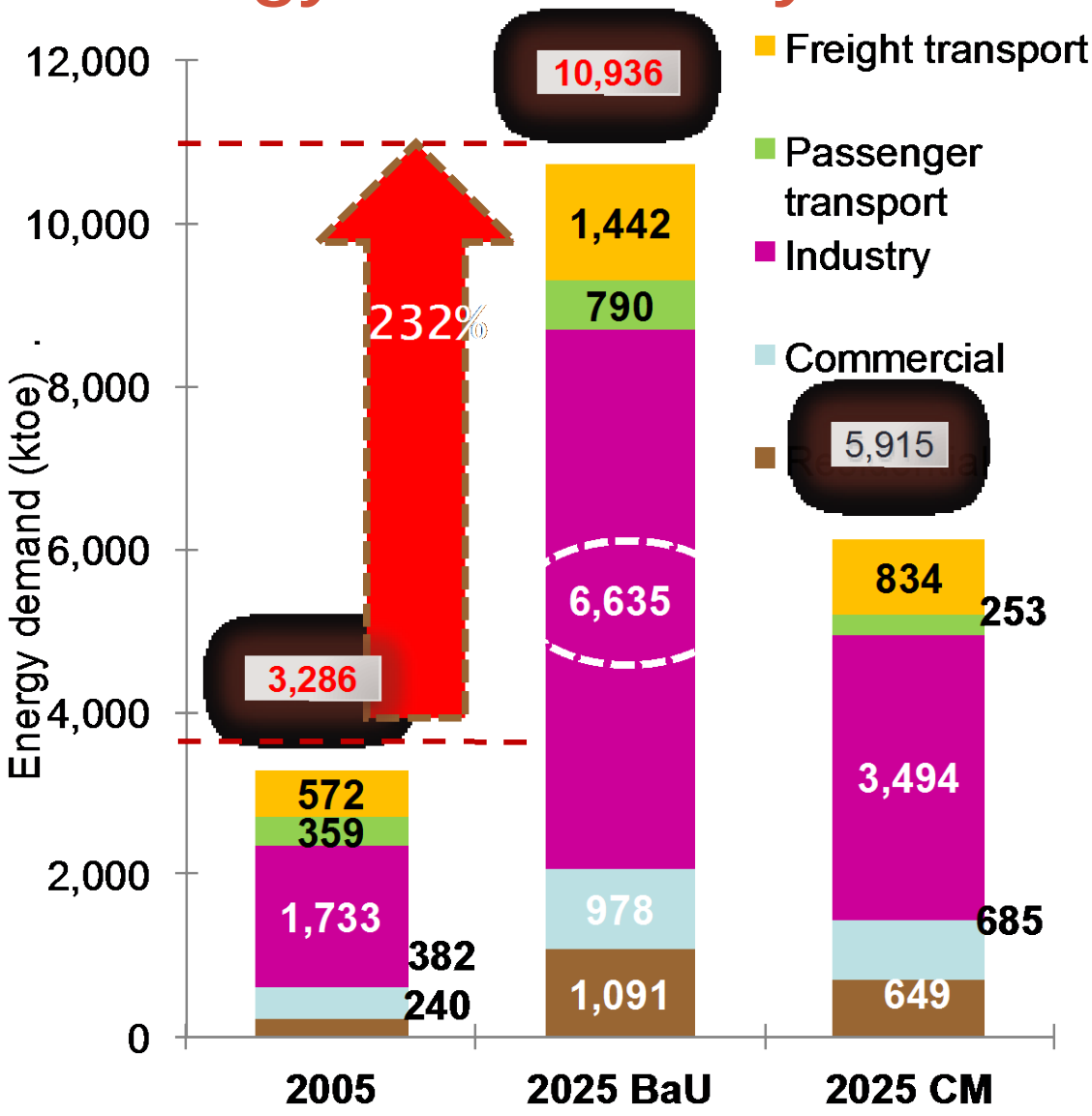
Energy consumption for each industry in IM

