## Low Carbon Asia Research Network (LoCARNet) First Annual Meeting Mobilising Wisdom for a Low-carbon Asia

Session 1-1: Policy Making Process and Use of Integrated Assessment Model

# Role of Asia-Pacific Integrated Model (AIM) towards Asia Low Carbon Society

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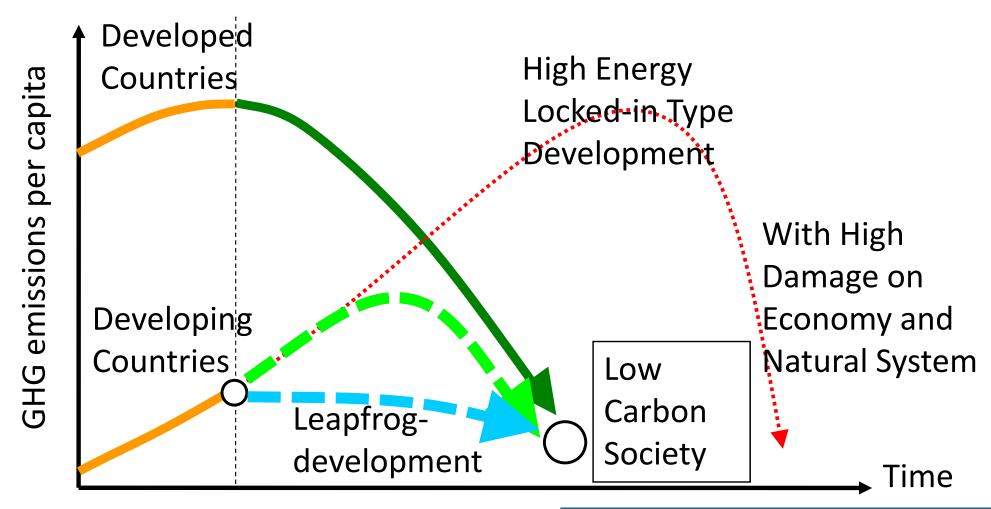
Venue: Novotel Bangkok on Siam Square,

Bangkok, Thailand





### **AIM LCS Scenario study**



#### **Development of Asia LCS Scenarios**

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



Policy Packages for Asia LCS

- Support setting the target
- Support developing comprehensive LC policy with the provision of actions and time frameworks
- Assist consensus building and decision-making among different 2 stakeholders with scientific basis

### Key aspects of Asian low carbon society

- take actions that are compatible with the principles of sustainable development, ensuring that the development needs of all groups within society are met
- make an equitable contribution towards the global effort to stabilize the atmospheric concentration of CO2 and other greenhouse gases at a level that will avoid dangerous climate change, through deep cuts in global emissions
- Take actions that improve environment conditions in various aspects.
- demonstrate a high level of energy efficiency and use low-carbon energy sources and production technologies
- adopt patterns of consumption and behaviour that are consistent with low levels of greenhouse gas emissions.



### Elements of actions to realize a low carbon society

- Technologies: Energy production technologies, end-use energy saving technologies, system integration of supply-demand technologies, etc.
- 2. Social infrastructure: transportation system, Urban infrastructure, etc.
- Human resources: active participation by policy makers, engineers, citizens participation, etc.
- 4. Institution: Support of market penetration, Funding mechanism, international/regional/national mechanisms such as carbon tax, emissions trading, etc.
- 5. Social capital, and lifestyle: Lifestyle specific to certain community, Energy efficient and low material consumption, etc.



## Multi-scales and interactive approach for LCS studies

Global and Pan-Asian scale analysis short-term National scale analysis Detailed -term Local region scale analysis



## Two approaches for ASIA LCS

#### [Top-down approach]

Global emissions scenario analysis using CGE model Identify the emission allowances for each Asian country to ensure the global emissions by half by 2050.

Japan, China, India, Korea, Thailand, Malaysia, Vietnam, Philippine, Singapore, Indonesia and Taiwan.

- Is it feasible to implement a scenario with cutting the GHG emissions by half in 2050 from 1990 level?
- •What would be the emission allowance for each Asian country? What would be the impact on economy?

#### [Bottom-up approach]

National, local, city-level approach using a simplified tools Discuss LCS visions which consider the local conditions & targets with local researchers/policy makers individually.

