

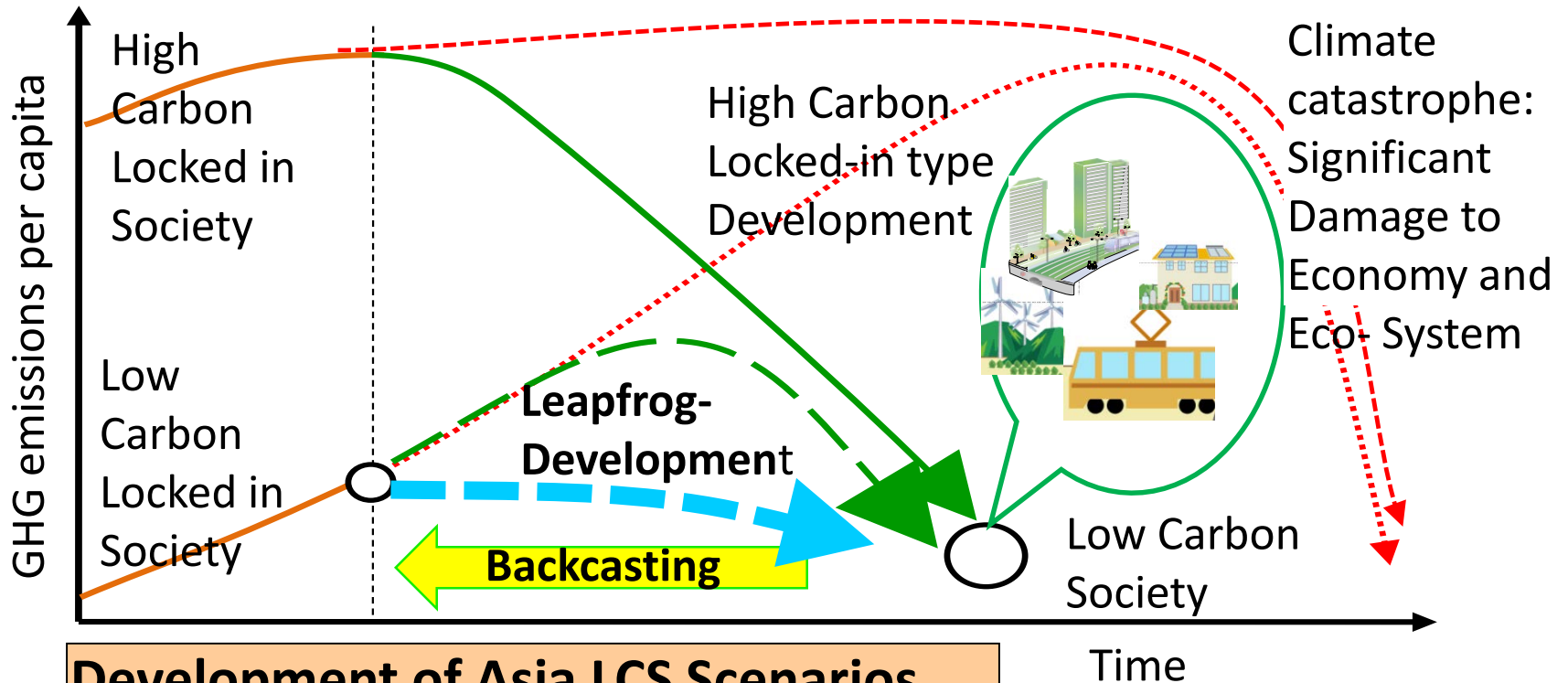
21th AIM International Workshop

# Modelling approach to bridge the climate change and SDGs

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Systems Research, NIES, and  
Senior Research Advisor, IGES

13-14 November 2015  
National Institute for Environmental Studies

# Can Asia Change the World through Leapfrogging?



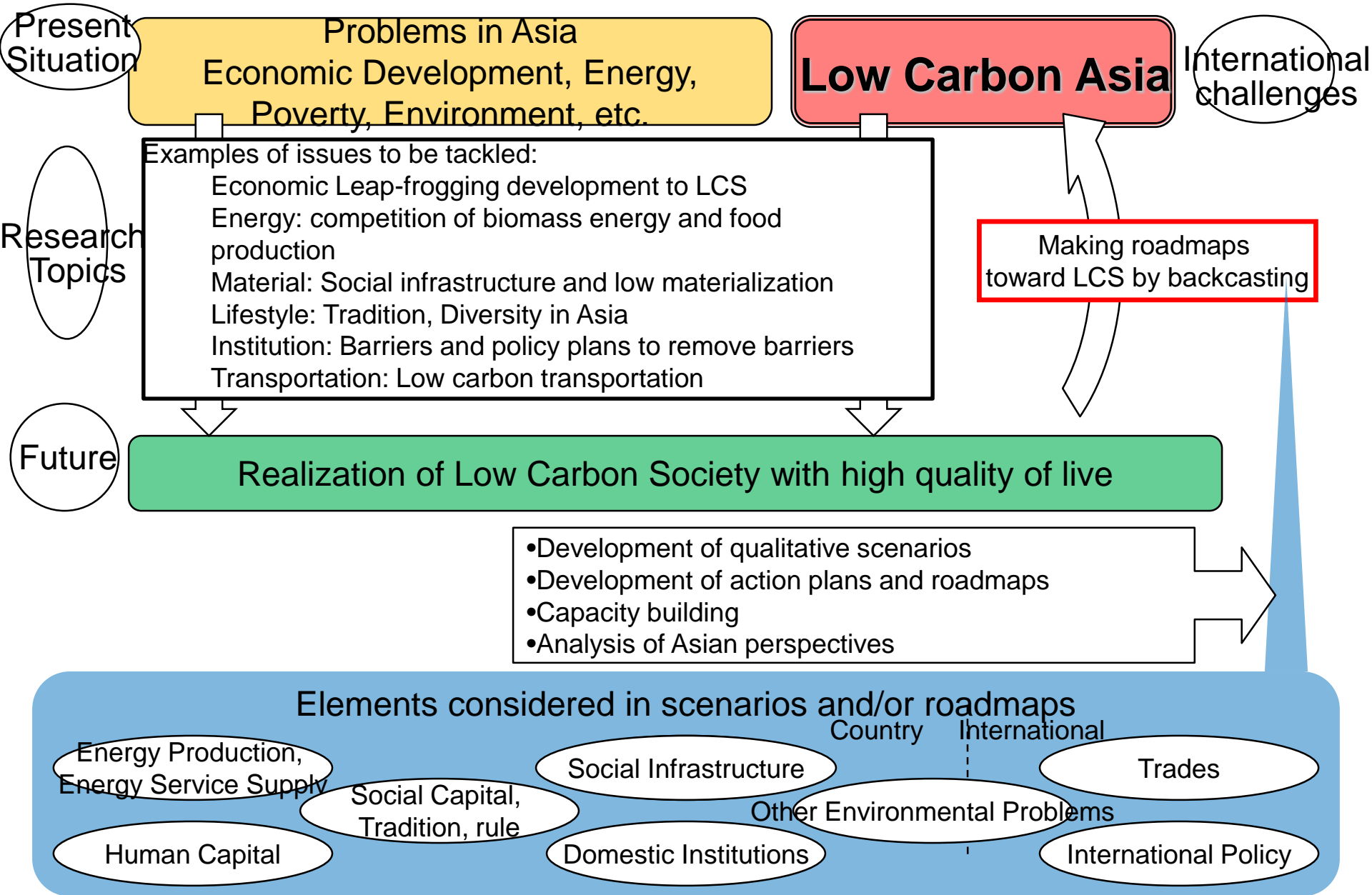
- (1) Depicting narrative scenarios for LCS
- (2) Quantifying future LCS visions
- (3) Developing robust roadmaps by backcasting



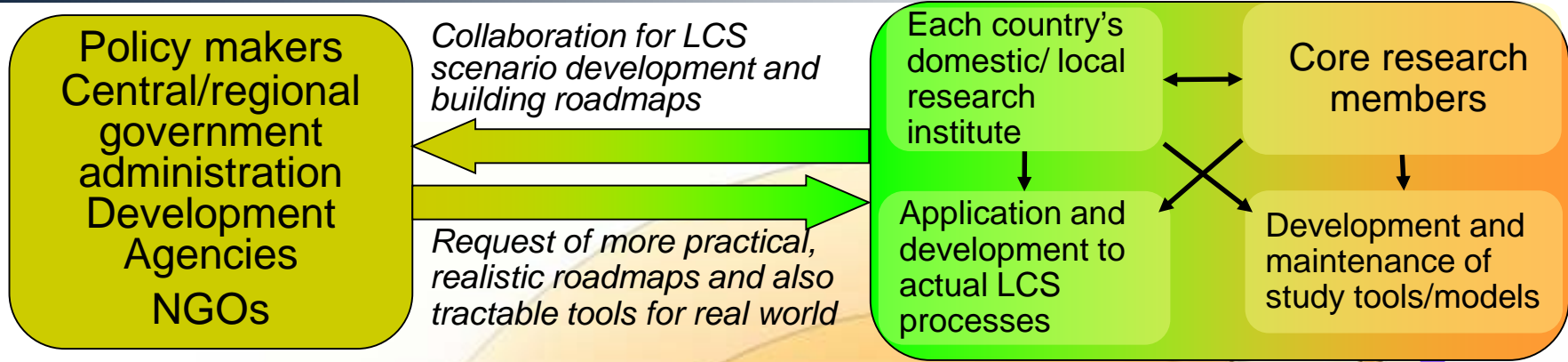
**Policy Packages for Asia LCS**

Funded by the Ministry of the Environment,  
Japan (GERF, S-6) and NIES  
<http://2050.nies.go.jp/index.html>

# Challenges toward low-carbon societies in Asia



# How to deploy our study to real world



A map of South and Southeast Asia is shown with several countries highlighted in white boxes: India, Bangladesh, Cambodia, Vietnam, Thailand, Malaysia, Indonesia, Korea, and Japan. Each country label is accompanied by a thumbnail image of a Low Carbon Society (LCS) report or roadmap. The reports include:
 

- India:** 'Low Carbon Society Vision 2050 INDIA' and 'VIBRANT AHMEDABAD'.
- Bangladesh:** 'Low-Carbon Society Development towards 2025 in Bangladesh'.
- India (Bhopal):** 'Low Carbon Society Scenario Bhopal 2035'.
- Thailand:** 'Sustainable Low Carbon Development towards 2050 in Thailand'.
- Malaysia:** 'Green City 2025 Baseline & Preliminary Report' and 'Sustainable Iskandar Malaysia'.
- Indonesia:** 'Low Carbon Society Scenario Toward 2050 INDONESIA Energy Sector'.
- Cambodia:** 'Low Carbon Development Strategy for Cambodia toward 2050'.
- Vietnam:** 'Sustainable Low Carbon Development towards 2050 in Vietnam'.
- Korea:** 'A Roadmap for Sustainable Shiga towards 2030' and 'Primary feasibility study on carbon development towards 2030 in Gyeonggi Province'.
- Japan:** 'A Roadmap towards Low Carbon Kyoto'.

# 10 Actions toward Low Carbon Asia

- NIES and other collaborating universities and institutes have proposed the 10 Actions to halve global greenhouse gas emission in 2050 compared to 1990 level.