= Energy consumption for each industry in Malaysia

* Value of gross output for each sector in IM

/ Value of gross output for each sector in Malaysia

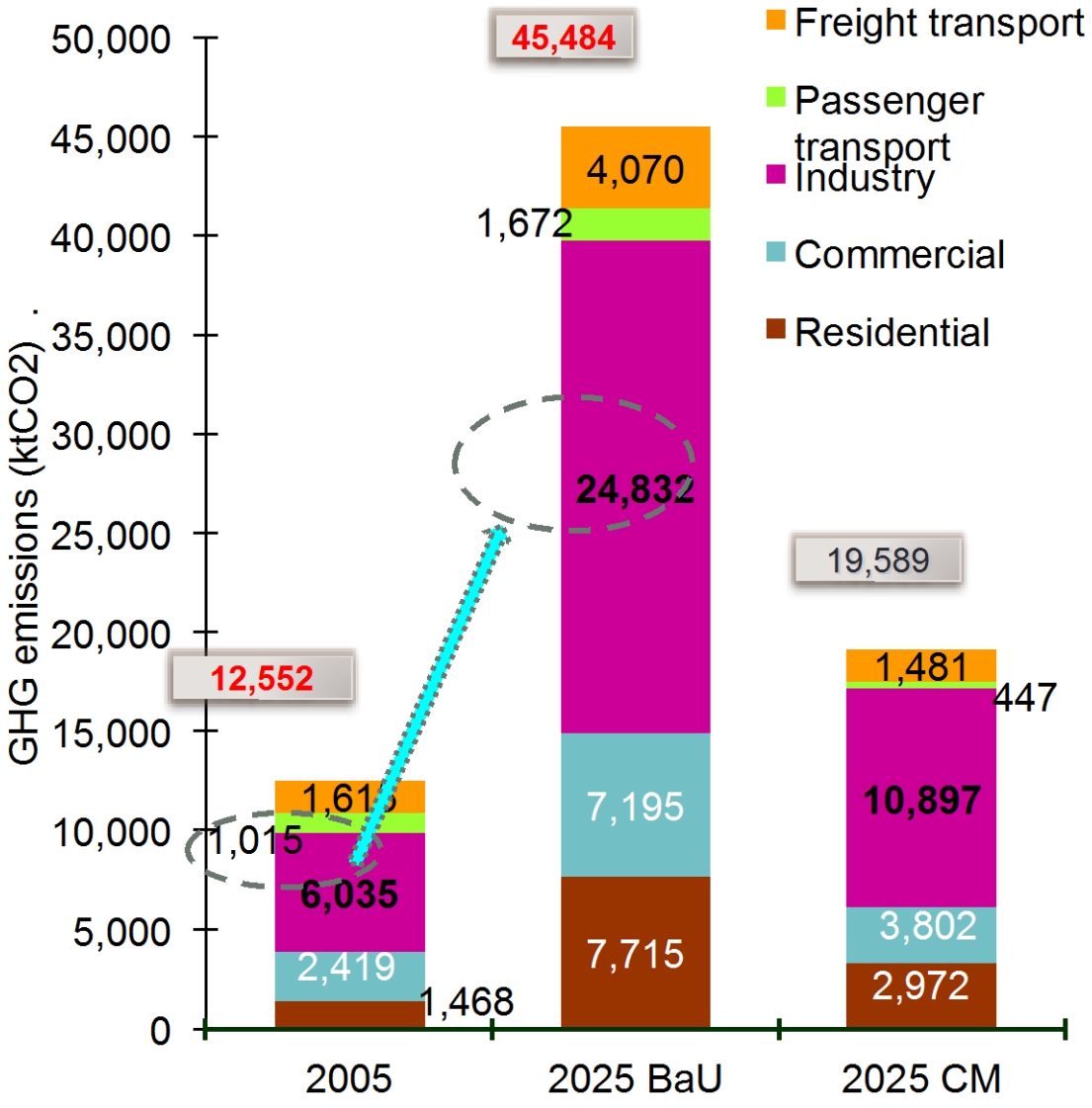
Energy Demand by Sector in IM



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 Projection in Iskandar Malaysia



