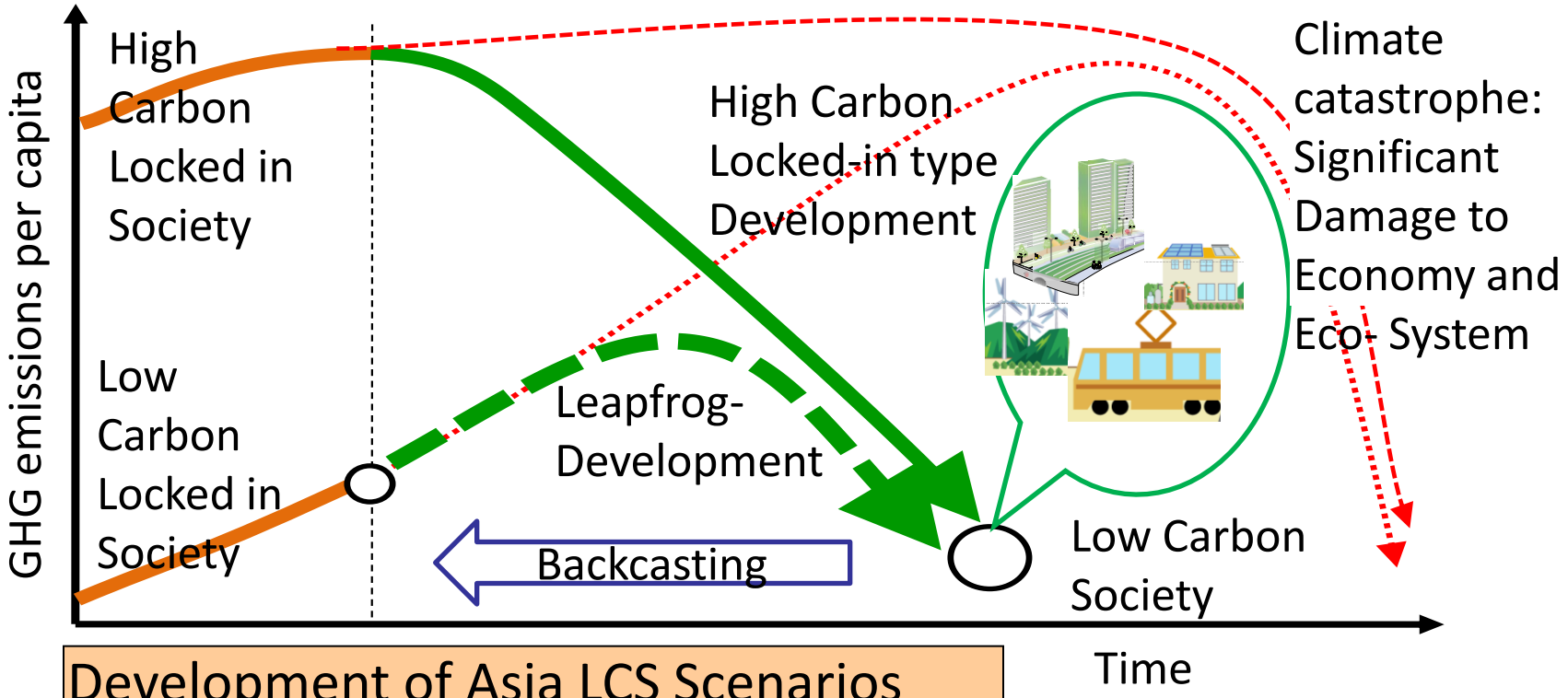
Low-Carbon Development (LCD) in Indonesia and Asia: Dialogues between Policymakers and Scientists on Green Growth (GG)

Low Carbon Development Scenario and Low Carbon Cities

Mikiko Kainuma
AIM Team

Bogor, 16th-17th February

"Asian Low-Carbon Society Scenario Development Study" (project leader: Mikiko Kainuma, FY2009-2013, funded by Global Environmental Research Program, MOEJ



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

1. Objective of the study

In order to realize Asian Low Carbon Societies, ...

1. We focus on domestic and international factors which control the realization of LCS,
2. Describe the development, accumulation, and deepening of factors which control LCS with multi-layered, spatial, and integrated quantification models/tools,
3. Apply quantification models/tools to whole Asian area and various regions in the Asia,
4. Taking account of regional distinctive diversified characteristics,
5. Cooperated with the policy options for other important problems of the Asian region in the 21st first half of the century,
6. And design positive Asian low carbon societies and roadmaps towards the LC societies with institutes in Asia with a back-casting methodology.

2. Background and necessity of the study

1. It is an urgent task to design Asian Low Carbon Societies and roadmaps towards them, considering multi-decades time range and their cross-disciplinarily nature.
2. Up to now, we have approached this problem with integrated assessment methodology, in which we proposed a systematic design methodology of future LCS and quantitative back-casting technique towards the designed future. We have applied this method to Japan's national level LCS development till 2050, with which emission reduction roadmaps were combined, using dynamic models of social/economic/ technical changes. We handled it as a social planning problem with high transparency.
3. Collaborating with each country's/region's research institutes, we explore the possibility to apply this approach to Asian region. By applying these tools we have developed, we anticipate to analyze national/regional and social/economic development modes, pathways towards LCS and other important issues.

3. What are the Asian Low Carbon Societies in the study?

By the middle of this century (2050), the target societies will satisfy the followings;

1. Harmonized with drastically changing future Asian society and economy,
2. complying with each country's national reduction target that consists with the global low carbon target, under the global, national and regional constraints on fossil and renewal energy resources, and land resource,
3. developing/devising/promoting LCS policies based on each region's characteristics,
4. and also utilizing effectively co-benefits of LCS policies and neighboring policies.

3.1: Harmonized with drastically changing future Asian society and economy

Rise and fall of the BRICs,
China's transformation to capitalism,
prosperity and stagnation in future India and other major powers,
future social and economic progress in Asia is full of high uncertainty, especially in the first half of this century.