## Action 1 **Urban Transport**

Hierarchically Connected  
Compact Cities



## Action 2 **Interregional Transport**

Mainstreaming Rail and Water in  
Interregional Transport



## Action 3 **Resources & Materials**

Smart Ways to Use Materials that  
Realize the Full Potential of Resources



## Action 4 **Buildings**

Energy-Saving Spaces Utilizing  
Sunlight and Wind



## Action 5 **Biomass**

Local Production and  
Local Consumption of Biomass



## Action 6 **Energy System**

Low Carbon Energy System  
Using Local Resources



## Action 7 **Agriculture & Livestock**

Low Emission Agricultural  
Technologies



## Action 8 **Forestry & Land Use**

Sustainable Forestry Management



## Action 9 **Technology & Finance**

Technology and Finance to  
Facilitate Achievement of LCS

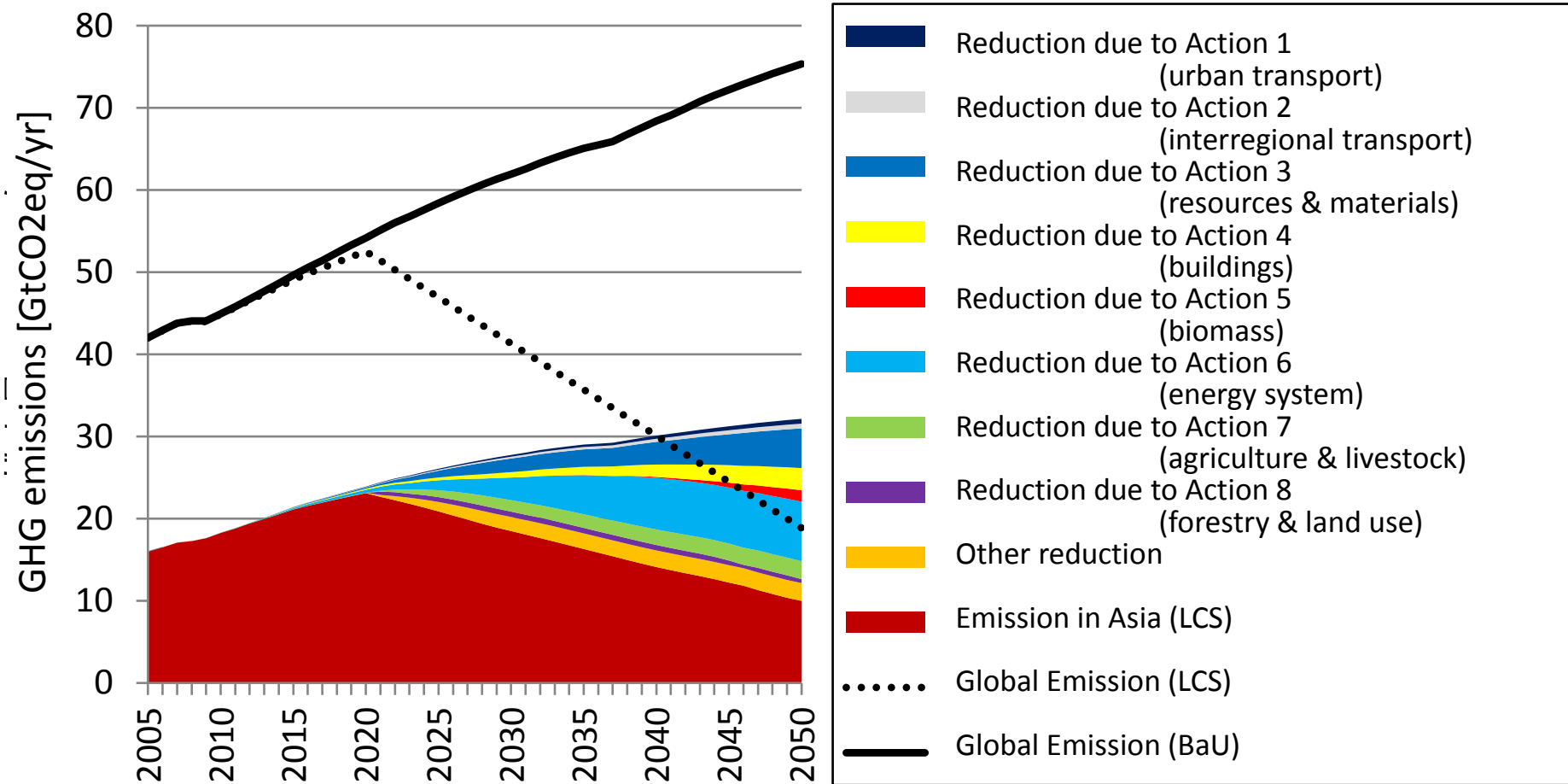


## Action 10 **Governance**

Transparent and Fair Governance  
that Supports Low Carbon Asia

Since the development stage of each country or region is different, modification of contents of each action is necessary.

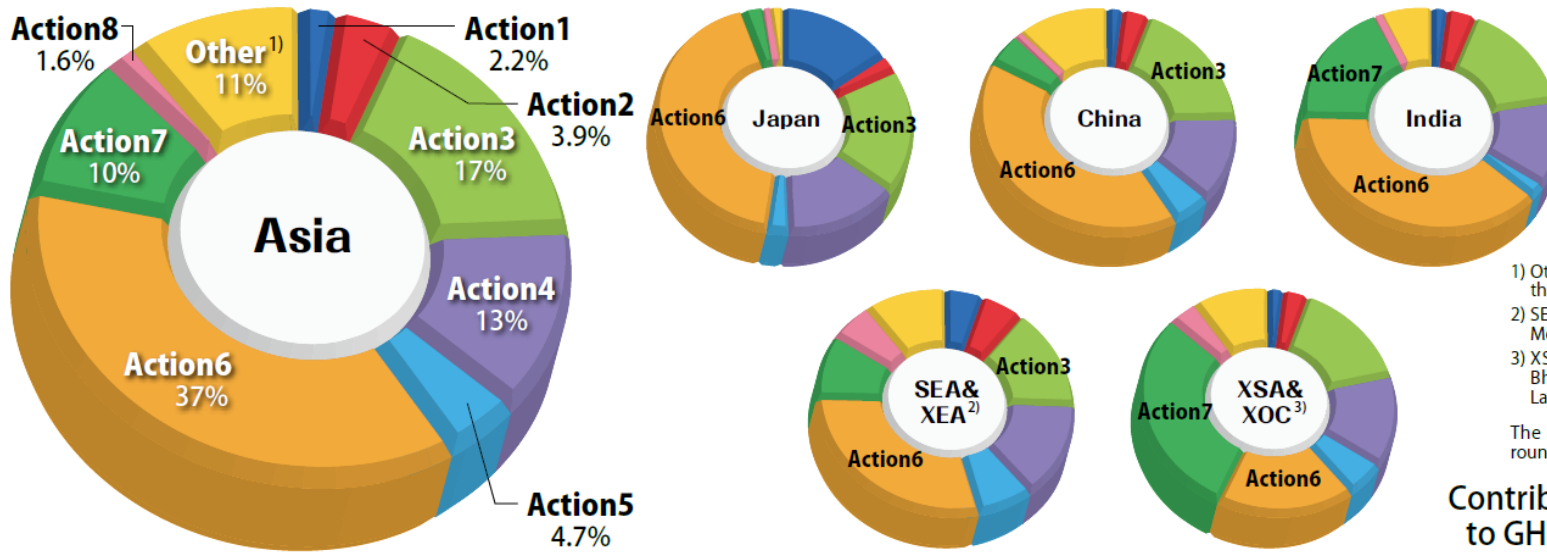
# GHG Emissions in Low Carbon Asia



By Dr. S. Fujimori (NIES), estimated from AIM/CGE [Global] model.  
[http://2050.nies.go.jp/file/ten\\_actions\\_2013.pdf](http://2050.nies.go.jp/file/ten_actions_2013.pdf)



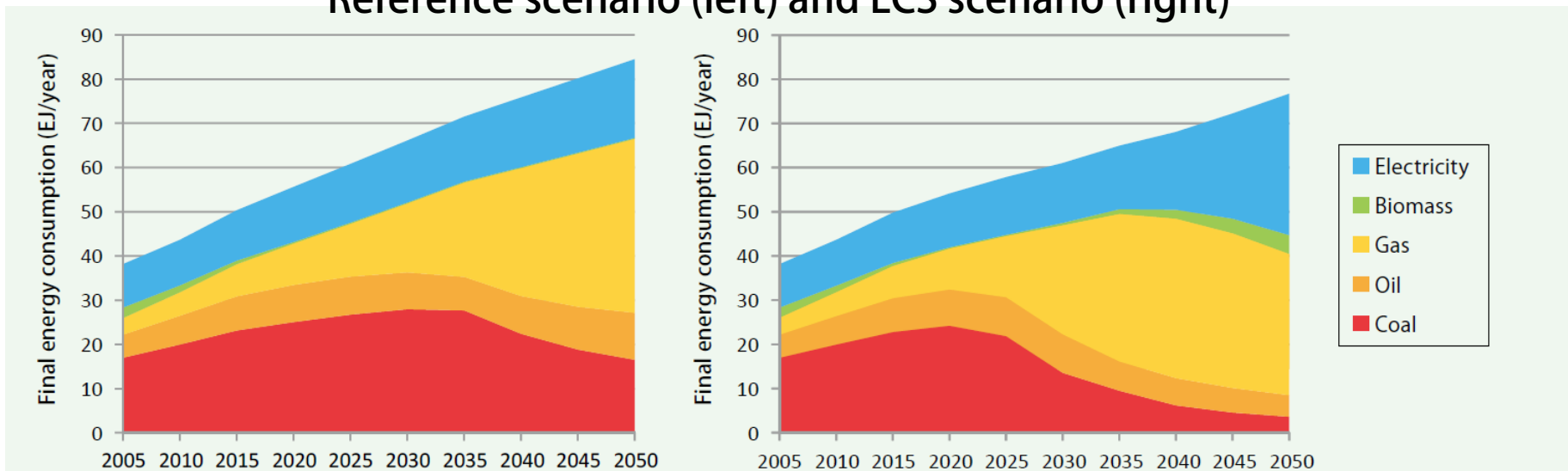
# GHG reduction by action



1) Other: CH<sub>4</sub> and N<sub>2</sub>O emissions from other than agriculture and livestock  
 2) SEA&XEA: Southeast Asia, Korea (DPR), Mongolia, Republic of Korea, and Taiwan  
 3) XSA&XOC: Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, Pakistan, Sri Lanka, and Small Island States in Oceania  
 The total is not always 100% because of rounding error.

Contribution of Ten Actions to GHG Reduction in Asia

## Final energy consumption in the industrial sector: Reference scenario (left) and LCS scenario (right)



# Example of Components of the Action

## Action 3: Smart Ways to Use Materials that Realize the Full Potential of Resources

Action 3 consists of three approaches: (1) production that dramatically reduces the use of resources, (2) use of products in ways that extend their lifespan, and (3) development of systems for the reuse of resources.

### 3.1 Production that dramatically reduces the use of resources

3.1.1 Development and active employment of technologies for weight reduction and raw material substitution

3.1.1.1 Support for research and development of technologies

3.1.1.2 Support for diffusion of technologies

3.1.2 Creation of materially simple lifestyles while still enjoying richness

3.1.2.1 Utilization of new indices including level of happiness

3.1.2.2 Diffusion of product evaluation systems

Please refer to [http://2050.nies.go.jp/file/ten\\_actions\\_2013.pdf](http://2050.nies.go.jp/file/ten_actions_2013.pdf) in detail.