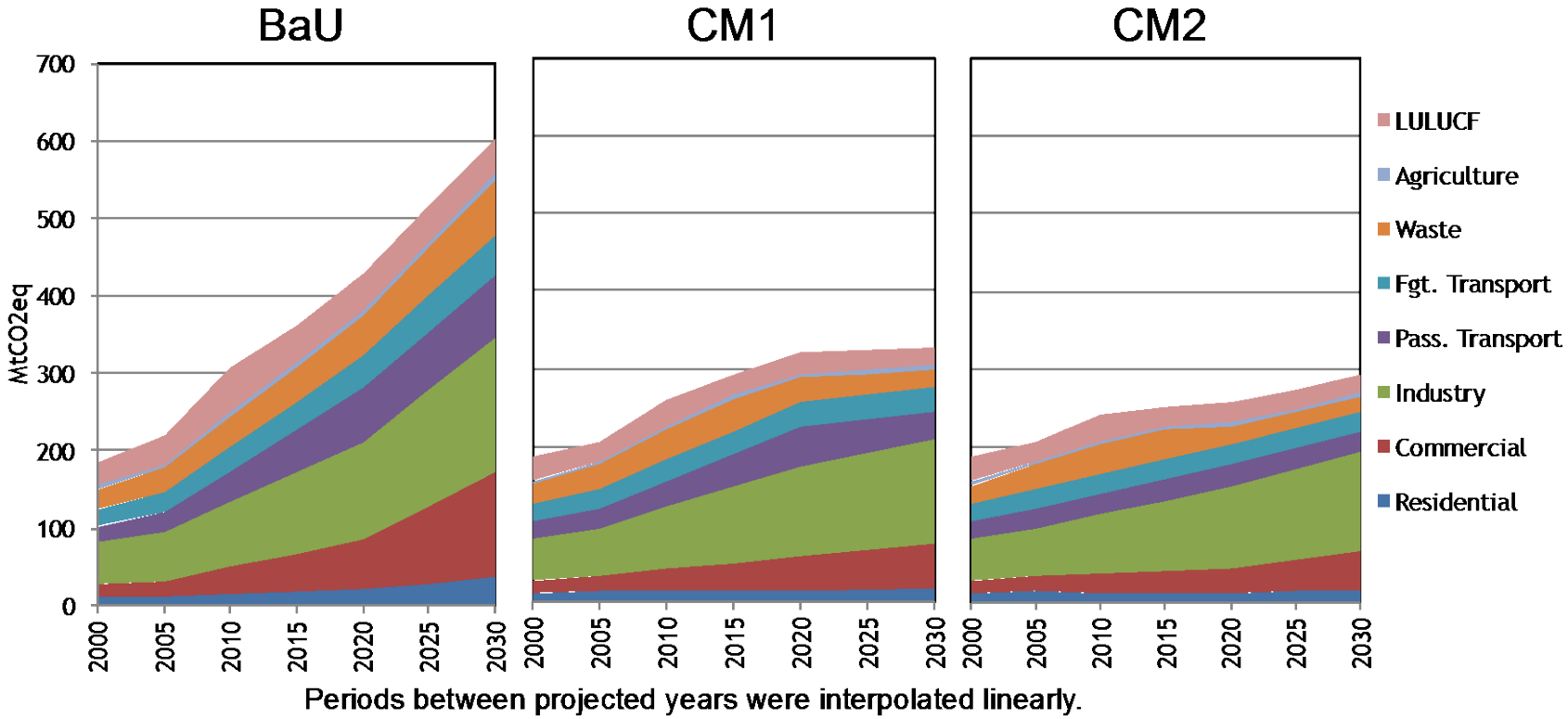
GHG Emissions in IM are projected to increase from 12,552 ktoe CO_2 (2005) to 45,484 ktoe CO_2 (2025 BaU)

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

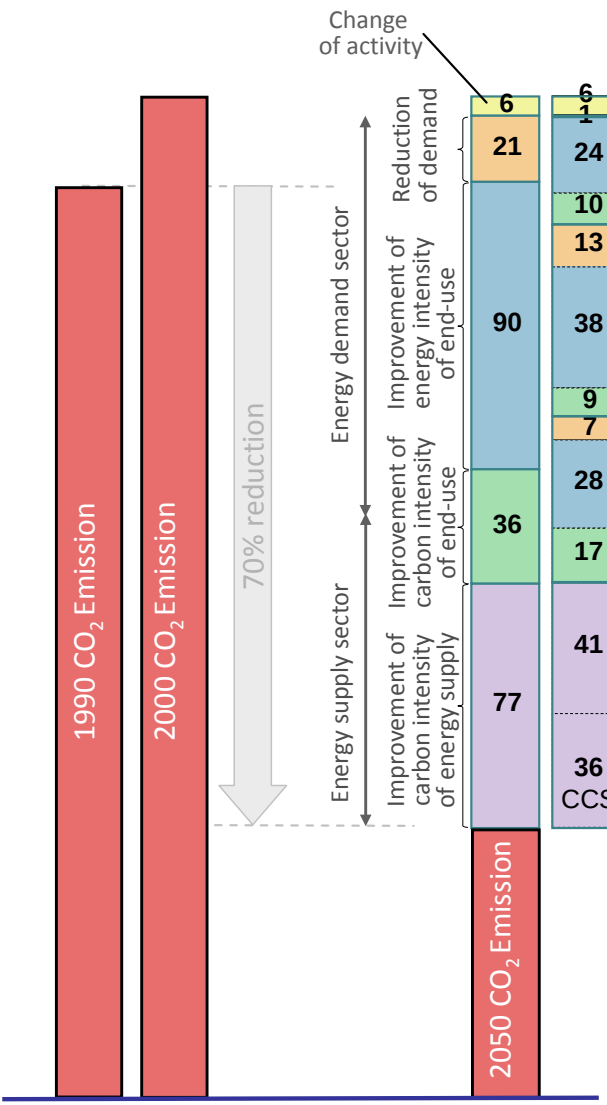
GHG emissions per capital : 9.3 tonnes of CO_2 /capita (2005) to **15.1 tonnes /capita (2025 BaU), with CM will be reduced to 6.5 tonnes of CO_2/capita.**

GHG Emission Projection in Malaysia

- Energy has the largest contribution in both scenarios in all years.
- In BaU scenario, GHG emission increased by 96% (2020) and 175% (2030) from 2005
- In CM1 scenario, it was reduced by 26% (2020) and 45% (2030) from BaU, in CM2, 40% (2020) and 51% (2030).