Examples of Concern

Population explosion will nearly cease except South Asia region, and some countries population will start decreasing,

Rapid decrease of birth-rate and coming aged society will change people's lifestyle

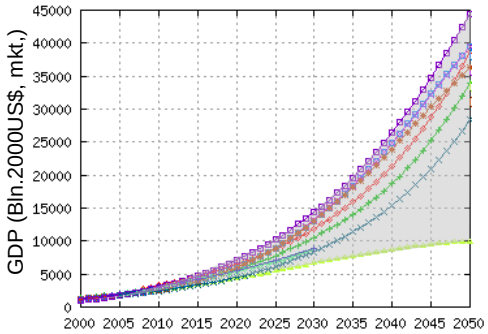
Dynamic and drastic transition of economic systems towards globalization

Rapid urbanization will still continue during next 50 years

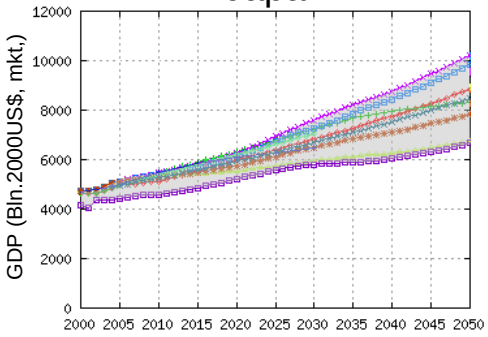
etc.

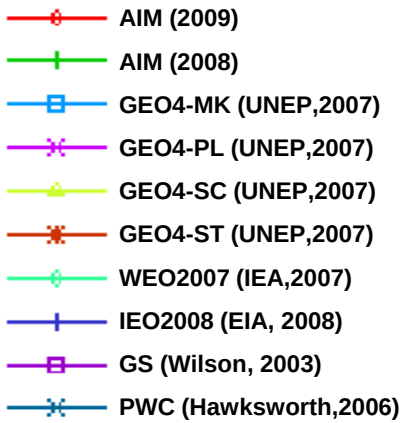
Previous studies reported very wide range of future prospects on Asian region

China

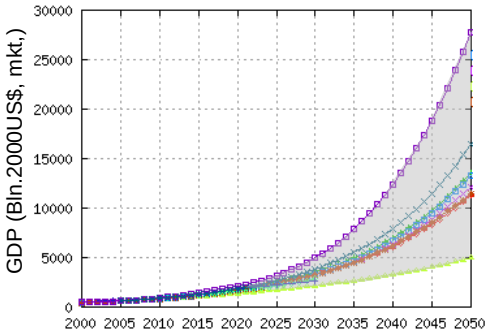


Japan

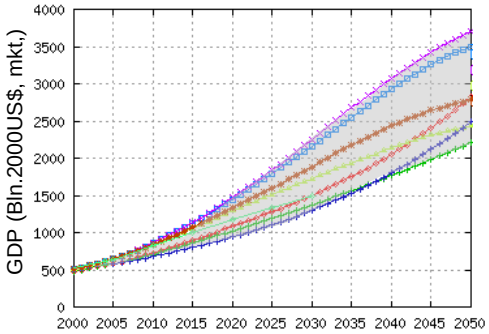




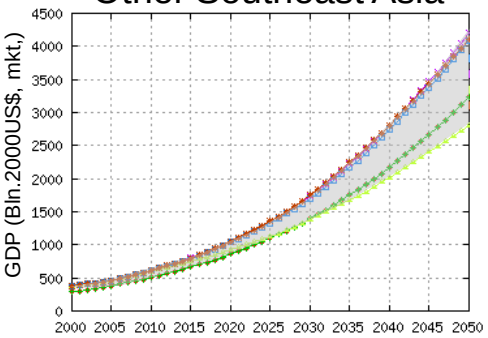
India



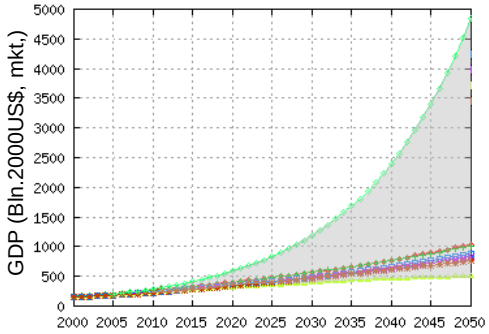
Korea



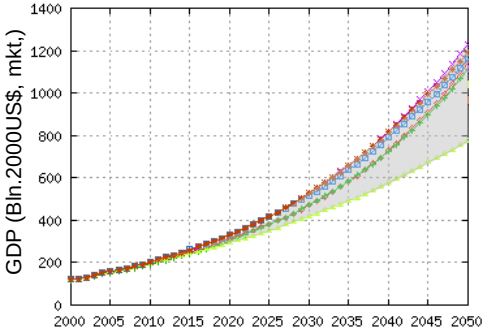
Other Southeast Asia



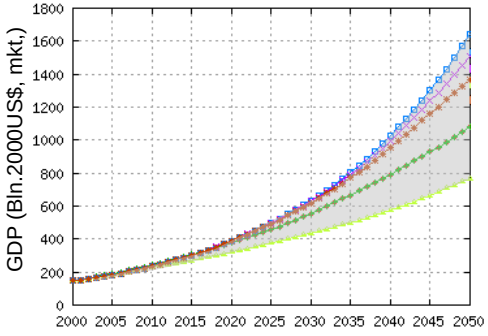
Indonesia



Thailand



Other South Asia



Asian LCS Study (2010)

3.2: Complying with each country's national reduction target that consists with the global low carbon target, under the global, national and regional constraints on fossil and renewal energy resources, and land resource

1. National targets of GHG emissions are analyzed with a long-term simplified dynamic CGE model coupled with a global climate module.
2. GHG emission, reduction potentials and their marginal costs are estimated with bottom-up type GHG emission models.
3. Depletion of oil resource, domestic and international commercial biomass, and the competition with agricultural production…
   All influence the realization of Asian low carbon societies.
4. Considering and integrating with other important issues which suffer the 21st century's Asia, such as human security, is a challenging issue of the study.