Malaysia, India, China, Thailand, Indonesia, Vietnam, Ahmedabad city (India), Bhopal city (India)

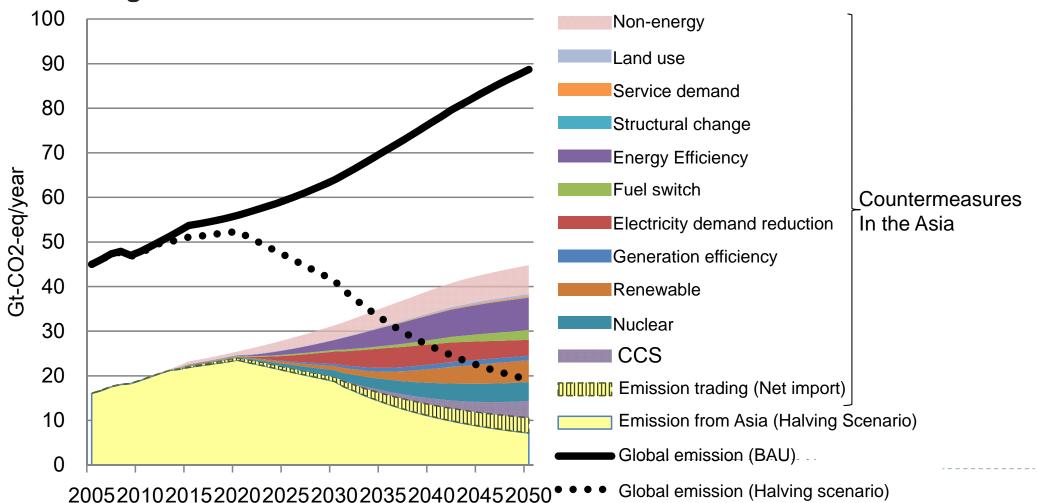
- What is the LCS in each region look like?
- •Is it possible to achieve the LCS together with solving the other socio economic issues in the region?
- What should be done to achieve the vision?

**ASIA LCS** 



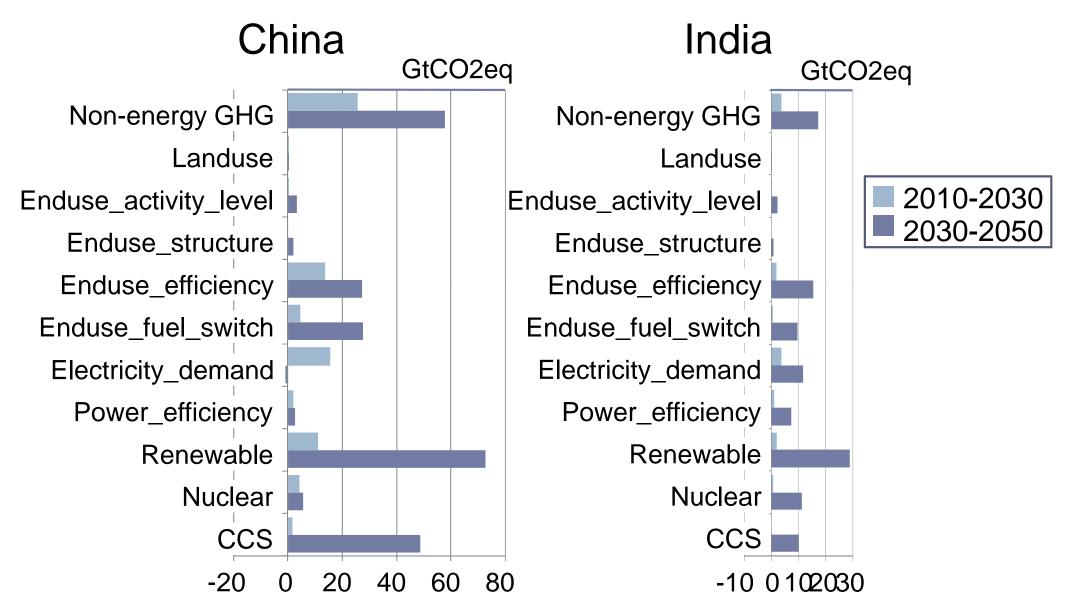
## Assessment of the "50% reduction" scenario

- Reducing GHG emissions by half by 2050 to the 1990 level: Feasible
- Estimated Marginal Abatement Cost is high
  - Cost reduction (possible? How?): need further discussion
- Impact on GDP: 2% (In some regions >10%)
- Share of GHG emissions from Asia is increasing. Need to avoid lock-in of high carbon infrastructure.



Source: AIM/CGE, Masui et al.