Experience in Japan: National Vision
GHG 70% reduction in 2050 Scenario A: Vivid Techno-driven Society



Change of activity
- High economic growth, Increase of service demand per household, Increase of office floor (increase)
- Servicizing of industry, Decline in number of households, Increase of public transportation (decrease)

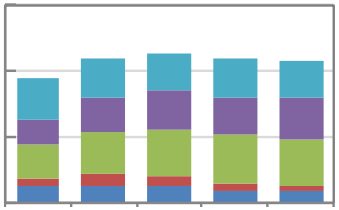
Industry
- Reduction of service demand
- Improvement of energy intensity
- Improvement of carbon intensity
  - Farm products produced and consumed in season
  - Fuel switch from coal and oil to natural gas

Residential & commercial
- Reduction of service demand
  - Insulation
  - Energy use management (HEMS/BEMS)
- Improvement of energy intensity
- Improvement of carbon intensity
  - Efficient heat pump air-conditioner, Efficient water heater, Efficient lighting equipment
  - Development and widespread use of fuel cell
  - All-electric house
  - Photovoltaic

Transportation
- Reduction of service demand
  - Advanced land use / Aggregation of urban function
  - Modal shift to public transportation service
- Improvement of energy intensity
- Improvement of carbon intensity
  - Widespread use of motor-driven vehicle such as electric vehicle and fuel-cell electric vehicle
  - High efficiency freight vehicle
  - Improvement of energy efficiency (train/ship/airplane)

Energy supply
- Improvement of carbon intensity
  - Fuel mix change to low carbon energy sources such as natural gas, nuclear energy, and renewable energy
  - Effective use of night power / Electricity storage
  - Hydrogen (derived from renewable energy) supply
- Carbon Capture Storage
  - Power generation without CO2 emission
  - Hydrogen production without CO2 emission

Estimation of Final Energy Consumption in Soso Area

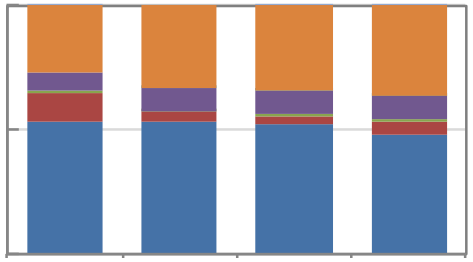


Reduction in energy consumption

Estimation of Fuel Consumption in Soso Area

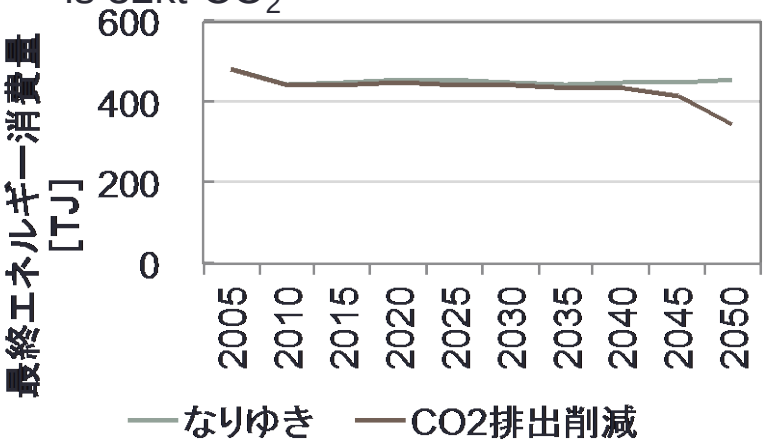
ndence to

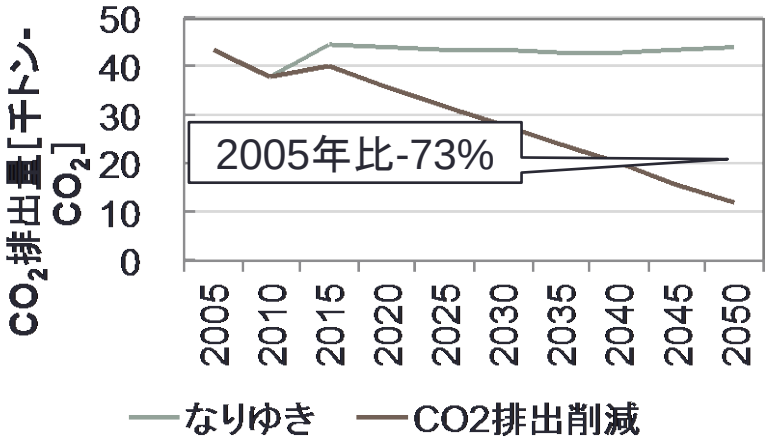
LPG



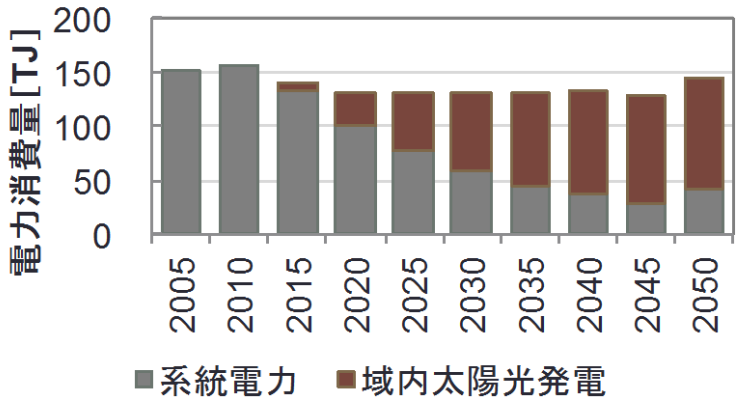
Low Carbon Scenario for Shinchi (1)