3.3: Developing/devising/promoting LCS policies based on each country's /region's characteristics

1. **Differences among countries' policies are caused by many factors.**
2. **For example, energy consumption structure and the role of the energy intensive industries in each country, demand of the energy intensive material, structure of material circulation in the society, amount of the carbon absorption potential such as forest's area, amounts of renewable energy production potential.**
3. **Various national level models will be applied and used to analyze these differences.**

Examples of Concern

Technological emission reduction potential in each country

Structures of energy demand are different country by country

Feasibility of renewable energy society

Leapfrogging to new rungs on the energy ladder, especially in residential sector

etc.

3.4: Utilizing co-benefits of LCS policies and neighboring policies effectively is essential

Strategies that enjoy co-benefits and subsidiary impacts will have to be examined quantitatively in the study.

Concerned issues are;

Ancillary benefits caused by LCS policies, such as acceleration of electrification rate and regional atmospheric environment

etc. …..

4. Modeling

Development, maintenance and application of multi-layered modeling system

---

Two groups of models and tools have been developed.

(1) Quantification tools encompassing various spatial scales and disciplines, operated complementary *e.g.* global, country, and regional (city) scales, economical, demographical, industrial, building, transportation systems, etc.

(2) Integration models/tools which link the above models towards low carbon society visions and roadmaps.

Manual of these models is available from http://www-cger.nies.go.jp/publication/I072/I072.html

Three integrated models/tools for developing LCS scenarios

- ***AIM/cge:*** One/multi-regional multi-sectoral static CGE model. Integration platform with which element models are soft-linked according to analytical objects.

- ***Extended snapshot tool (ExSS):*** A tool to designing social accounting matrices, energy balance tables, GHG emission and reduction tables of the target societies. Multi-regional static model.

- ***Back-casting model (BCM):*** A model for designing roadmaps towards low carbon societies. Dynamic optimization model.

5. Two stages of LCS scenario development

Stage one: Design of a Low Carbon Society

1. **Creation of narrative storylines of future Low Carbon Societies**
2. **Description of sector-wise details of the future LCSs.**
3. **Quantification of the Macro-economic and social aspects of the LCSs.**
4. **Identification of policy measures and packaging the measures**

Stage two : Construction of a policy roadmap toward the Low Carbon Society

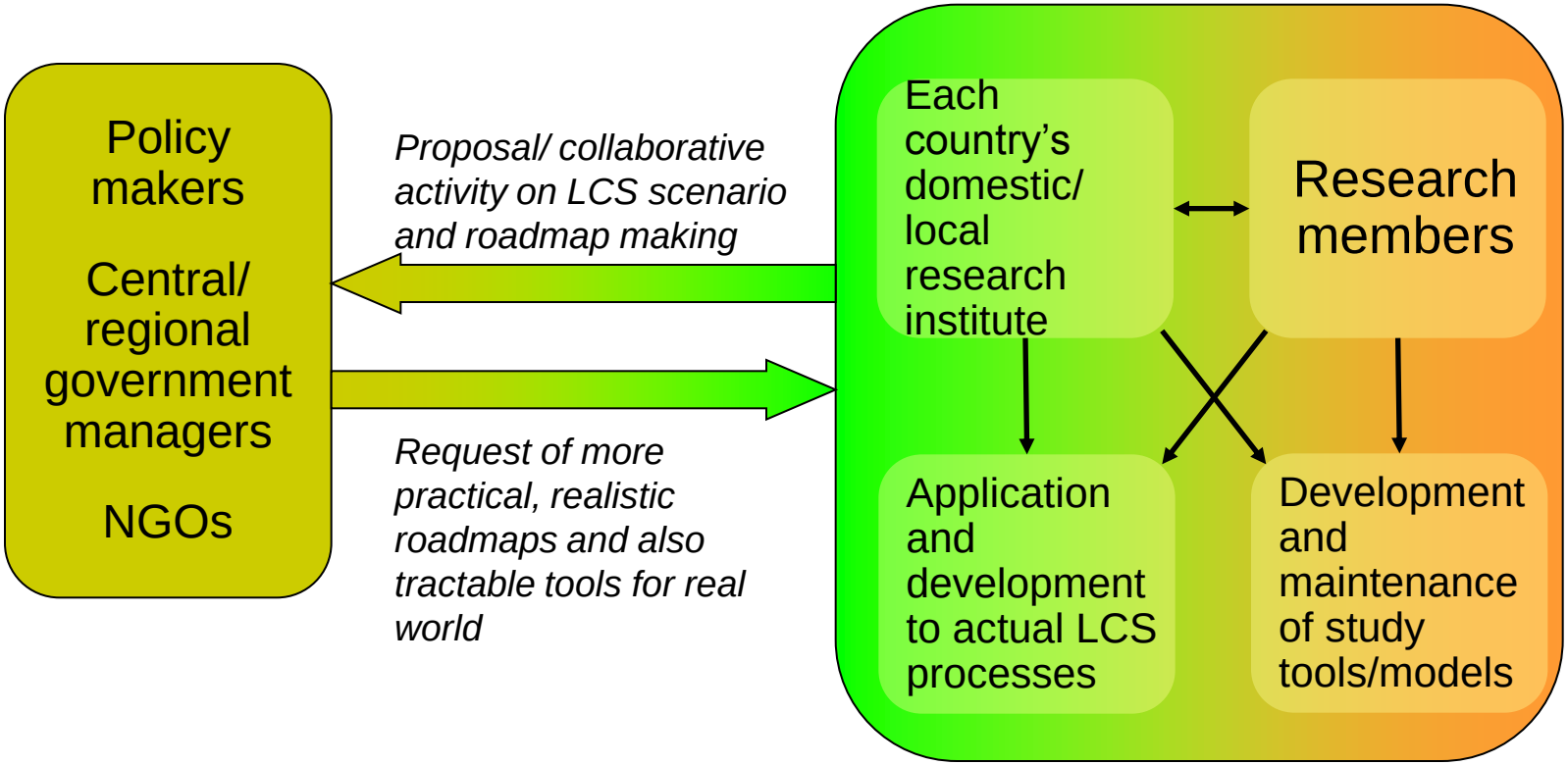
1. **Design of policy roadmaps toward the Low Carbon Society**
2. **Feasibility analysis of the roadmaps considering uncertainties involved in element policies**
3. **Analysis of robustness of the roadmap caused by societal, economical and institutional uncertainties and acceptability**