## 3.2 Use of products in ways that extend their lifespan

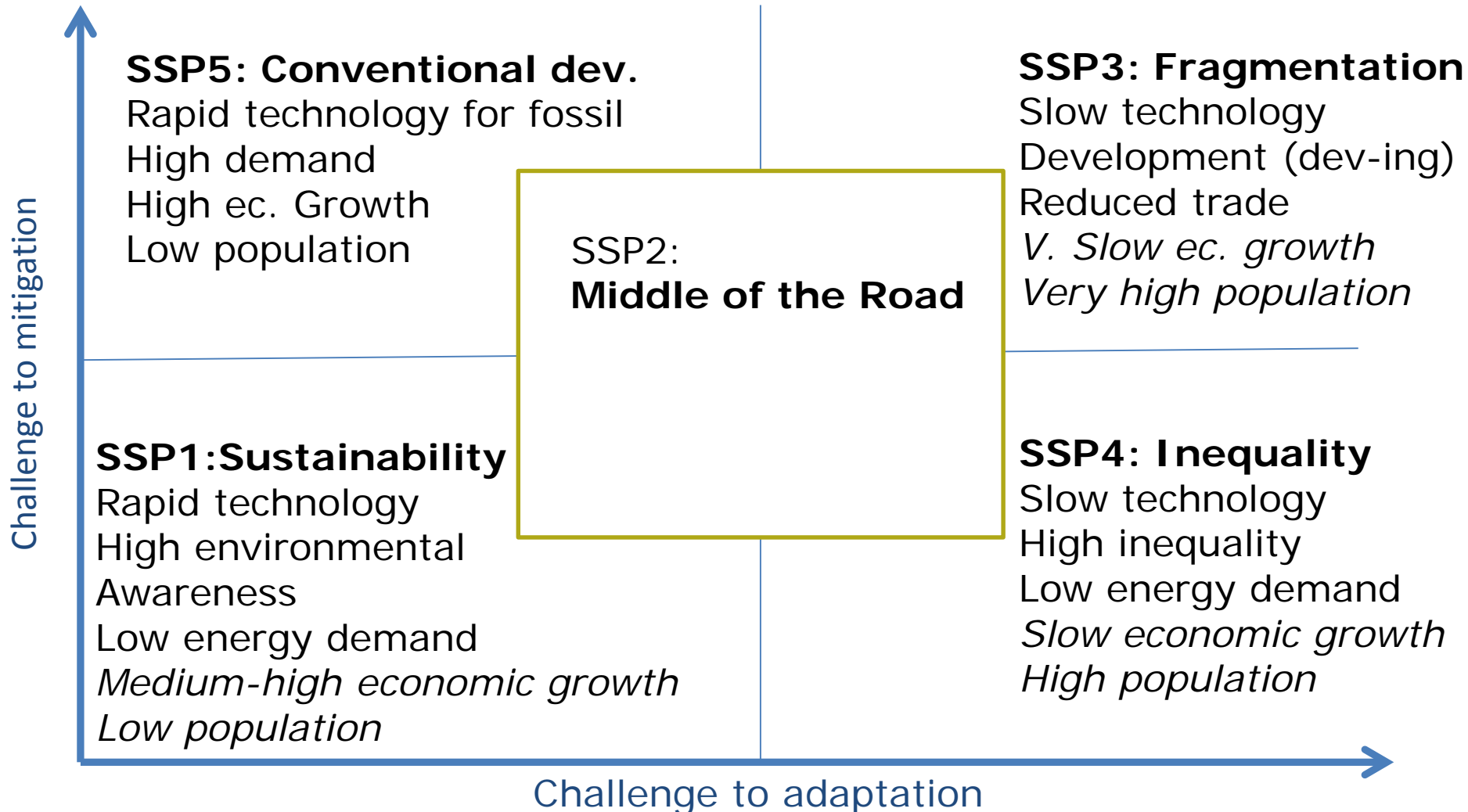
- 3.2.1 Development and active employment of product life-extension technologies and maintenance systems
  - 3.2.1.1 Support for research and development of technologies
  - 3.2.1.2 Support for diffusion of technologies
- 3.2.2 Development of cities and national land from a long-term perspective
  - 3.2.2.1 Design of cities and national land from a long-term perspective
  - 3.2.2.2 Support for construction of long-lasting infrastructure and maintenance of existing infrastructure
  - 3.2.2.3 Establishment of institutions for evaluation of the effectiveness of public projects and their operation
- 3.2.3 Construction of long-lasting housing and replacement of housing
  - 3.2.3.1 Support for construction of long-lasting housing
  - 3.2.3.2 Diffusion of housing evaluation systems
- 3.2.4 Selection of less resource consuming, long-lasting, recyclable, and reusable products
  - 3.2.4.1 (3.1.2.2) Diffusion of product evaluation systems

## 3.3 Development of systems for the reuse of resources

- 3.3.1 Development and active employment of recycling and reuse technologies
  - 3.3.1.1 Support for research and development of technologies
  - 3.3.1.2 Support for diffusion of technologies
- 3.3.2 Establishment of recycling and reuse systems for various goods
  - 3.3.2.1 Establishment of various recycling laws
  - 3.3.2.2 Establishment of institutions related to reuse
- 3.3.3 (3.2.4) Selection of less resource consuming, long-lasting, recyclable, and reusable products

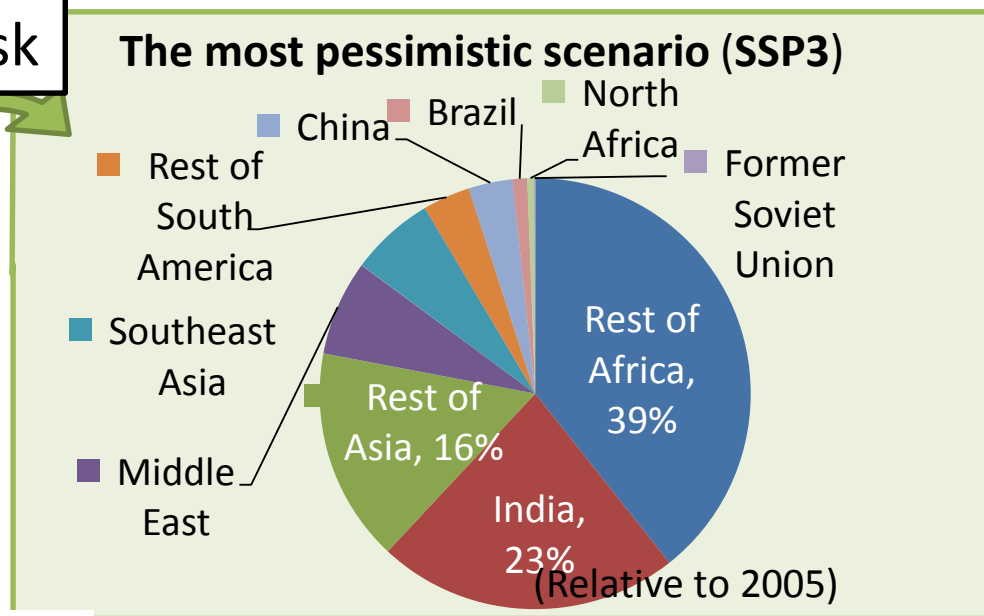
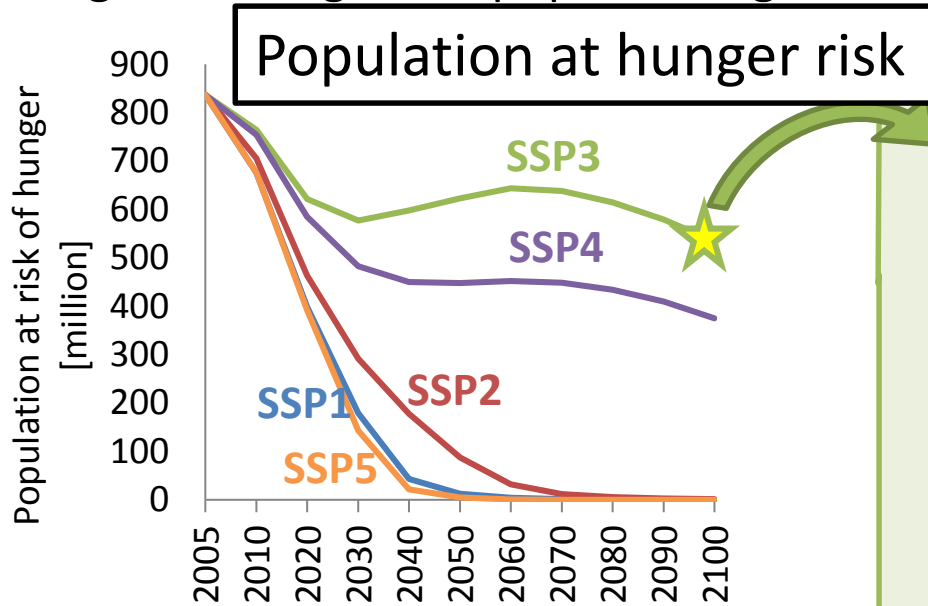
# IPCC New Scenario Development

## Shared Socio-economic scenarios (SSP) for mitigation and adaptation

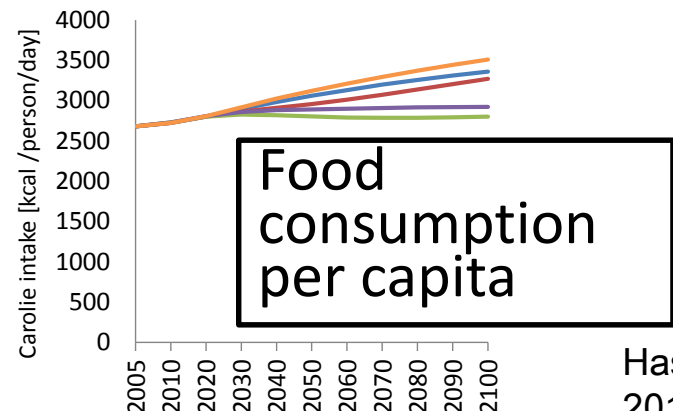
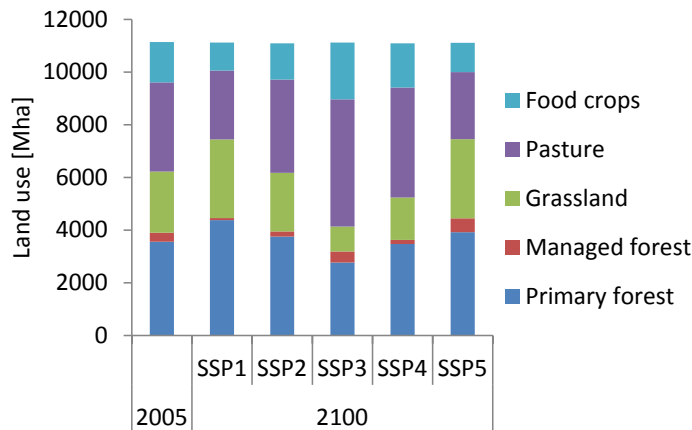


# Risk of hunger in the 21<sup>st</sup> century

- 21st-century risk of hunger strongly differs among different socioeconomic conditions
- Regional distribution depends greatly on population growth, equality in food distribution and increase in food consumption
- Regions with greater population growth face higher risk of hunger.