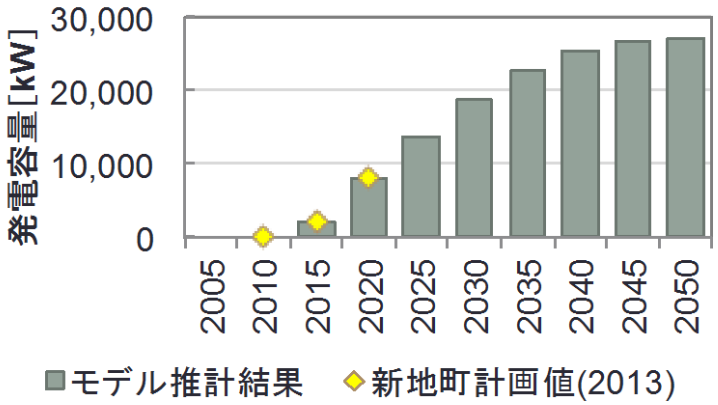
- Overview
  - Bau Scenario: Energy consumption and CO2 emission are almost same till 2050
  - LCS scenario: Reduction of energy consumption to 105TJ, CO2 emission reduction is 32kt-CO_2





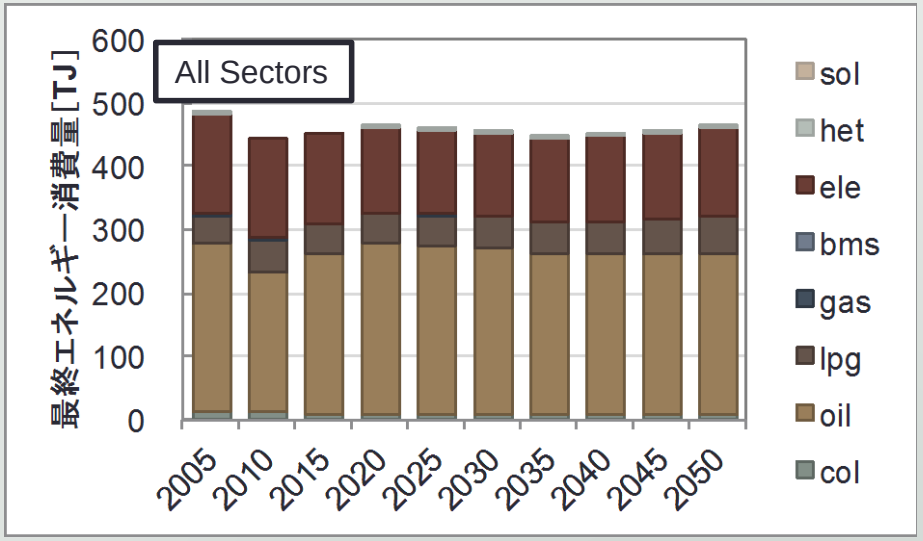
- Characteristics of energy supply in LCS scenario
  - In LCS scenario, PV covers 70% of electricity demands in 2050