6. Additional/Related focused points in the study

In this study, with models, quantification and consolidation of the following points are also focused, and they are reflected in LCS development.

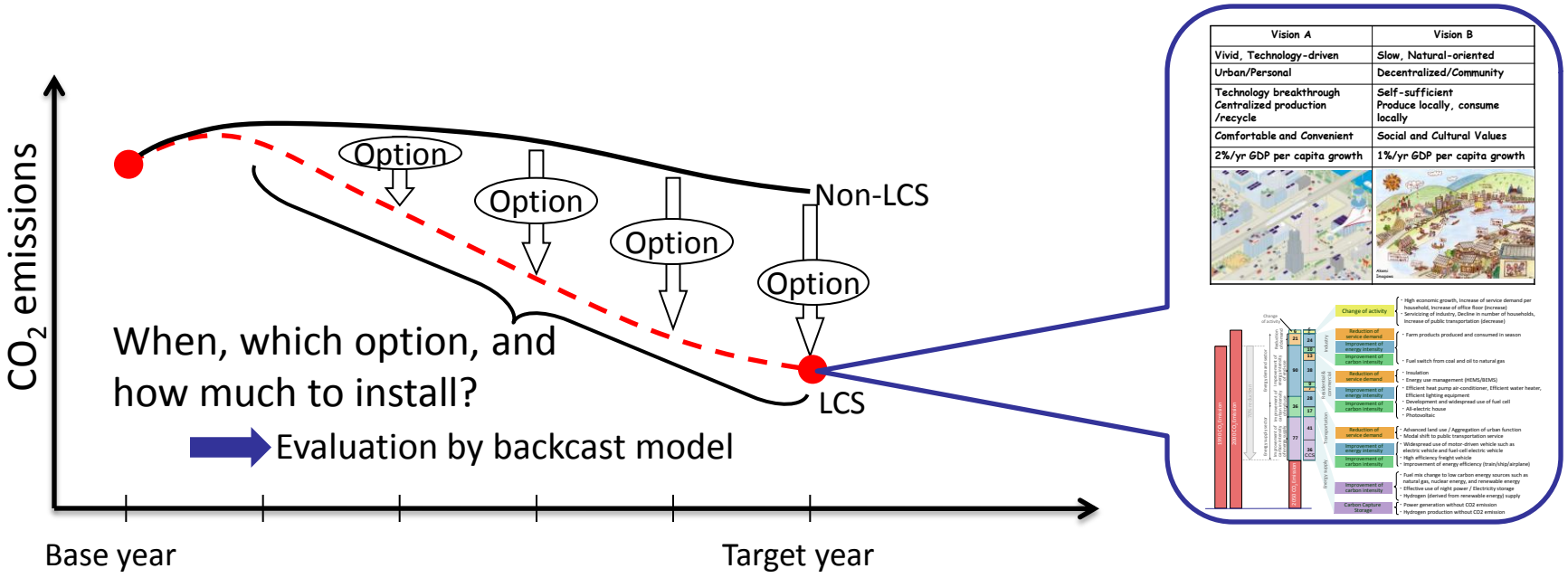
	Issues	Challenges
1	Accumulation and deepening processes of the next five capitals. 1) Energy infrastructure and technology, 2) Urban infrastructure, 3) Human capital, 4) Institution, 5) Social capital	How to integrated in LCS roadmaps wth engineering/ economic/ financial/ institutional rationality ?
2	Resolution of urban and rural disparity, energy-poverty nexus.	Realization of renewable energy society, and leapfrogging to new rungs on the energy ladder
3	Development and specialization of industrial structure, external dependency and vulnerability of the region.	Trend-breaking to new material/energy efficient, economicaly robust, and endogenously developing industrial system
4	Deployment of urban and inter-urban traffic systems.	How to realize comfortable Asian compact cities ?
5	Regional climate characteristics, building characteristics and lifestyle..	Harmonization and merging of appropriate life and building style, e.g. Asian vernacular habitation, modern highly insulated material intensive building, …
6	Potentials of renewable energy resources, and developments of their utilizing facilities.	Integration of natural conservation, regional tradition, renewable energy deployment, and energy security