## Cumulative reduction potential

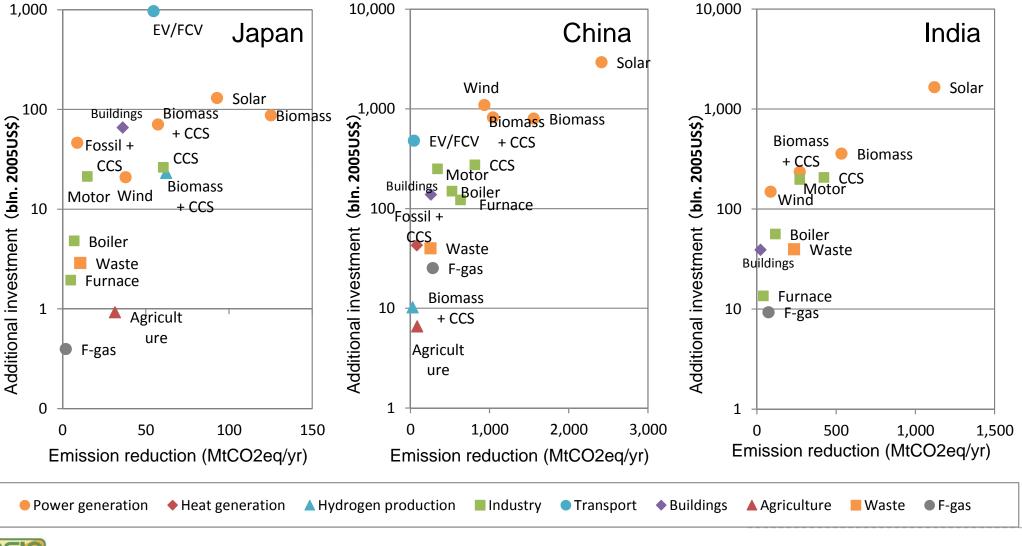


Projected emissions in China: 2030年 6.85 GtCO2eq, 2050年 2.41 GtCO2eq

Projected emissions in India:2030年 4.33 GtCO2eq, 2050年 3.25 GtCO2eq

Source: AIM/CGE[Country], Namazu et al.

## Additional Investment for GHG emission reductions in some Asian countries until year 2050





Source: AIM/Enduse[Global], Akashi et al.