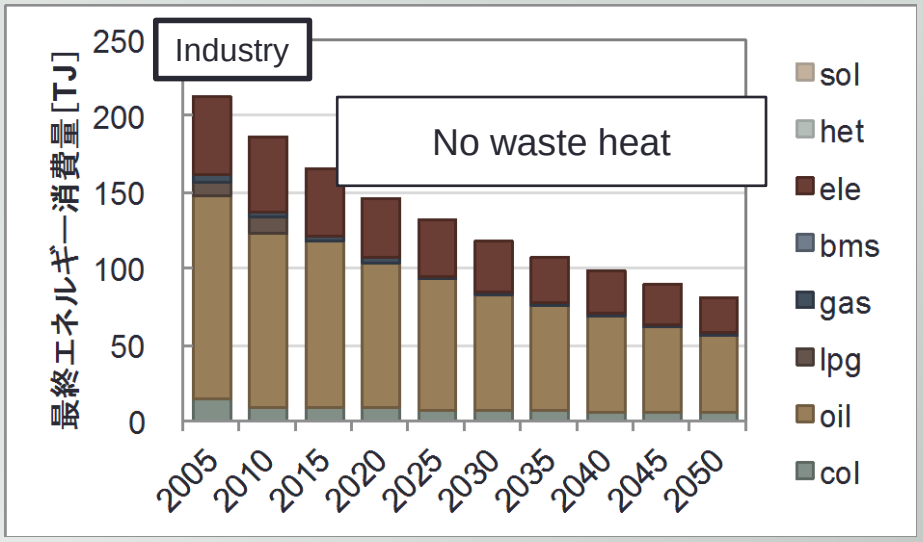




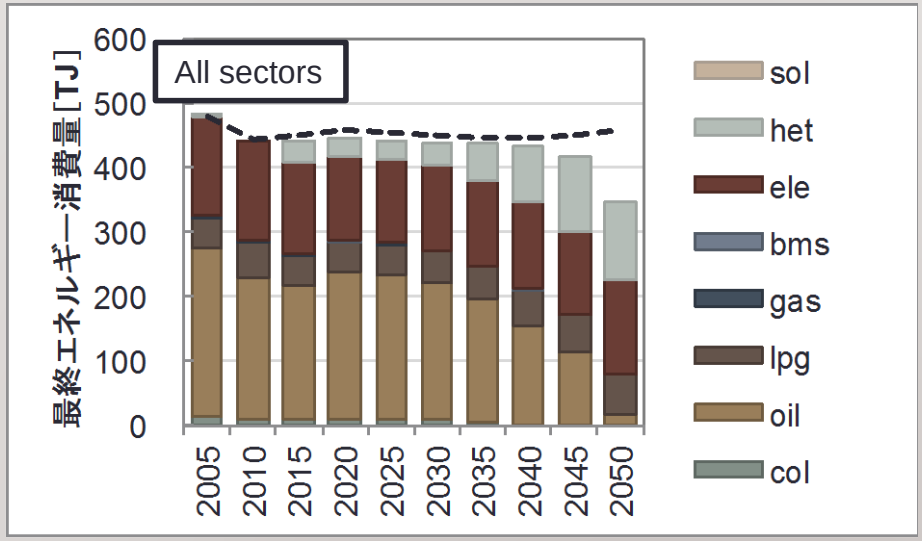
Low Carbon Scenario for Shinchi (2)

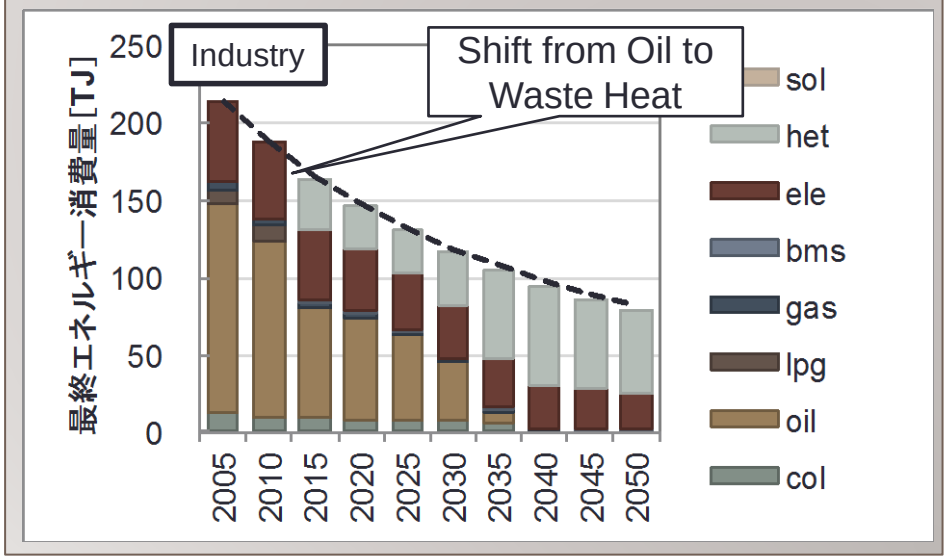
BAU scenario
Keep current situation till 2050