7. How to deploy our study to real world



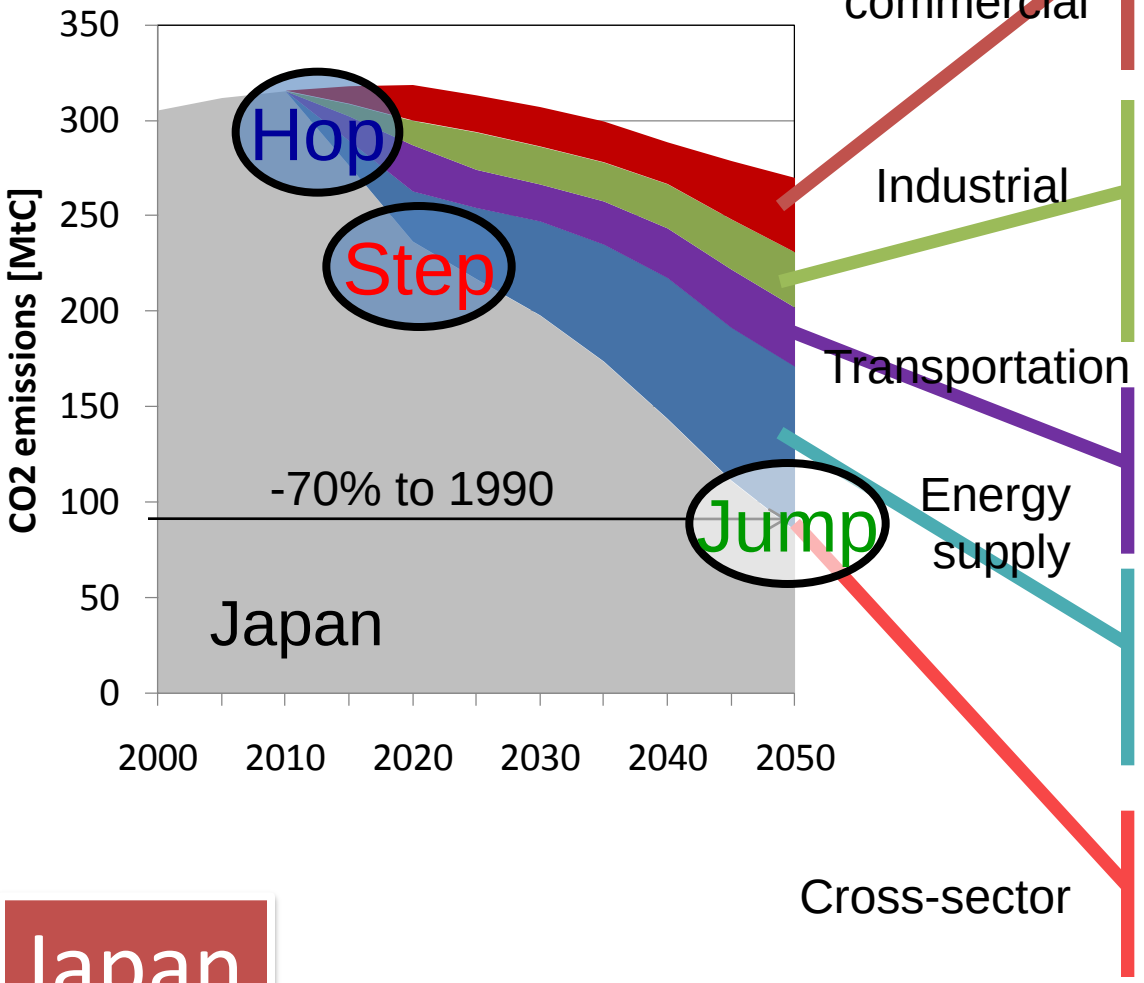
Current status of our study

- We have shown feasibilities of Low-carbonization in Japan by 2050.
  - Some journal articles and reports have been published.
  - Our outcomes (probably) affects national policy/strategy about climate change (esp. CO2 reduction).



- We have made roadmaps: “How to reach the future?”

A dozen actions make it possible to reduce 70% CO2 emissions by 2050

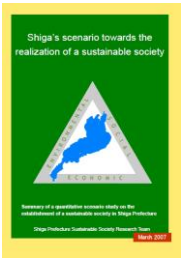


Japan

Key Actions toward LCS in Japan

1. Comfortable and Green Built Environment
2. Anytime, Anywhere Appropriate Appliances
3. Promoting Seasonal Local Food
4. Sustainable Building Materials
5. Environmentally Enlightened Business and Industry
6. Swift and Smooth Logistics
7. Pedestrian Friendly City Design
8. Low-Carbon Electricity
9. Local Renewable Resources for Local Demand
10. Next Generation Fuels
11. Labeling to Encourage Smart and Rational Choices
12. Low-Carbon Society Leadership