## Actions towards a low carbon society



#### Ten Actions towards Low Carbon Asia



**Action 1** Urban Transport

**Structured Compact City** 



**Action 6** Energy System

Low carbon energy system with local resources



**Action 2** Interregional Transport

Mainstreaming trains and water transportation



Action 7 Agriculture & Livestock

Spread of high yields and low emission agricultural technologies



**Action 3** Resources & Materials

Smart material use that realizes the full potential of resources



Action 8 Fore

**Forest & Landuse** 

Sustainable forest management



Action 4 Buildings

Smart buildings that utilize natural systems



Action 9

**Technology & Finance** 

Technology and finance to facilitate achievement of LCS



Action 5 Biomass

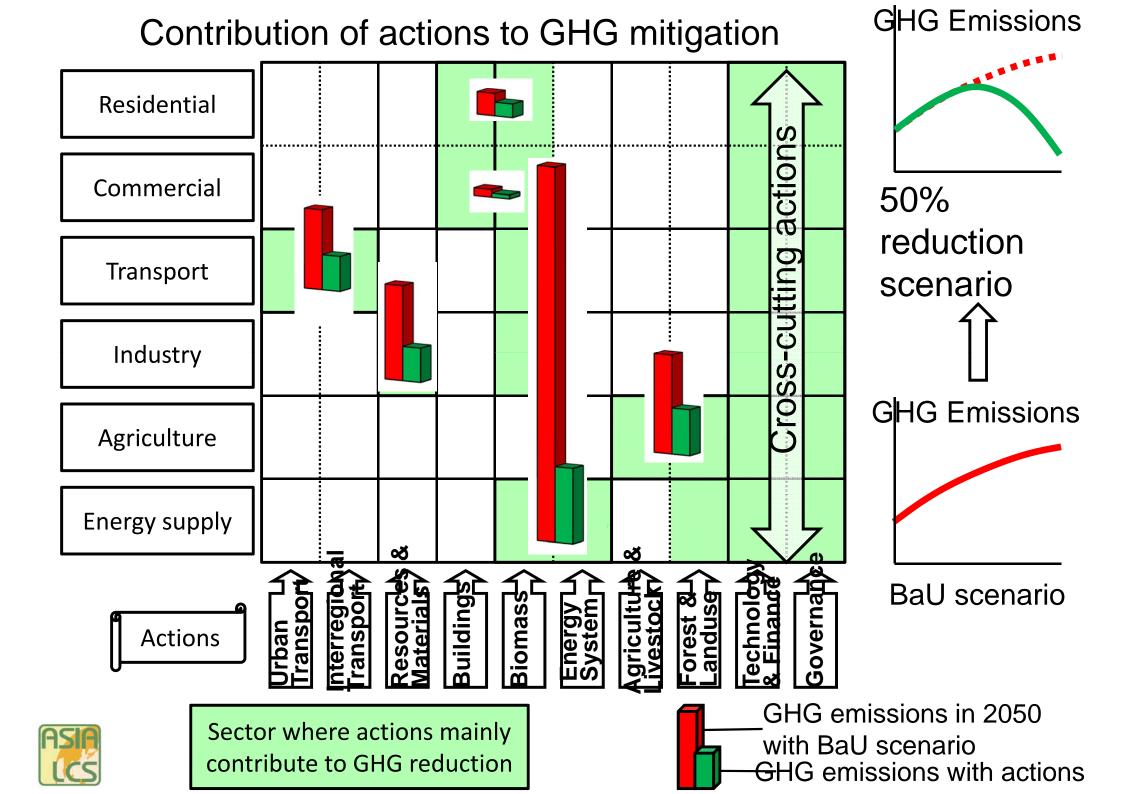
Local production and local consumption of biomass



Action 10 Go

Governance

Transparent and Fair Governance that Supports LCS Asia



Example of LCS Roadmap: Action 6: Low Carbon Energy System

#### **Current Situation**

The electrification rate of Asia is roughly 80%, but 800 million people still do not have access to electricity, particularly in South

(3)

Asia. The introrural areas, but resources. White low carbon and remains uncer Fukushima, Jap

**Challenges** 

The Challenges for the future are: (1) to develop a power grid connecting all countries Asia in order to improve the energy supply in each country and to enable flexible power interchange between countries, (2) to promote a decentralized energy supply system particularly in rural areas, and provide a stable energy supply through micro-arids connected with the core electric

Research on high efficiency power generation

system, and

conditions.

energies by introd

regional, and nat

Cooperation to demand management init

Development of the concept and support

Joint development and knowledge shari

Unification of electric

Citizen

International Agencies Vision in 2050

The near-total electrification will be completed across Asia. While the urban areas' energy supply will be provided by the core system, the rural areas' energy will be provided by a micro-grid connected with renewable energies. By sophisticated projections of power generation and highly-developed power storage technologies, the capacity of renewable energies will increase significantly. The efficiency of thermal power generation will be dramatically improved, the carbon capture storage will be effectively developed by appropriate management.

#### Vision in 2050

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### **Example of LCS Roadmap: Action 6: Low Carbon Energy System**

	•			_			
2	2000 2010 2020	2030	2040	2050	2060		
	Promotion of rural electrification - expar	nsion of elec	trification areas				
A of to	ssessment of the potential or renewable energy in Asia Development of a mid-to long-term low carbon energy plan						
Government	Implementation of pilot project about smart grid in Asia	t Establish	ment of relevant	t regulations			
	Establishment of demandament among utility customers	nd response s	technologies and	l consensus l	ouilding		
	Introduction of measures to stimulate energies (ex. FIT/RPS) and automatic	te positive a dissem <mark>inat</mark> i	ttitudes towards on of renewables	renewable			
	Provision of land for CCS Estab	olishment o	CCS facilities for	thermal pov	ver generation		
Private Sector	Research on high efficiency variety of energy source	ol methods a ces and tech	and smart grid sys nologies	stems makin	g use of wide		
	power géneration						
	Establishment of deman utility customers	d response	technologies and	consensus b	ouilding among		
	Coping with cyber secur	ity problem	S				
Citizen	Preferences to low carbo	n electric sc	urces (ex. purcha	se of green o	electricity)		
	Cooperation to demand management initiatives such as peak shift						
International Agencies	Development of the cond	cept and sup	port for Asian en	ergy system	network		
	Unification of ele	ectric powe	standards at the	internationa	al level		
	Develop Asian er	oment of ap nergy syster	ppropriate financi n network	al support m	echanisms for		
	Joint development and knowledge sharing of the technology and tools for weather information and forecasting						