**Land use change**



# Collaboration Project for COP21

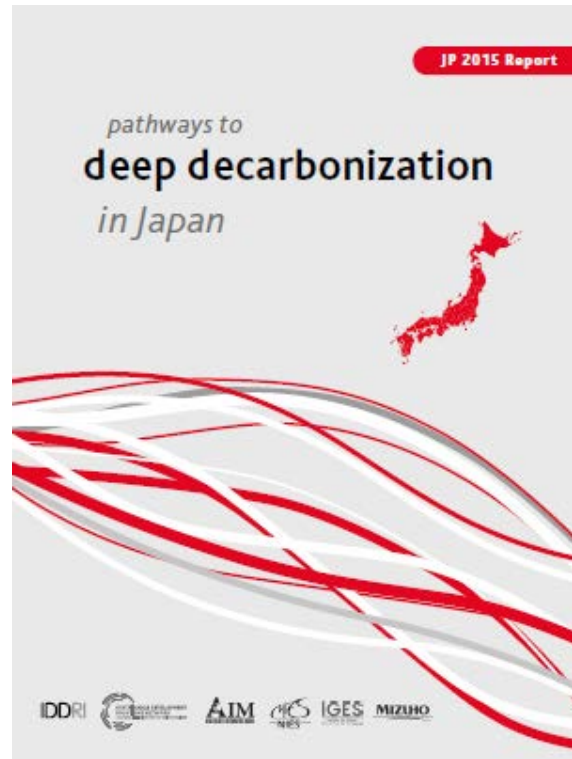
## Deep Decarbonization Pathways Project

### Scenario Analysis through 2050

#### Global Report



#### Japan Report



## MILES Project

### Scenario Analysis through 2030

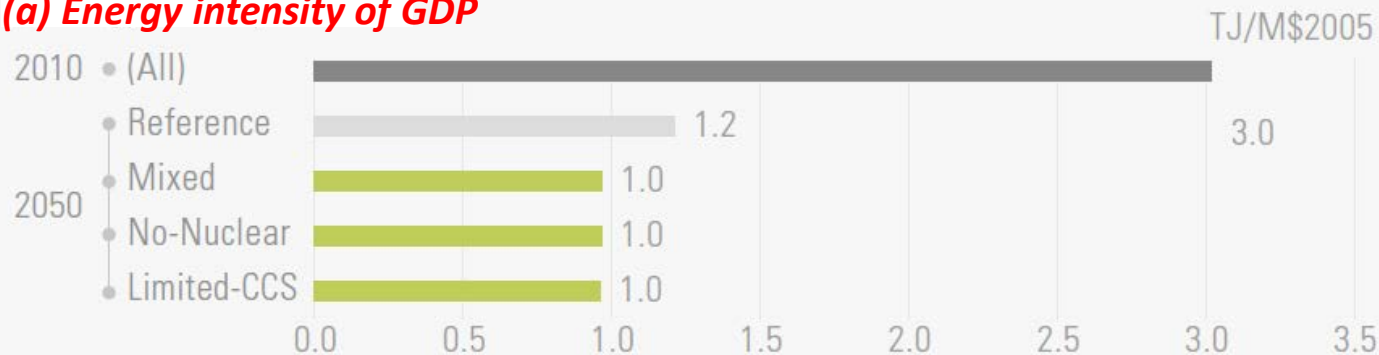
#### Assessment of Intended National Determined Contribution (INDC)



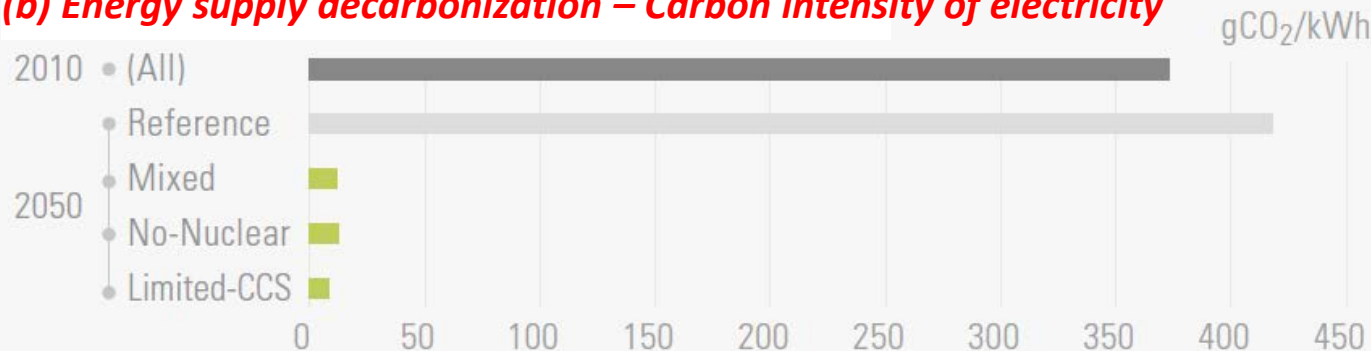
# Results: Indicative metrics for the three main decarbonization strategies compared to 2010

Japan DDP Scenario

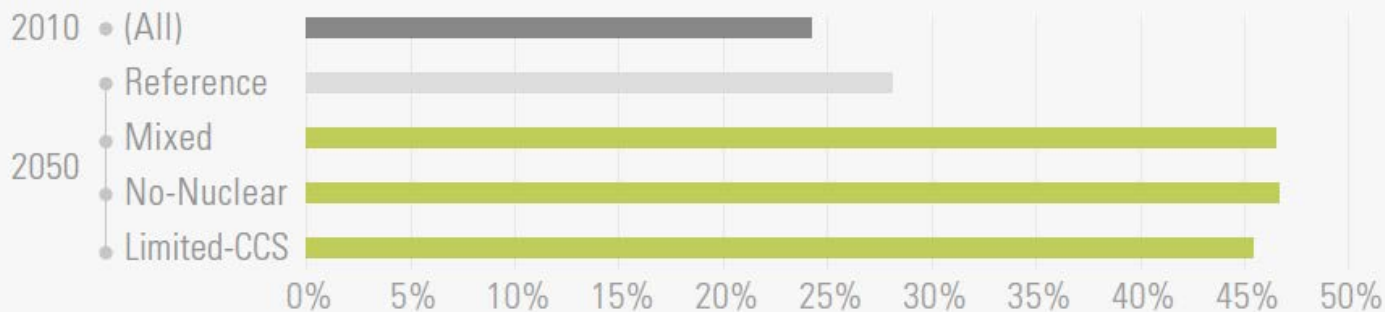
**(a) Energy intensity of GDP**



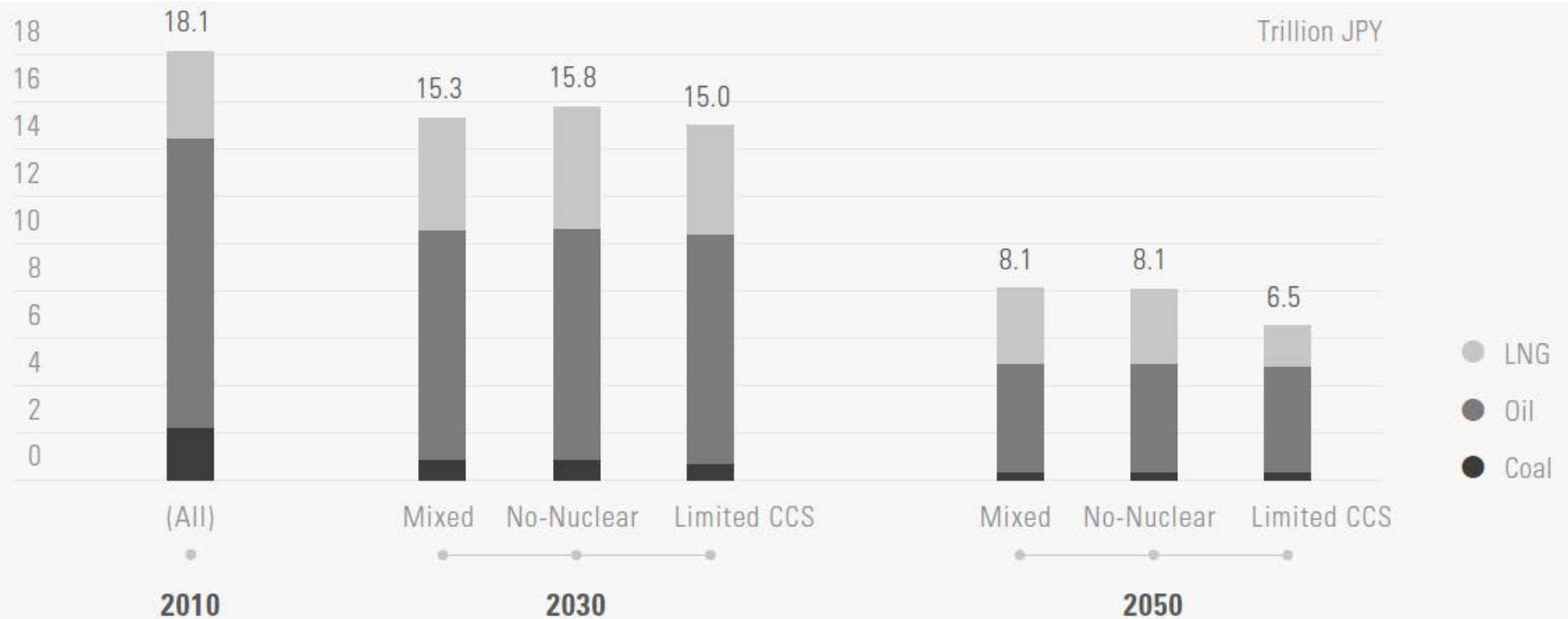
**(b) Energy supply decarbonization – Carbon intensity of electricity**



**(c) Electrification, share of electricity in final energy**



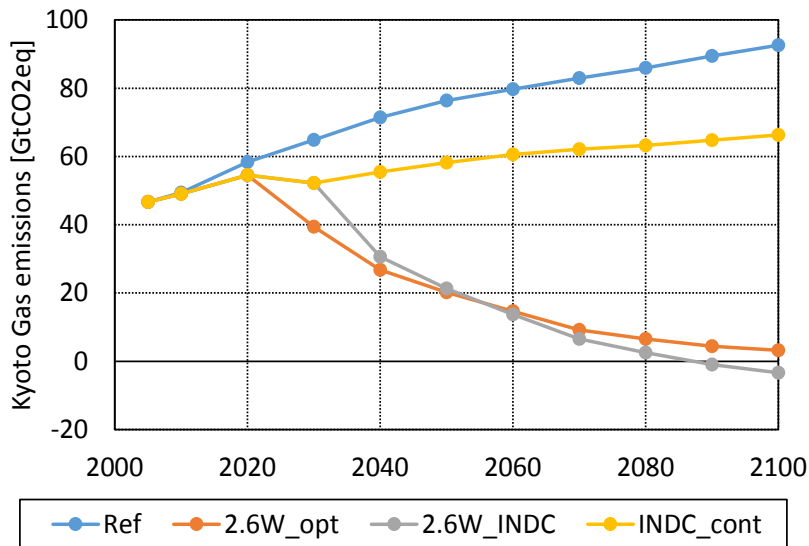
# Fuel import cost



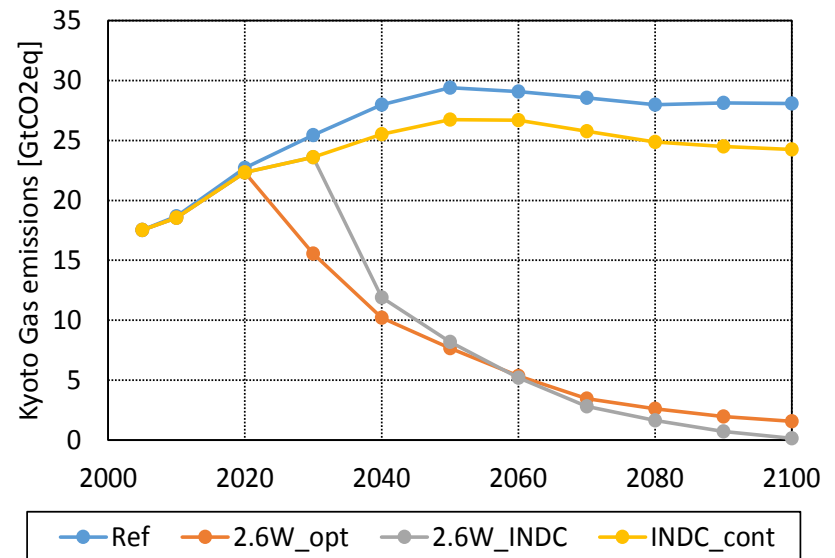
- A crucial feature of the deep decarbonization for Japan is the reduction of the dependency on imported fossil fuel. The cost of fuel imports to the Japanese economy continuously decreases over time in parallel with the strengthening of deep decarbonization, reaching a 56% to 65% reduction in 2050 compared with 2010 levels.
- The effect is most pronounced in the Limited CCS Scenario, which imposes an even more ambitious reduction of fossils use (and hence imports) in the electricity sector and favors the diffusion of domestic renewable energy.

# Assessment of INDCs using AIM/CGE[Global] (Ver.1)

Targets proposed in INDCs are meaningful and necessary to develop low carbon society. However, achievement of the 2 °C target will depend on the revision of INDCs and mitigation measures after 2030. Share of GHG emissions in Asia is large, therefore mitigation measures in Asia, become more important.