Sustainable Shiga study

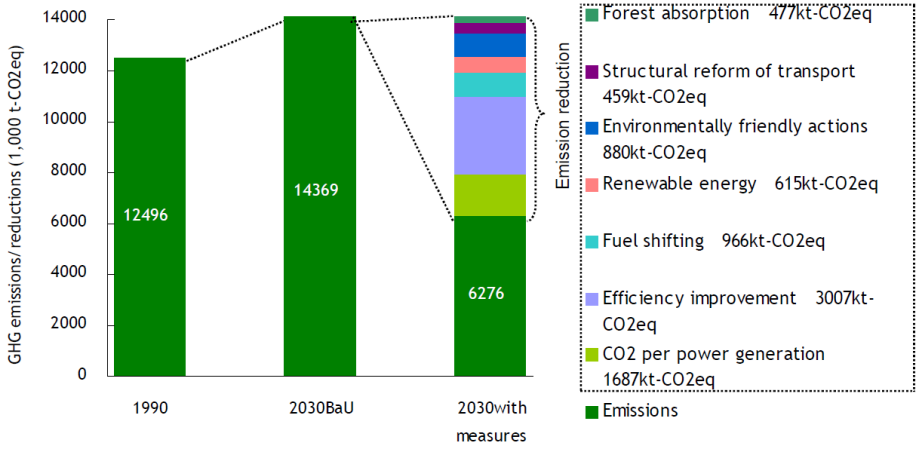


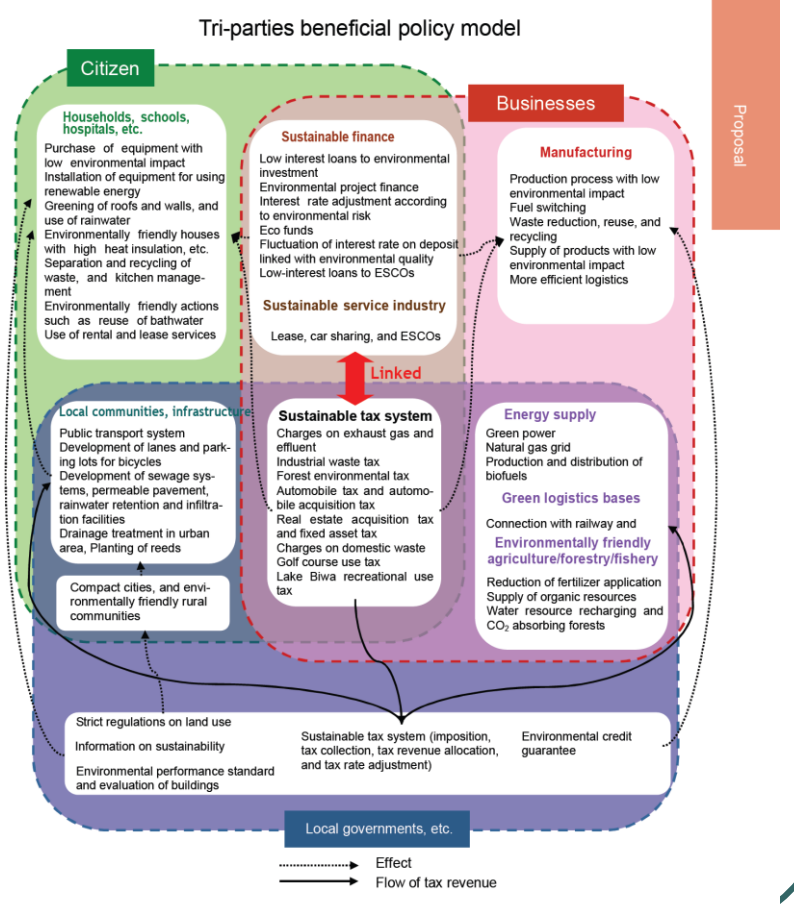
Environmental targets for 2030

- **Reduction of GHG emissions by half**
- **Reduction of pollutant load flows into the lake by half for the conservation of water quality**
- **Reduction of landfill waste by 75%**

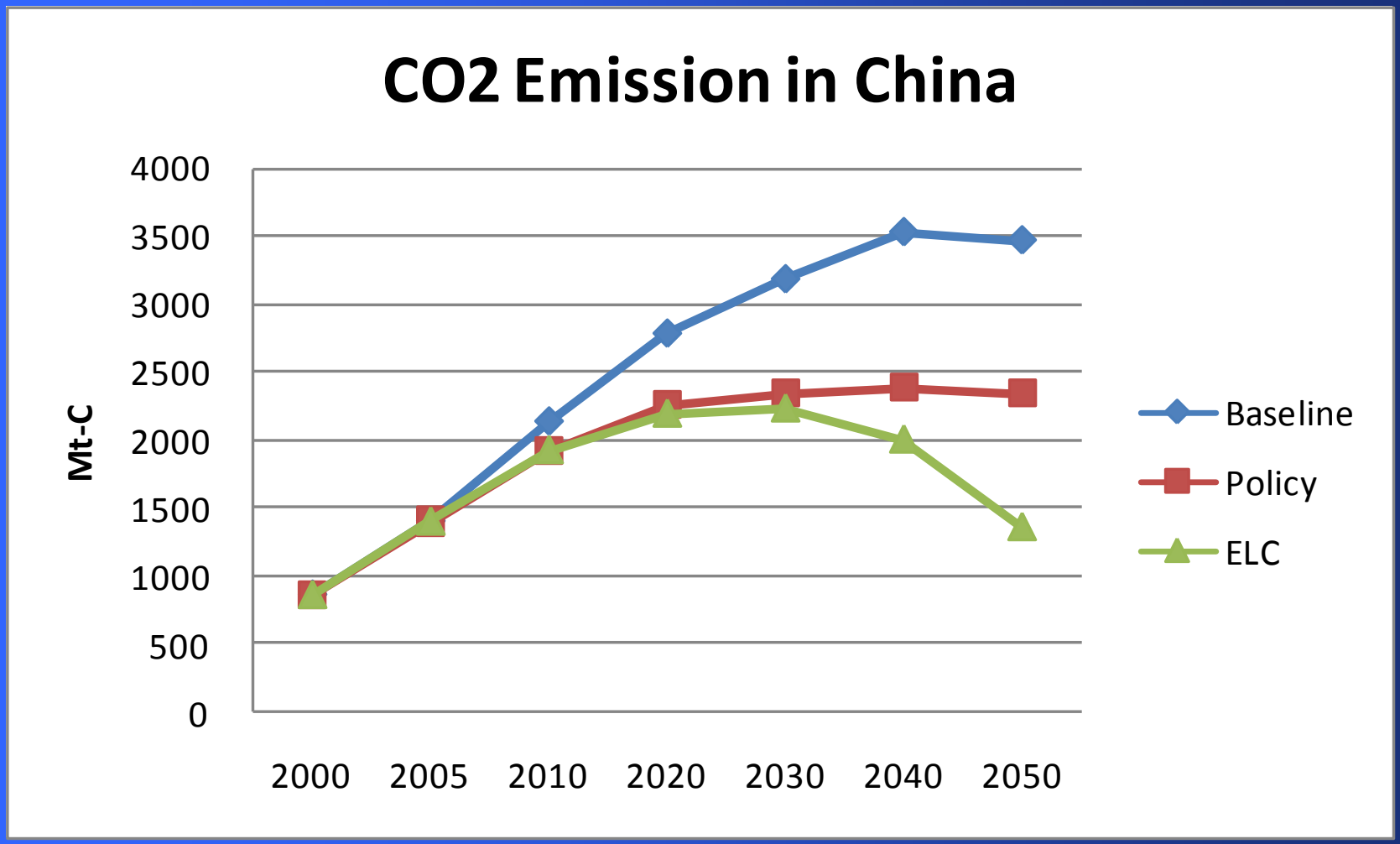
Contribution of each measure

The figure below shows CO_2 emission reductions by different types of measures. Efficiency improvement equipment accounts for the largest proportion, 37% of the total reductions, followed by changes in the compo of power sources in Japan as a whole (21%). Among the categories of measures, those especially necessary local governments to take are the structural reform of transport, environmentally friendly actions, penetration newable energy, and forest absorption. The shares of them in reductions are 6%, 11%, 8%, and 6% respecti and 30% in total. To realize a low carbon economy, Shiga Prefecture has to have original policies for encour businesses and citizen to take these measures.