## Asian countries' LCS Study with AIM

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

**Application and** development to actual LCS processes

Core research members

**Development and** maintenance of study tools/models

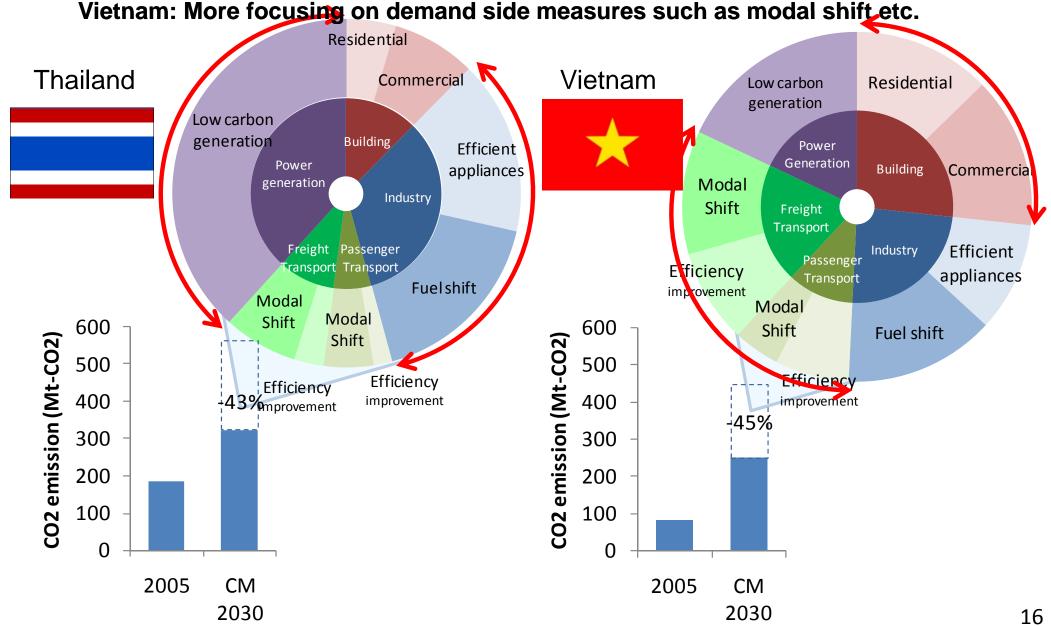




## The effects of countermeasures differ by country

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



## Continuation and Extension of AIM activities

- East Asia Low Carbon Growth Knowledge Platform (Input to East Asia Summit through East Asia Low Carbon Growth Partnership)
  - the Climate Change International Training Center (CITC),
     Thailand
- Development and implementation of low carbon scenarios
  - Bangladesh, Cambodia, China, India, Indonesia, Korea, Malaysia, Thailand, Vietnam, etc.
- Applicability of AIM to NAMA, e.g. Thailand Case Study
- Collaboration towards low carbon cities
   Ahmedabad, Bangkok, Bhopal, Iskandar, etc.



Collaboration with policymakers, researchers and other stakeholders through LoCARNet towards Aisa LCS

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## A Policy Package towards Low-Carbon Thailand

43% reduction to BaU

#### Residential and Commercial



- Building insulation
- Energy efficiency labeling
- Green purchasing policy
- Energy performance standard of equipment and evaluation of buildings

#### **Electricity Generation**



- Subsidy in investment to energy efficient equipment
- Promotion of technology transfer
- Promotion of renewable energy
- Fuel switching
- Reduce own usage and transmission loss

#### Transportation 🔻 38 MtCO2 (16%)

- Environmental performance standard of vehicles
- Tax rate adjustment to energy efficient vehicles
- Promotion of natural gas and hybrid cars
- Promotion of renewable energy
- Promotion of mass transit system

#### Industry



80 MtCO2 (33%)

- Subsidy in investment to energy efficient equipment
- Promotion of technology transfer
- Promotion of alternative and renewable energy

Source: Bundit Lim, Thammasat University

## 既往研究による各国の一人当たりGDP推移の幅

**ADV CNV** AIMモデルによる幅 中国 日本 USD 2000price) (1000 インド ベトナム -人あたりGDP 

Source: AIM/CGE, Masui & Fujimori





## **Example of Action: Action 6**

Energy system: Low Carbon Energy System with Local Resources

#### 3 key points:

- Sustainable local energy system with renewables
- Smart energy demand-supply system
- Enhancing energy security with collaboration between low carbon energy sources and fossil fuels

## Example of LCS Roadmap: Action 6: Low Carbon Energy System

#### **Current Situation**

The electrification rate of Asia is roughly 80%, but 800 million people still do not have access to electricity, particularly in South Asia. The introduction of renewable energies is now spreading in rural areas, but they do not go as far as being the core energy resources. While nuclear energy is being promised as an option for low carbon and large scale power generation, its prospect in Asia remains uncertain due to the fallout of the nuclear accident in Fukushima, Japan.