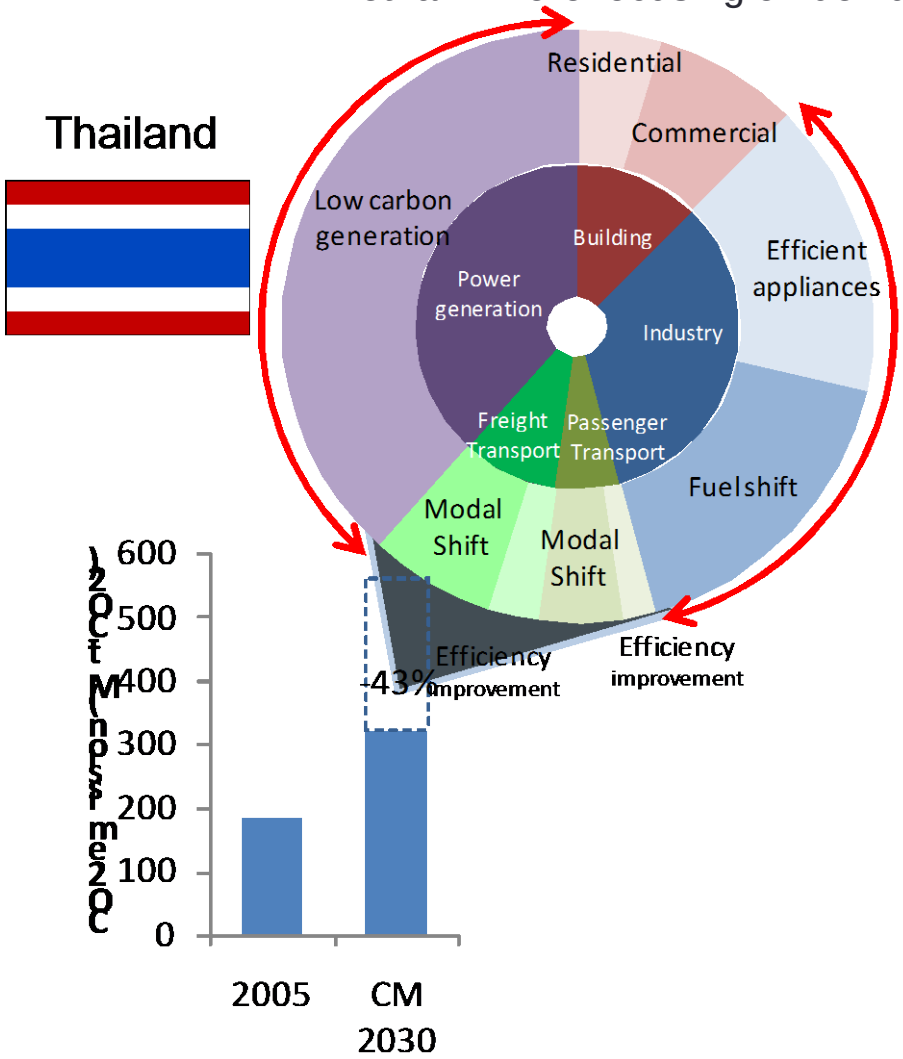
LCS scenario
Shift from Oil to Waste Heat and Electricity

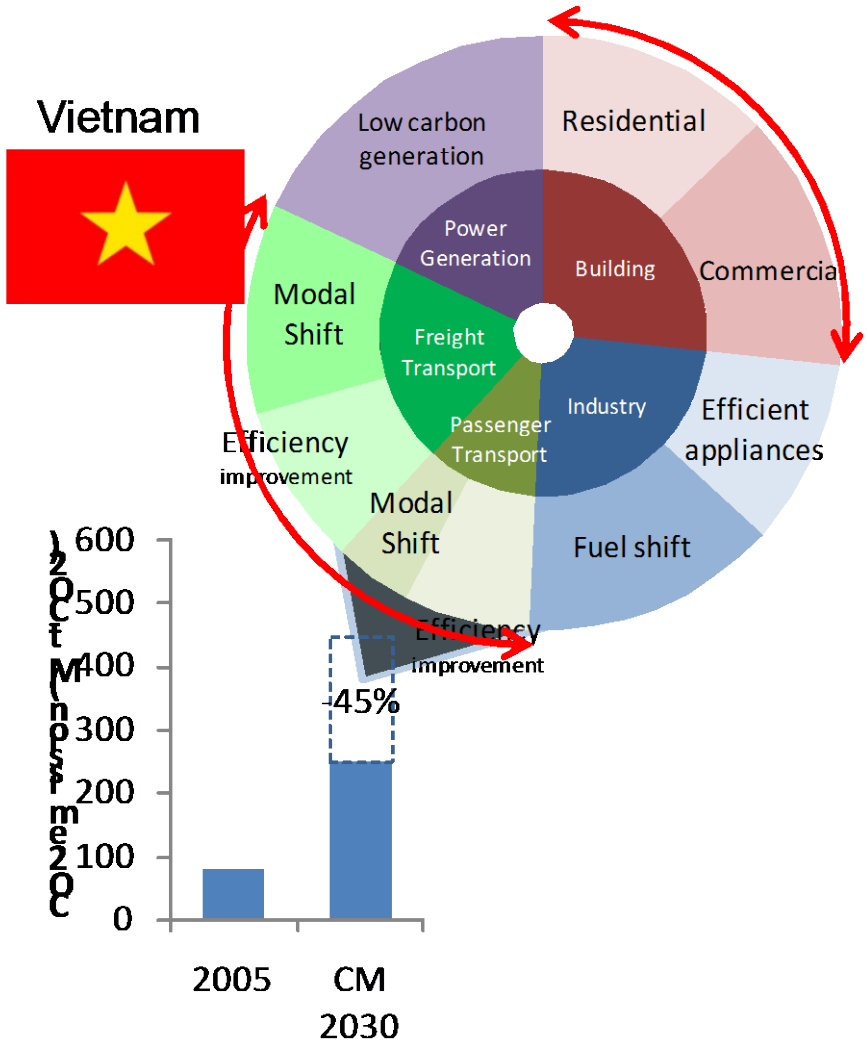




LCS scenario differs country/region/city

- Scenarios of each region vary in terms of combination of actions and their effects.
  Ex) Thailand: Higher reductions from power generation and fuel shift in Industry
  Vietnam: More focusing on demand side measures such as modal shift etc.