Trend of global GHG emissions

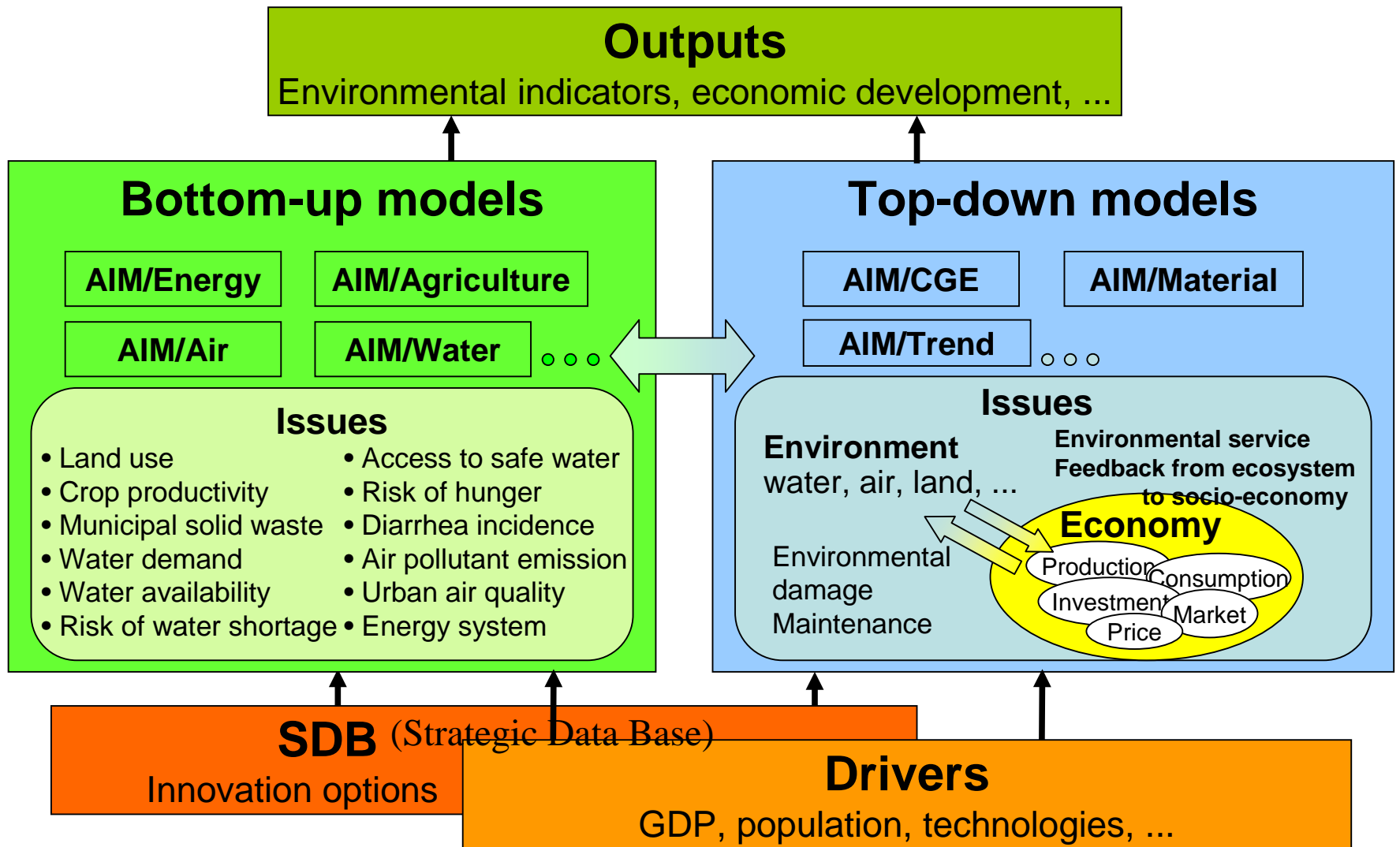


GHG emissions in Asia



# The 17 UN Sustainable Development Goals





**SDB** (Strategic Data Base)

Innovation options

**Drivers**

GDP, population, technologies, ...

Models of the AIM family

# ***What kind of issues IAM Tools can address?***

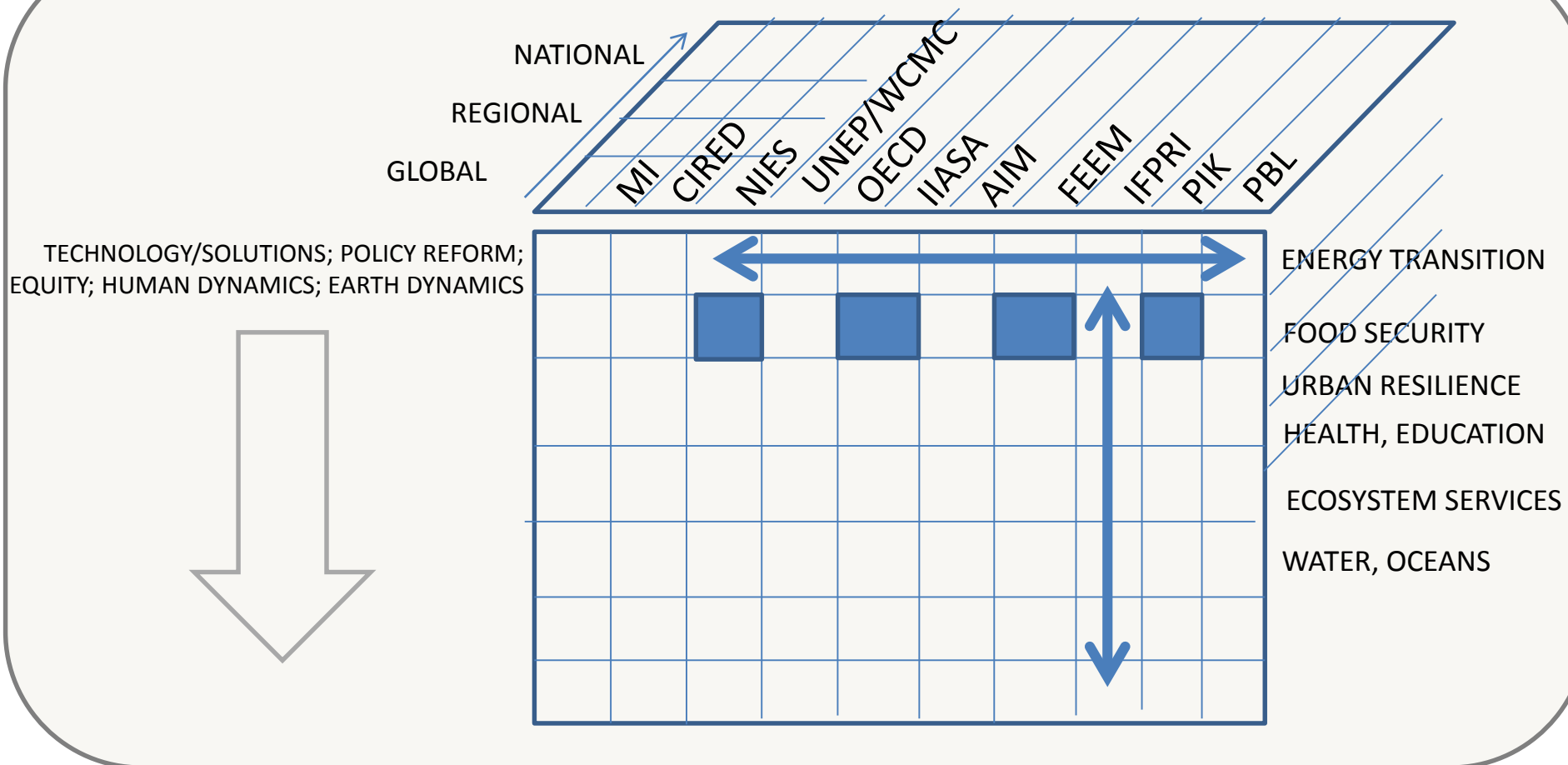
Issues Considered	Examples
Integration of sustainable development goals, global environmental problems, and sustainability	<b>India's</b> assessment of innovative options for <b>meeting both sustainable development goals and climate change objectives</b>
Renewable energy, rural electrification, and municipal solid waste management	<b>Thailand's</b> and <b>Korea's</b> <b>environmentally sound energy innovations</b>
Rain water, drinking water, weather, climate, ....	<b>Asia-Pacific countries'</b> water and <b>sanitation developments and national health improvements</b>
City air pollution management	<b>Beijing city</b> air management <b>China</b> air <b>pollution and health impact</b>

**IAM Tools can address country-specific various environment and development problems**

# INTEGRATED SCENARIOS OF MEETING SDGS WITHIN PLANETARY BOUNDARIES – VERSUS BAU

HUMAN DEVELOPMENT/ECONOMIC DEVELOPMENT/EARTH RESILIENCE

## Normative framing of desired future: SDGs within PBs



# Networking for Low Carbon Society



## COP21 – A moment of truth for climate and sustainable development

*Time is running out to act on climate change, poverty eradication and sustainable development. These challenges cannot be met independently of each other. The task of COP21 is to send strong policy signals that determined climate action is needed and will not harm the economy. In fact, these actions will trigger multiple employment, health and human development benefits by aligning strengthened short-term economic growth with long-term sustainable development goals.*

*It is challenging but possible to trigger the transformation toward low carbon futures and to increase the affordability of advanced technologies despite the current pressures on public budgets. The world is awash in liquidity. What is needed is to redirect the savings of households, pension funds, insurance schemes, and sovereign wealth funds towards long-term and low-carbon investments.*

*Sound regulatory frameworks and innovative financial mechanisms must be established to reduce the risks attached to potentially profitable low-carbon projects that are blocked by a combination of high upfront costs and an uncertain environment, so as to attract private savings and institutional investors.*

*COP 21 can provide critical policy hooks for step changes in economical and financial intermediation based on public guarantees for low carbon investments; an agreed social value of carbon mitigation activities could be incorporated into diverse low-carbon financial initiatives supporting Intended Nationally Determined Contributions (INDCs); strong and enforceable requirements for Measuring, Reporting and Verification (MRV) can ensure the environmental integrity and sustainability of the resulting investments. Such a framework can secure the transparency of voluntary commitments by countries, clubs of countries and non-state actors.*

*If it can achieve these goals, the Paris Agreement can unleash a wave of investments into low-carbon development that responds to short-term economic and social challenges while supporting the fundamental changes that will be needed to build our new common future.*



## LoCARNet Iskandar Malaysia Declaration

### Stabilising climate through low carbon actions in Asia - Road to COP 21 and Beyond

Climate change is taking place and its impacts are increasingly felt; tackling climate change is not an option and now is the time! Everyone on the planet needs to contribute. Being a continent that is called home by over half the world's population, fast urbanising, and experiencing the most rapid economic growth, Asia's positive actions towards stabilising the climate are especially indispensable. Asia must be included for any global climate change mitigation and adaptation actions to be meaningful towards the year 2020 and beyond.

We, participants of the International Conference on Low Carbon Asia and LoCARNet 4<sup>th</sup> Annual Meeting in Iskandar Malaysia, Johor, have thus agreed to produce the Iskandar Malaysia Declaration as stated below:

1. **Asian wisdom** for sustainable development potentially underpins the success of any international and regional climate change mitigation and adaptation efforts. Asian wisdom's holistic and extra-long term world view; espousal of harmony and balance; and emphasis on "mottainai" (frugality), "gotong-royong" (collective actions), sufficiency economy philosophy (SEP) and mutual benefits for all offer effective frameworks for international consensus, advancement and operationalisation of climate stabilisation goals and actions.
2. Transformation of Asian economies into sustainable low carbon economies via embracing **green growth** needs to be accelerated; new opportunities and possibilities for economic growth in Asia arising out of climate change mitigation and adaptation actions need to be emphasized.
3. People are at the centre of any consequential transition into a low carbon society (LCS) and economy, and Asians are a highly diverse people; **inclusive** and enabling climate policies that empower the people to determine and take positive climate stabilisation actions in accordance with their economic, socio-cultural and technological capacities are vital.
4. Asian nations will continue to protect, restore and promote sustainable use of terrestrial ecosystems, including **cities, human settlements and natural environments** (sustainable management of forests through REDD+, combating desertification; halting and reversing land degradation; halting biodiversity loss), as well as ensure sustainable use of the oceans, seas and marine resources.
5. Bringing 'Science-into-Action' (S2A) is an indispensable dimension of effective climate policies and **low carbon governance** towards ensuring that climate policies are not only formulated based on good scientific evidence but are also implementable. Asia will continue to focus efforts on strengthening well established pro-active research networks and communities of researchers, sub-national as well as national policymakers and implementation agencies to spearhead low carbon transition into a sustainable LCS.
6. Global climate stabilisation goals cannot possibly be achieved without Asian nations' concrete contributions and Asian nations need variable forms and levels of supports and aids from developed economies to transform into LCS. Global and regional **smart partnerships** in the form of North-South and South-South-North cooperation in capacity building, mutual learning, technology transfer, technical assistance and financial aids will be a key success factor of the transition towards resilient LCS that is compatible with an increase in average surface temperatures limited to 1.5° to 2°C compared to the pre-industrial level.