#### **Challenges**

The Challenges for the future are: (1) to develop a power grid connecting all countries Asia in order to improve the energy supply in each country and to enable flexible power interchange between countries, (2) to promote a decentralized energy supply system particularly in rural areas, and provide a stable energy supply through micro-grids connected with the core electric system, and (3) to enable the effective use of renewable energies by introducing power storage systems at the local, regional, and national levels in regions with good weather conditions.

#### Vision in 2050

The near-total electrification will be completed across Asia. While the urban areas' energy supply will be provided by the core system, the rural areas' energy will be provided by a micro-grid connected with renewable energies. By sophisticated projections of power generation and highly-developed power storage technologies, the capacity of renewable energies will increase significantly. The efficiency of thermal power generation will be dramatically improved, the carbon capture storage will be effectively developed by appropriate management.

2030 2000 2010 2020 2040 2050 2060 Promotion of rural electrification - expansion of electrification areas Development of a mid-to long-term low carbon energy plan Assessment of the potential for renewable energy in Asia Government Establishment of relevant regulations Implementation of pilot project about smart grid in Asia Establishment of demand response technologies and consensus building among utility customers Introduction of measures to stimulate positive attitudes towards renewable energies (ex. FIT/RPS) and automatic dissemination of renewables Provision of land for CCS Establishment of CCS facilities for thermal power generation Development of control methods and smart grid systems making use of wide variety of energy sources and technologies Research on high efficiency Private Sector power generation Establishment of demand response technologies and consensus building among utility customers Coping with cyber security problems Preferences to low carbon electric sources (ex. purchase of green electricity) Citizen Cooperation to demand management initiatives such as peak shift Development of the concept and support for Asian energy system network International Agencies Unification of electric power standards at the international level Development of appropriate financial support mechanisms for Asian energy system network Joint development and knowledge sharing of the technology and tools for weather information and forecasting

#### Action9: Technology and finance to facilitate achievement of LCS

Sept. 26

#### **Current Situation**

Quick transfer and diffusion of existing technologies, as well as development of innovate technologies are indispensable for the Asian countries to achieve LCS. Today, however, there are many reasons that hamper such diffusion and development. There is a need to eliminate such hurdles, while increasing positive incentives for private firms to invest in new technology development. There is also a need for financial support for private firms and least developing countries to stimulate technology development and diffusion.

Development of institutions of swill complogical development and diffusion in Asia is necessary. Meanwhile, it is also necessary to consider sufficient protection of intellectual property rights (IPR) and other related rights. The challenge for Asia is to achieve a society where all necessary technology to decrease GHG emissions is diffused by 2050. Financial assistance from developed countries is not sufficient to invest in technological development and diffusion. All countries need to play their respective role in technological investment and diffusion.

#### Vision in 2050

Gaps between countries in Asia in terms of economic development have decreased. Products of the best available technology is used in all countries. These products are subsidized, so that the prices are lower than less-GHG-emitting products. Low carbon businesses are flourished in many countries. Private firms and research institutes compete for innovative technologies that further reduce GHG emissions. Investments for technological development is financially supported by private investments and international funding mechanisms.

2040 2050 Tech. development in industrialized countries Set up programmes for achieving green tech. within science & tech. policies Government Financial support for companies for investments Financial support for low carbon products to be less expensive Subsidies for existing low-carbon products to be promptly diffused Innovative technologies are commercialized Standardization of energy / emission efficiency of products Support large-scale projects such as CCS Establishment of technology fund Pay back period by commercialization of tech. Development of low-carbon tech. Increasing investments in tech. R & D with support of the government Private Publicizing strategies to inform consumers of low-carbon products Exchange of views with the government on institutional barriers against tech. diffusion Smart consumers that select low- carbon products Citizen Appropriate use of low-carbon products without unnecessary uses Strategies to establish Asia-wide funding mechanism for tech. International Capacity building towards recognition of IPR Establishment of Asian tech. information center Asia regional ownership of innovative tech. CDM and other mechanisms for tech, transfer