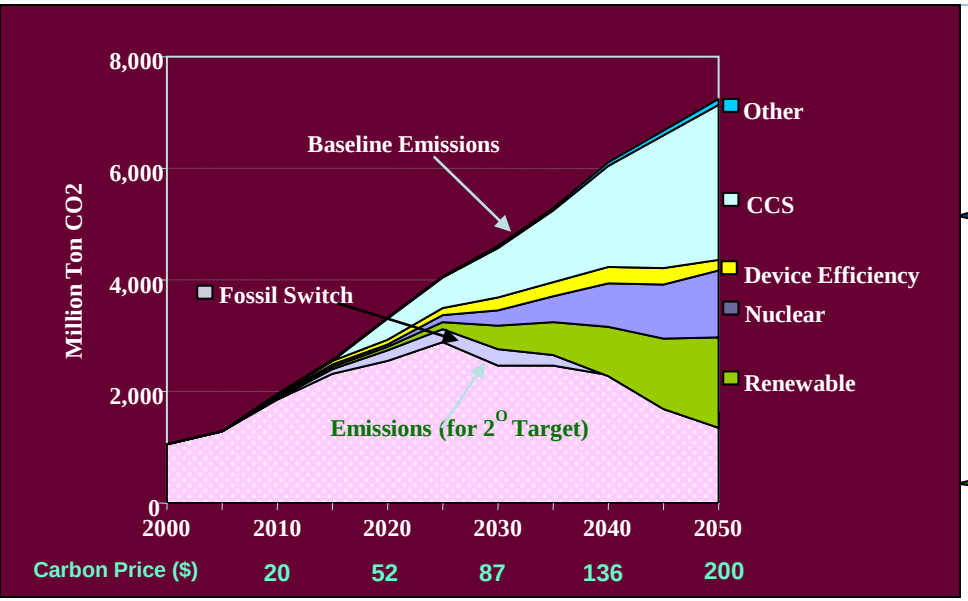
China



Source: Jiang

India

Mitigation Technology Options



Conventional Approach: transition with conventional path and carbon price

- High Carbon Price
- Climate Focused Technology Push
- Top-down/Supply-side actions

Technology Co-operation Areas

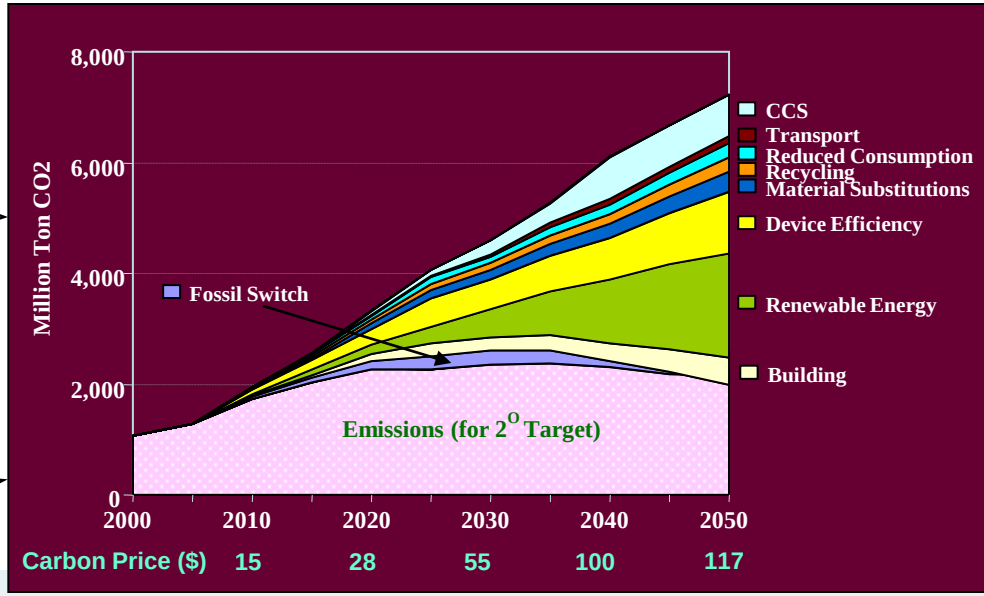
- Energy Efficiency
- Wind/Solar/Biomass/Small Hydro
- Nuclear/CCS

Sustainability Approach: aligning climate and sustainable development actions

- Low Carbon Price
- Bottom-up/Demand-side actions
- Behavioural change
- Diverse Technology portfolio

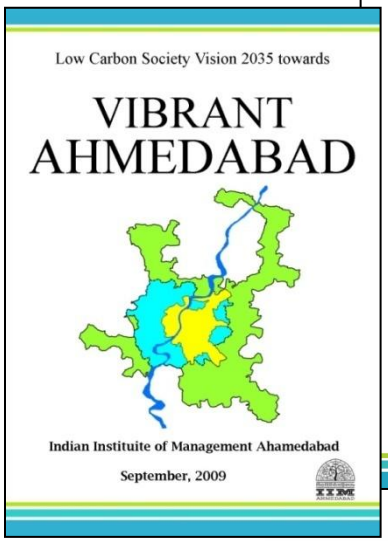
Technology Co-operation Areas

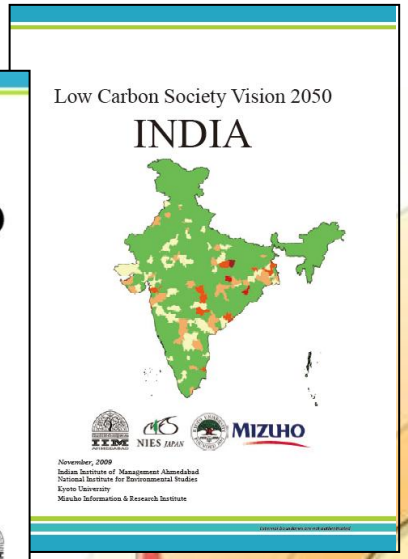
- Transport Infrastructure Technologies
- 3R, Material Substitutes, Renewable Energy
- Process Technologies
- Urban Planning, Behavioral Changes