The world can no longer afford any delay in taking real, positive actions to mitigate and adapt to global climate change. Asia is ready to contribute.

Asia positively anticipates desirable outcomes of the Paris Climate Change Agreement that will put in place an inclusive and enabling framework for actions which recognises differentiated capacities and potential of, and thus is supportive to, all nations in their quest to contribute realistically to mitigating and adapting to global climate change.

# Topics included in the LoCARNet Iskandar Malaysia Declaration

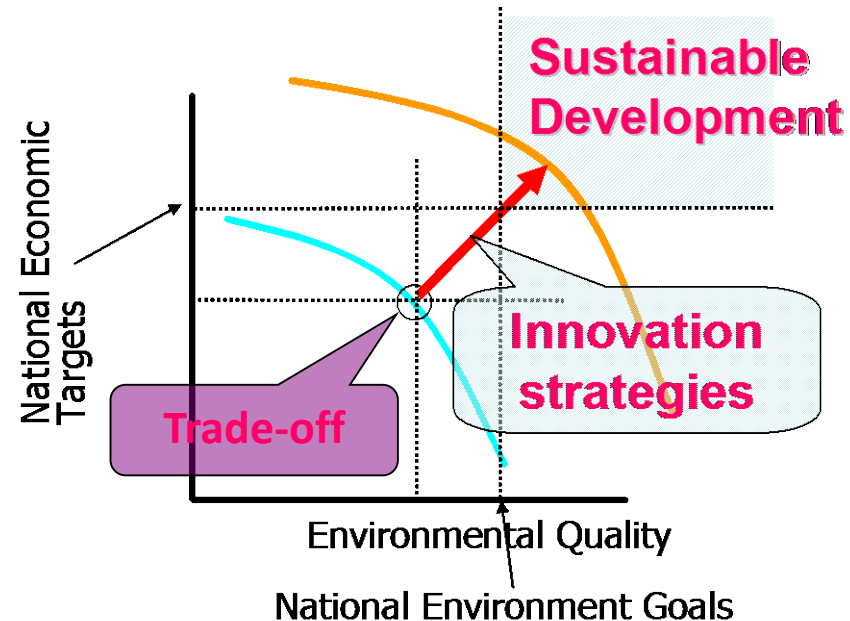
1. **Asian wisdom** for sustainable development
2. Transformation of Asian economies into sustainable low carbon economies via embracing **green growth**
3. **Inclusive** and enabling climate policies that empower the people to determine and take positive climate stabilisation actions in accordance with their economic, socio-cultural and technological capacities are vital.
4. **Cities, human settlements and natural environments**
5. **Low carbon governance** towards ensuring that climate policies are not only formulated based on good scientific evidence but are also implementable.
6. Global and regional **smart partnerships** in the form of North-South and South-South-North cooperation in capacity building, mutual learning, technology transfer, technical assistance and financial aids will be a key success factor of the transition towards resilient LCS.



# *Messages from AIM*

## *-Integrated Environmental Assessment-*

1. IAM tools can assess policies to achieve SDGs & national targets, link science and policy, and assist to improve effectiveness of policy-making.
2. Quantitative assessment can provide information and insights for making innovative choices delivering co-benefits.
3. Technology and institution innovations are keys to extend the frontier of environment and development.

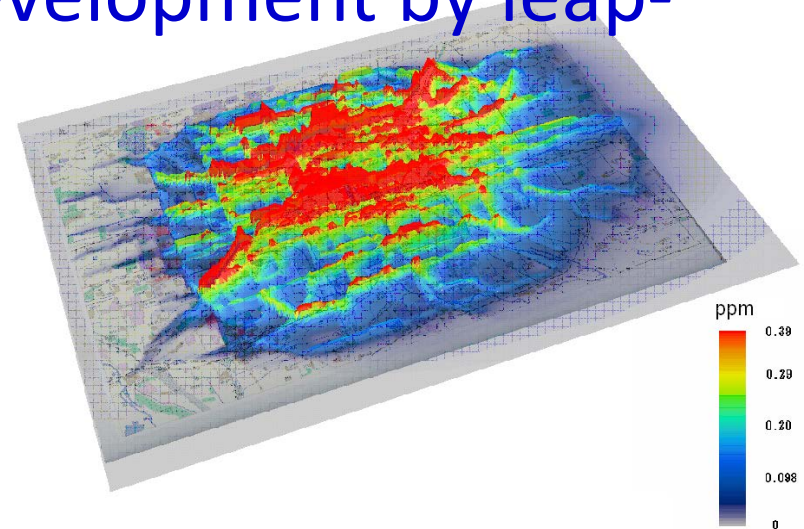




# ***Messages from AIM***

## ***-Integrated Environmental Assessment-***

4. There is a gap between 2 °C target and INDCs. How to fill the gap is a challenge and the policies to meet SDGs can enhance to meet the climate goal.
5. There are great opportunities in Asia to achieve sustainable development by leap-frogging.



# Thank you for your attention!

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

Live simply so others may simply live.  
Mahatma Gandhi

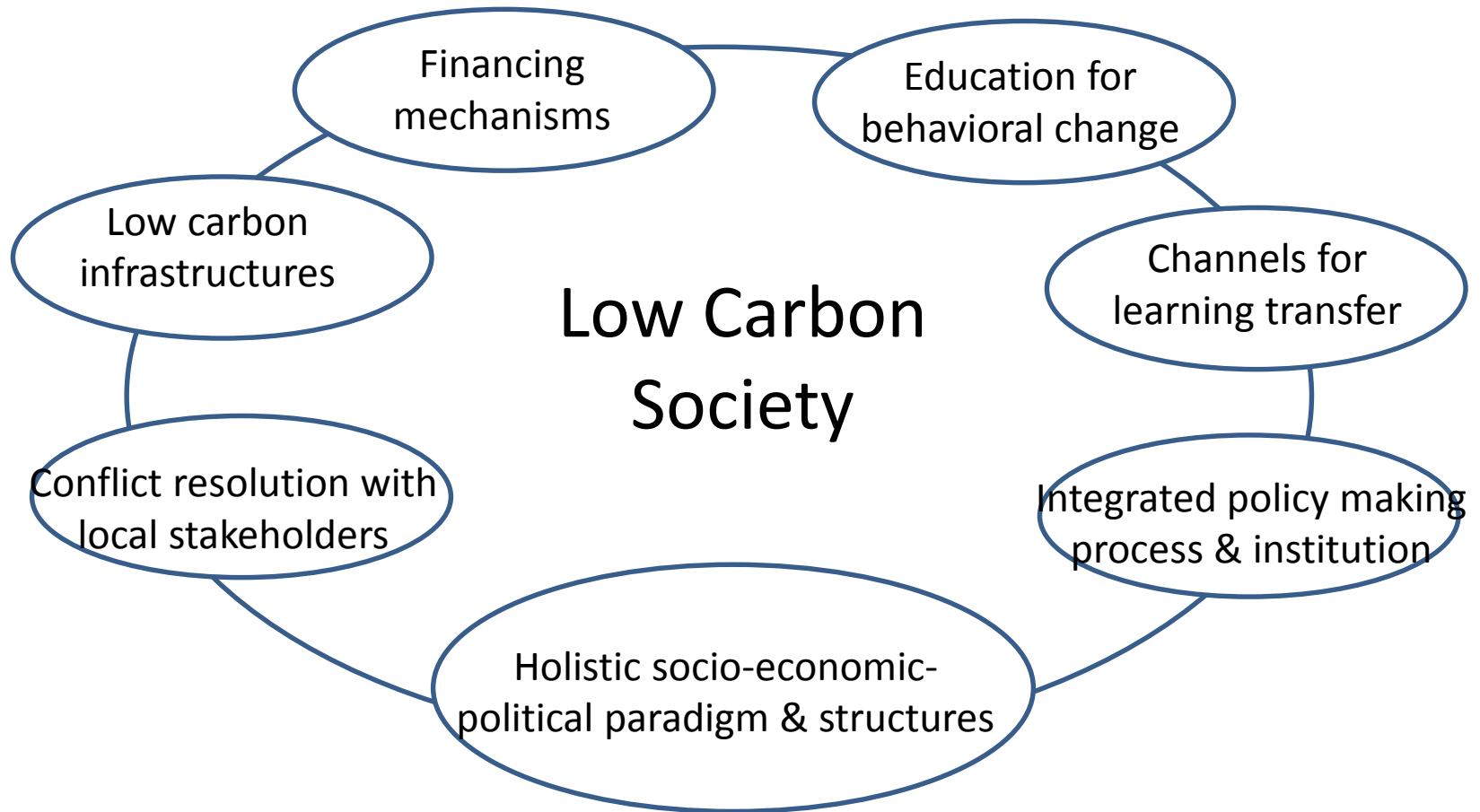


# Key Issues discussed at 5<sup>th</sup> Annual Meeting of LCS-RNet

1. **Vision:** A global vision and a set of coordinated policies and measures are necessary to direct investment towards low carbon project/programmes at the global level.
2. **Governance:** Cooperation is essential if social and environmental goals are to be achieved; while competition will help to achieve goals cost-effectively.
3. **Economy:** Delays in the transition will cause lock-in of the economy into less cost-effective alternatives. Transitioning to a low carbon society can stimulate the economy and create new industries.
4. **Scale:** Local (e.g. City) level actions can accelerate the transition to low carbon societies at a global scale.
5. **Social:** The transition to a low carbon society will imply fundamental changes in the underlying culture, structure and behaviour of societies.

# Additional Slides

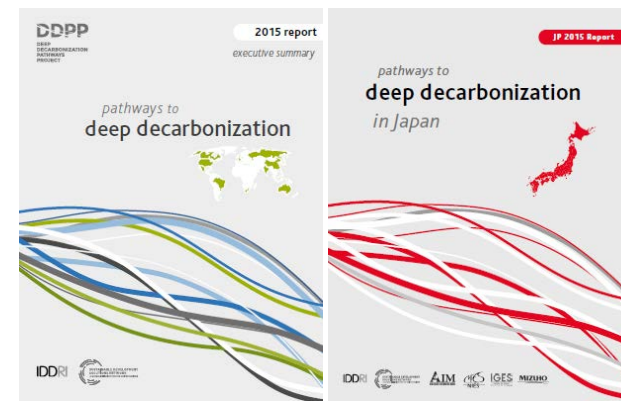
# Changes needed in structures, institutions, processes and mechanisms for a low carbon society



There are formidable barriers that inhibit or slow down the introduction and diffusion of low-carbon measures. Some require implementation of new mechanisms of market or regulation. Those which require fundamental structural changes are harder to implement. Inertia makes such changes difficult.