National and Subnational LCS Scenarios

Up to now, the AIM has been developed 8 national scenarios including Vietnam and 11 sub-national scenarios such as Kyoto, Shiga and Iskandar Malaysia.

Bridging Research to Policy

Policy makers
Central/regional government administration
Development Agencies
NGOs

Collaboration for LCS scenario development and building roadmaps

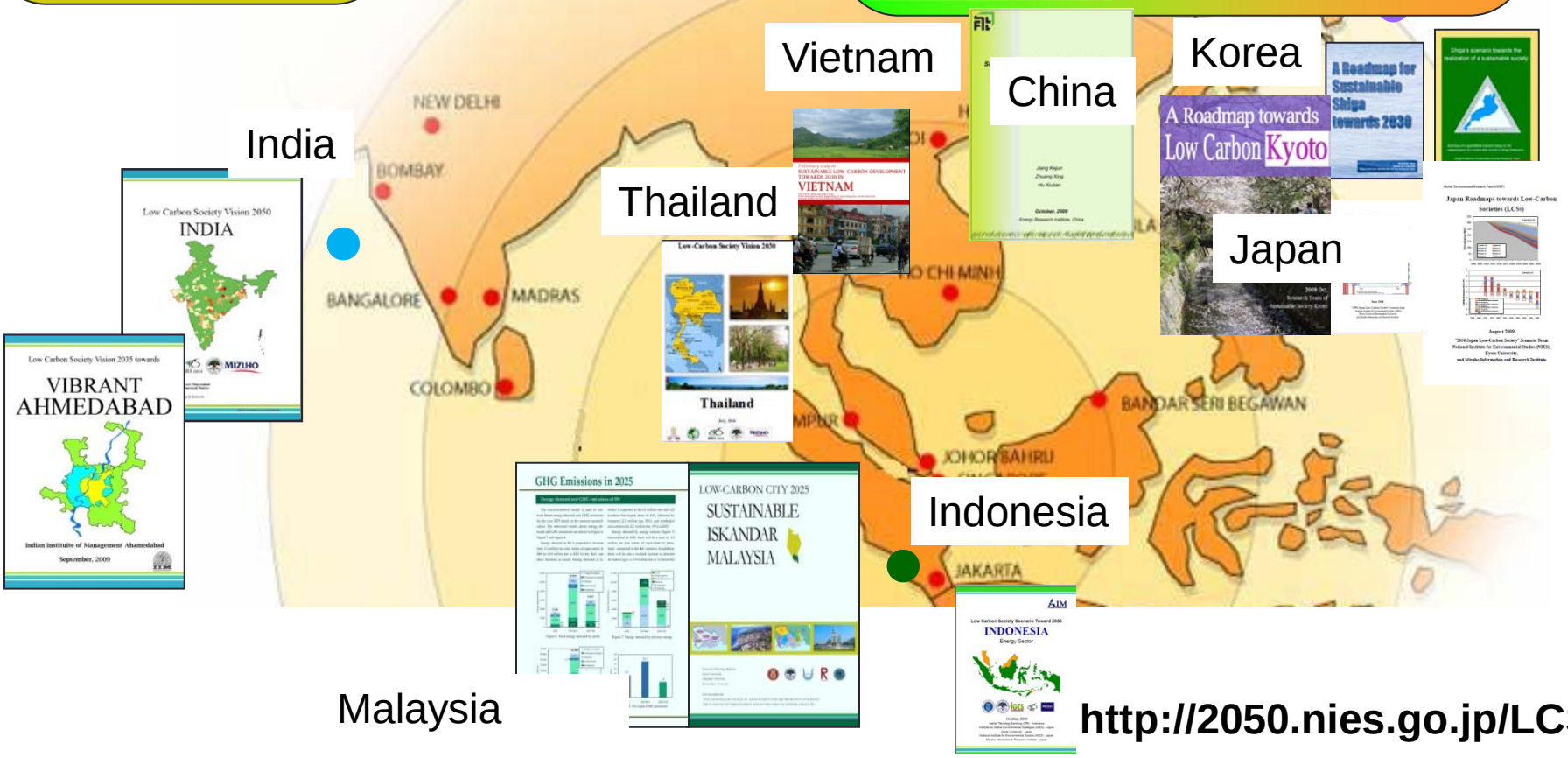
Request of more practical, realistic roadmaps and also tractable tools for real world

Each country's domestic/ local research institute

Core research members

Application and development to actual LCS processes

Development and maintenance of study tools/models



http://2050.nies.go.jp/LCS