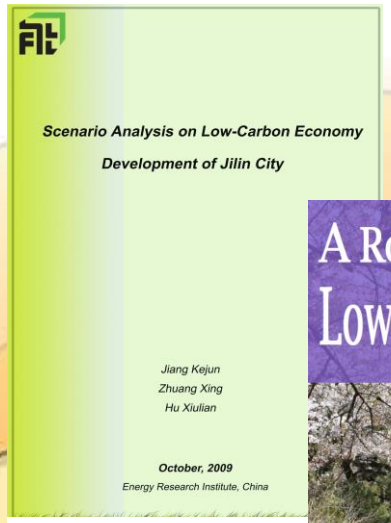


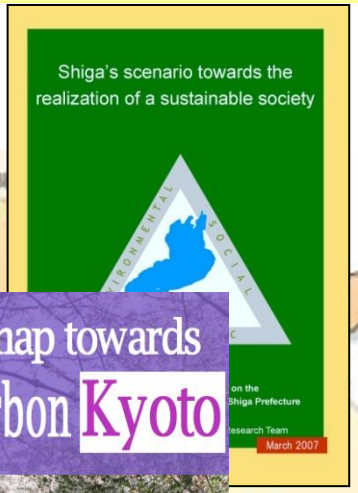
Source: Shukla

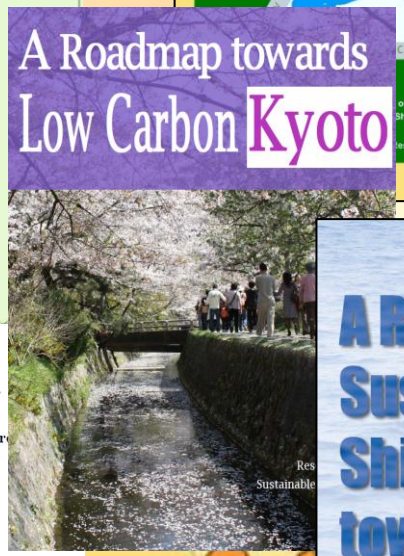
Low-Carbon Scenarios for Asian cities

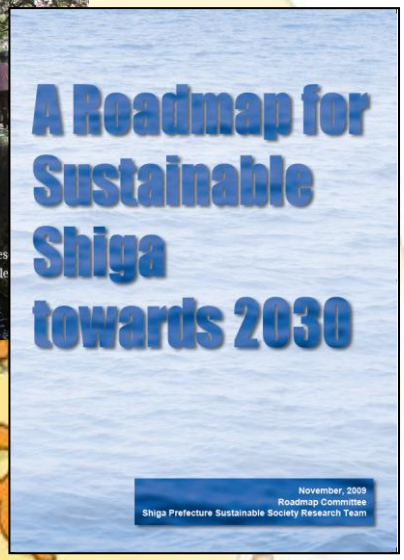


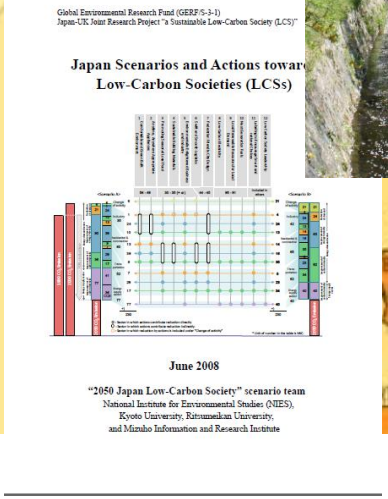


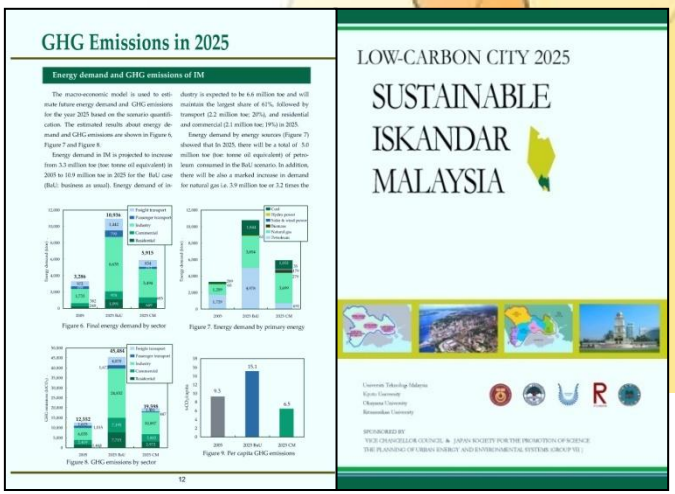












http://2050.nies.go.jp/LCS/

8. Final remarks

1. “Low Carbon Society (LCS)” issue is not only related with energy supply and consumption systems but also essentially connected with socio-economic-industrial planning. Real and quantitative integration is necessary in order to design Low Carbon Society.

2. Myopic tactics can not drive us to LCS. In order to realize LCS, policy measures with well calculated strategies and time horizon of more then several decades are necessary.

3. From that point of view, we have developed tools in order to design quantitatively the visions of LCS and roadmaps towards LCS. We applied them to the real fields mainly in Japan.

4. Collaborating with Asian colleagues, we want to extend our approach to Asia region, acquiring experience, improving and intensifying the applicability to real world.