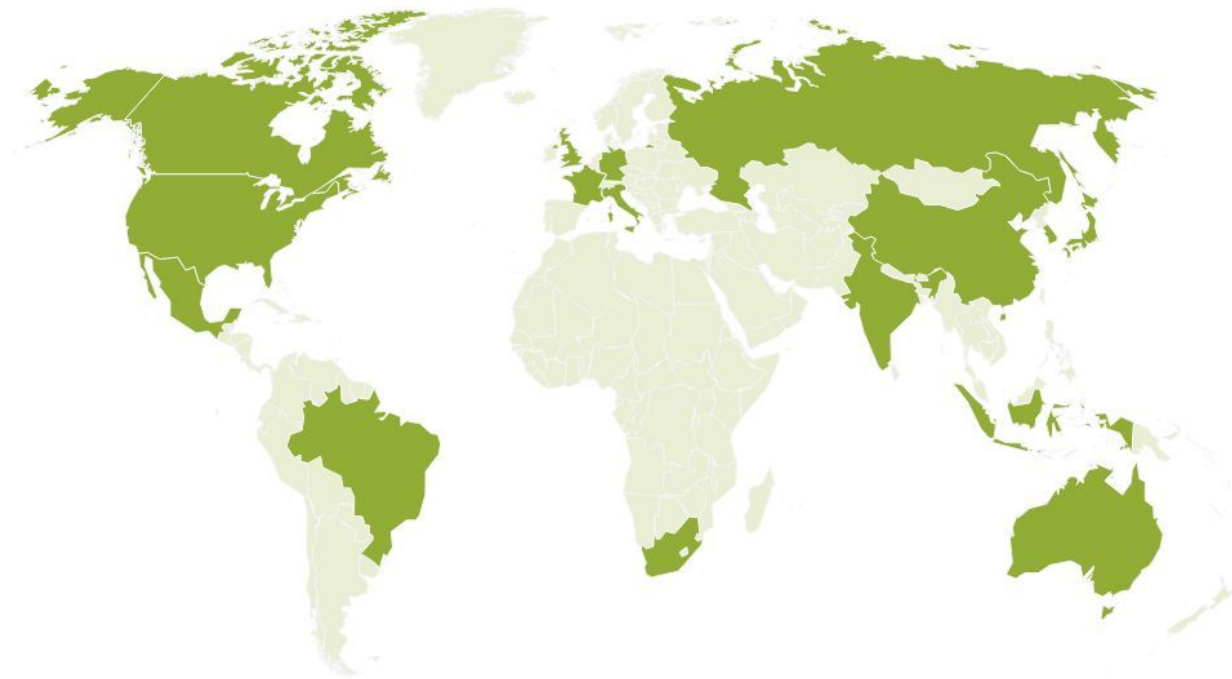
# これまでの経緯

- 2013年 プロジェクト開始
- 2014年7月 2014年中間報告書：  
潘基文国連事務総長に提出
- 2014年9月 国連気候変動サミット：  
ジェフリー・サックス氏より発表
- 2014年10月 DDPP報告シンポジウム1  
(東工大くらまえホール)  
※結果は地球環境センターニュース2014年12月号に掲載  
<http://www.cger.nies.go.jp/cgernews/201412/289003.html>
- 2015年9月 2015年報告書の公表  
(統合報告書・国別報告書)



# 16か国の研究機関が参加

- 各国が、自国の低炭素化シナリオを分析し、国別レポートを作成（オーストラリア、ブラジル、カナダ、中国、フランス、ドイツ、インド、インドネシア、イタリア、日本、メキシコ、ロシア、南アフリカ、韓国、英国、米国）
- 日本の参加研究機関：国立環境研究所・地球環境戦略研究機関（IGES）・みずほ情報総研





# 2015年報告書の公表

- COP21に先立って、2015年9月14日に報告書を公表
- 同日のMedia Workshop(パリ)にて報告  
(日本からは国立環境研究所甲斐沼美紀子フェローが参加)



## 【Media Workshopの様子】

約15カ国25名程度のメディアに紹介。

DDPPの立上者の一人であるTubiana教授  
(COP21特別代表:左から2人目)より、  
長期目標の検討が重要であるとの説明。

## Concrete/practical steps for transformation

- We should try to meet the climate change targets and SDGs as one overarching goal, as they are complimentary and one cannot do without the other – a failure to meet targets set by the climate change regime would also have an adverse effect on achieving the SDGs.
- Not only for targets for GHG emissions reduction, but also for targets for SDGs, it is utmost important to take data in a comparable manner, with uniform indexes and hard measures.
- In the post-2015 development era, multi-stakeholder partnerships are expected to play an increasingly important role in the implementation of sustainable development.

Source: Presentation by Sébastien Treyer, Iddri at The 7<sup>th</sup> Low Carbon Society research network, Paris Conference

# What kinds of things matter most for adaptation challenges?

- Expert Survey Results (41 respondents), Schweizer and O'Neill, 2011, variables that most shape adaptation challenges
  - Per-capita income (36)
  - Quality of governance (36)
  - Extreme poverty (35)
  - Coastal population (19)
  - Water availability (19)
  - Urbanization (18)
  - Educational attainment (18)
  - Innovation capacity (17)

Source: Marc A. Levy, Deputy Director, CIESIN

## **TARGETS**

### **13.1**

Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

### **13.2**

Integrate climate change measures into national policies, strategies and planning

### **13.3**

Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

### **13.a**

Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly \$100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible

### **13.b**

Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

# The Consequence of Climate Mitigation on Food Security

Aim of the study:

- Quantify the 3 impacts on food security
- Explore the possibility of reducing the negative impacts of mitigation measures by transferring funds.

1. Future climate change will affect **food supply and demand** through change in crop yields.

Climate  
change  
impact

2. Heavy bioenergy implementation would cause **land competition between food and energy crops** owing to limited land and water resources.

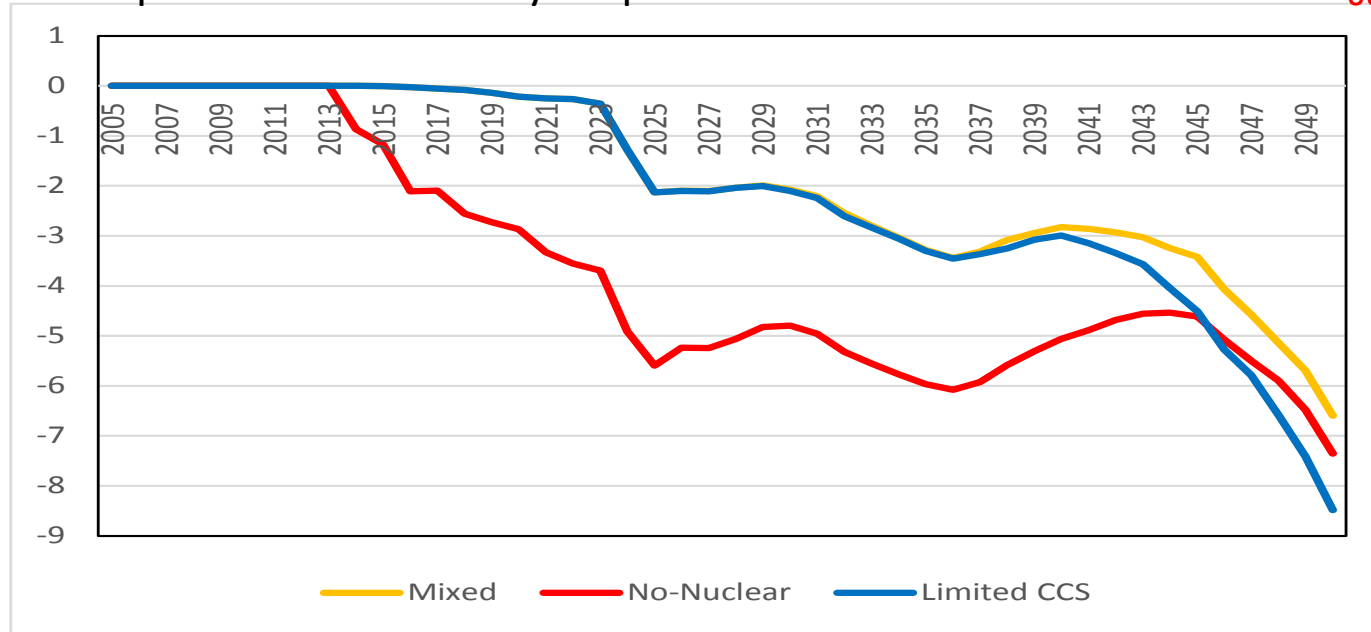
Bioenergy  
impact

3. Mitigation measures to stabilize GHG concentration at 450 ppm would cause **GDP loss** by 2050 (IPCC AR4 WGIII chapter 3).

Macroeconomic  
impact

# GDP loss in Japan relative to the Reference Scenario

trillion Japanese Yen at 2005 year price

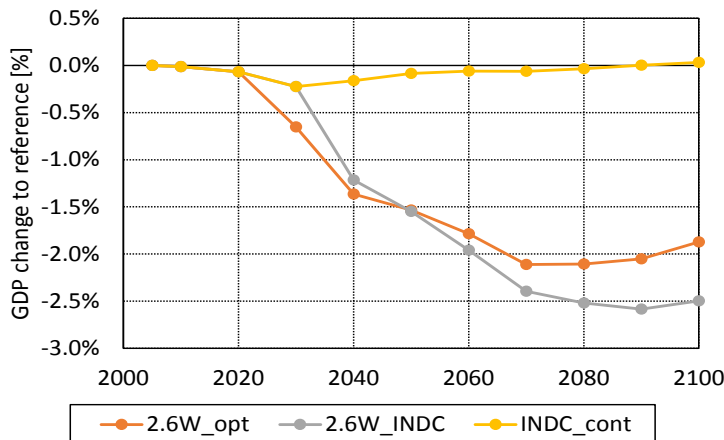


Japan DDP Scenario

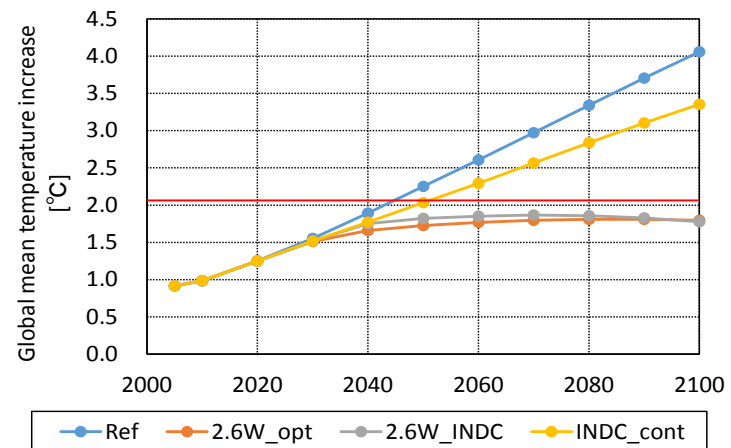
- In the Mixed Scenario, GDP in 2050 will be less than that of the Reference Scenario by 6.6 trillion yen at 2005 price. This means the annual GDP growth rate in the Mixed Scenario from 2010 to 2050 will be decreased by 0.02% point compared with the Reference Scenario.
- In the No-Nuclear Scenario, the GDP loss compared to the Reference Scenario will be 7.4 trillion yen in 2050. This result implies that the No-Nuclear Scenario will affect severe in the short term period, but in the long term period, the impact will be mitigated.
- In the Limited CCS Scenario, the GDP loss to the Reference Scenario will be 8.5 trillion yen in 2050. When the mitigation after 2050 is taken into account, the limitation of CCS will bring the more severe economic damages.

# GDP Changes and Global Mean Temperature Change (Assessment of INDCs)

The global GDP decrease in INDC scenario is lower than that of 2.6W\_opt by 2050, but it becomes larger after 2050. The global mean temperature increase in 2100 compared with the pre-industrial level will be 4 °C in REF scenario, and 3.3 °C in INDC\_cont scenario. Note that the costs of climate impacts are not counted in the GDP analysis. If we count the costs of climate impacts, GDP of Ref scenario could be lower than 2 degrees scenarios.



Global GDP change to Ref

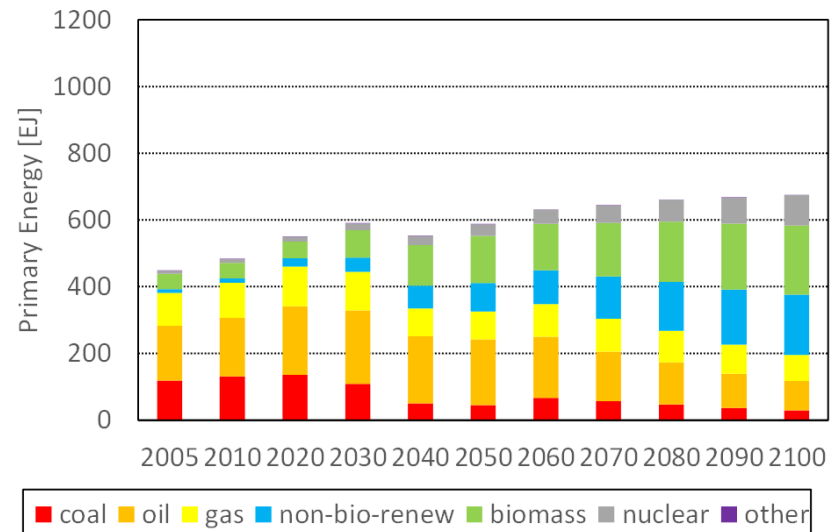
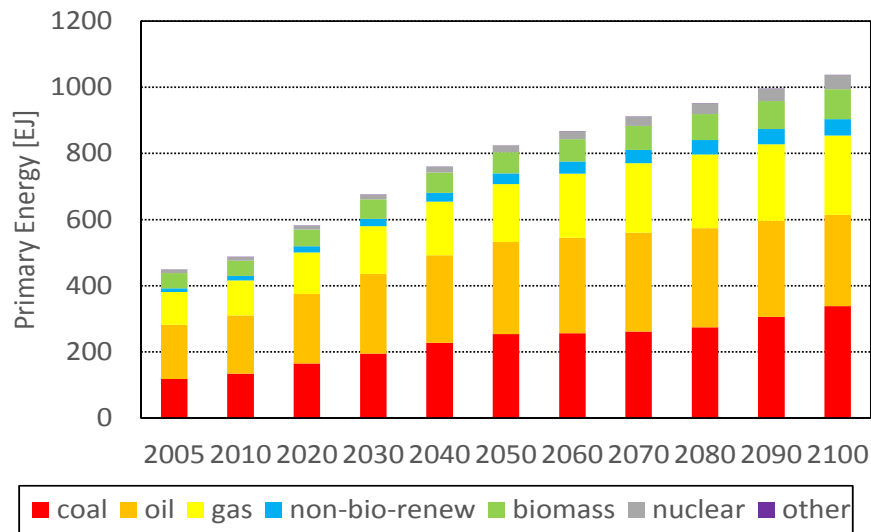


Global mean temperature change to the pre-industrial level



# Trends of global primary energy supply (Assessment of INDCs)

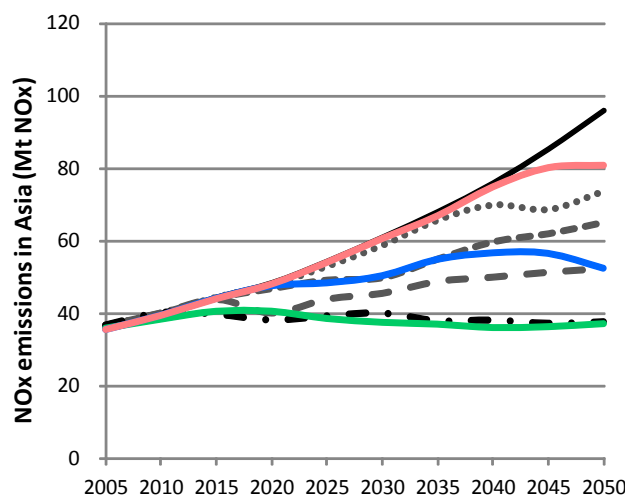
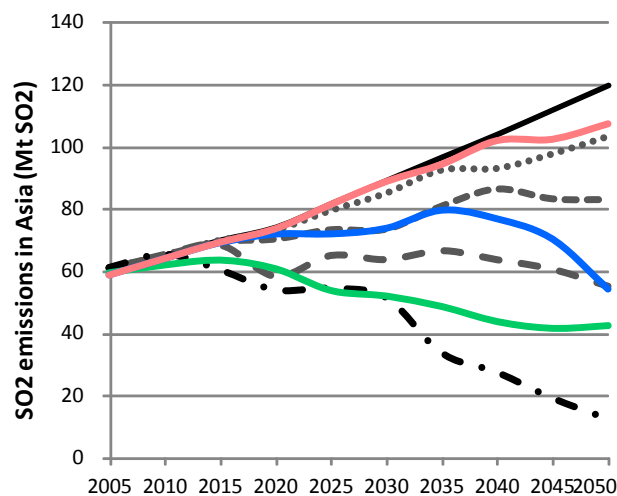
In 2030, INDCs will be able to lead the reduction of the global primary energy supply through the energy saving, and the switch from fossil fuels to non-fossil energy. In 2.6W\_INDC pegged with the 2 °C target, this trend after 2030 will be more likely, and the total primary energy will be around 60% compared with Ref. Moreover, 75% of total supply will be renewable energy.



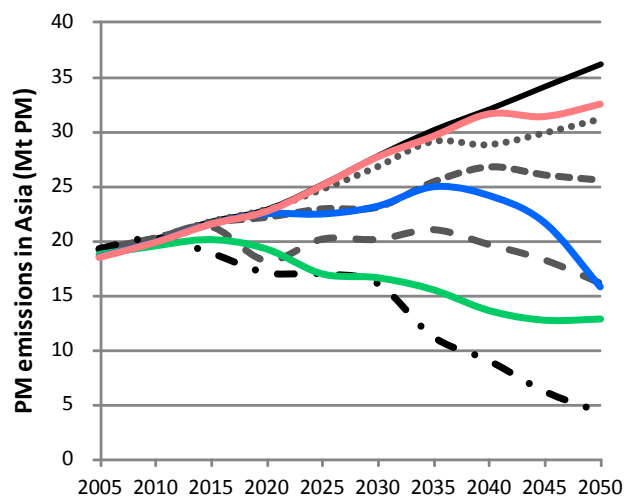
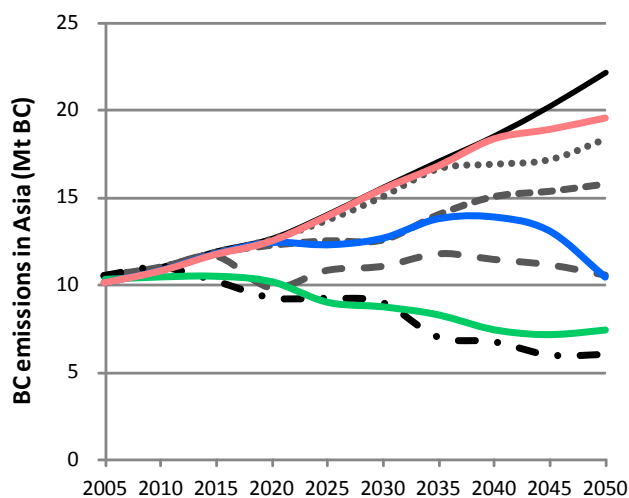
Trends of global primary energy supply (Left: Ref, Right: 2.6W\_INDC)

# SLCP & Air pollutants emissions in Asia

## - Cobenefits of implementing CO2 mitigation policies-

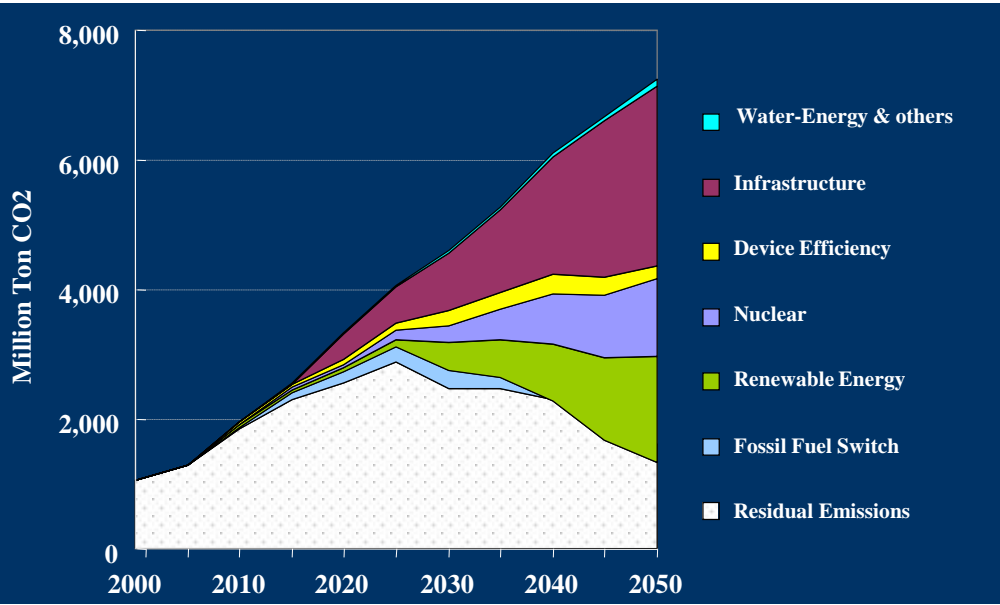


There are large reduction potentials of air pollutants and SLCPs, due to GHG mitigation actions such as drastic fuel shifts and energy efficiency improvement. (e.g. 60~90% reductions compared to baseline in 2050)



- Reference
- ..... 50US\$/tCO2
- - - 100US\$/tCO2
- · - 200US\$/tCO2
- · · 400US\$/tCO2
- 3°C scenario
- 2.5 °C scenario
- 2 °C scenario

# 2°C Stabilization: Mitigation Alternatives



**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**

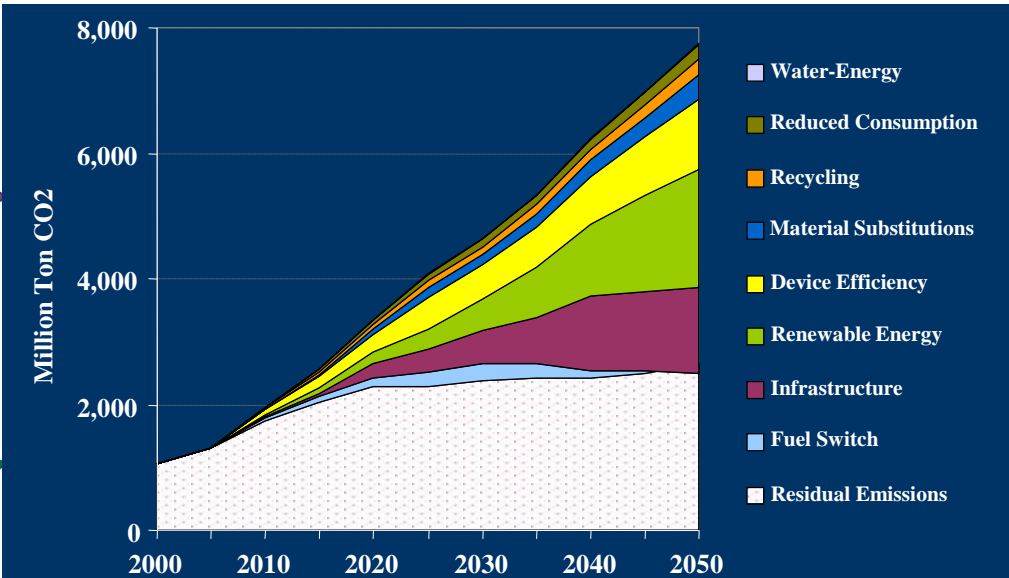
- Energy Efficiency
- Wind/Solar/Biomass/Small Hydro
- Nuclear/Low Carbon Infrastructure

**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**

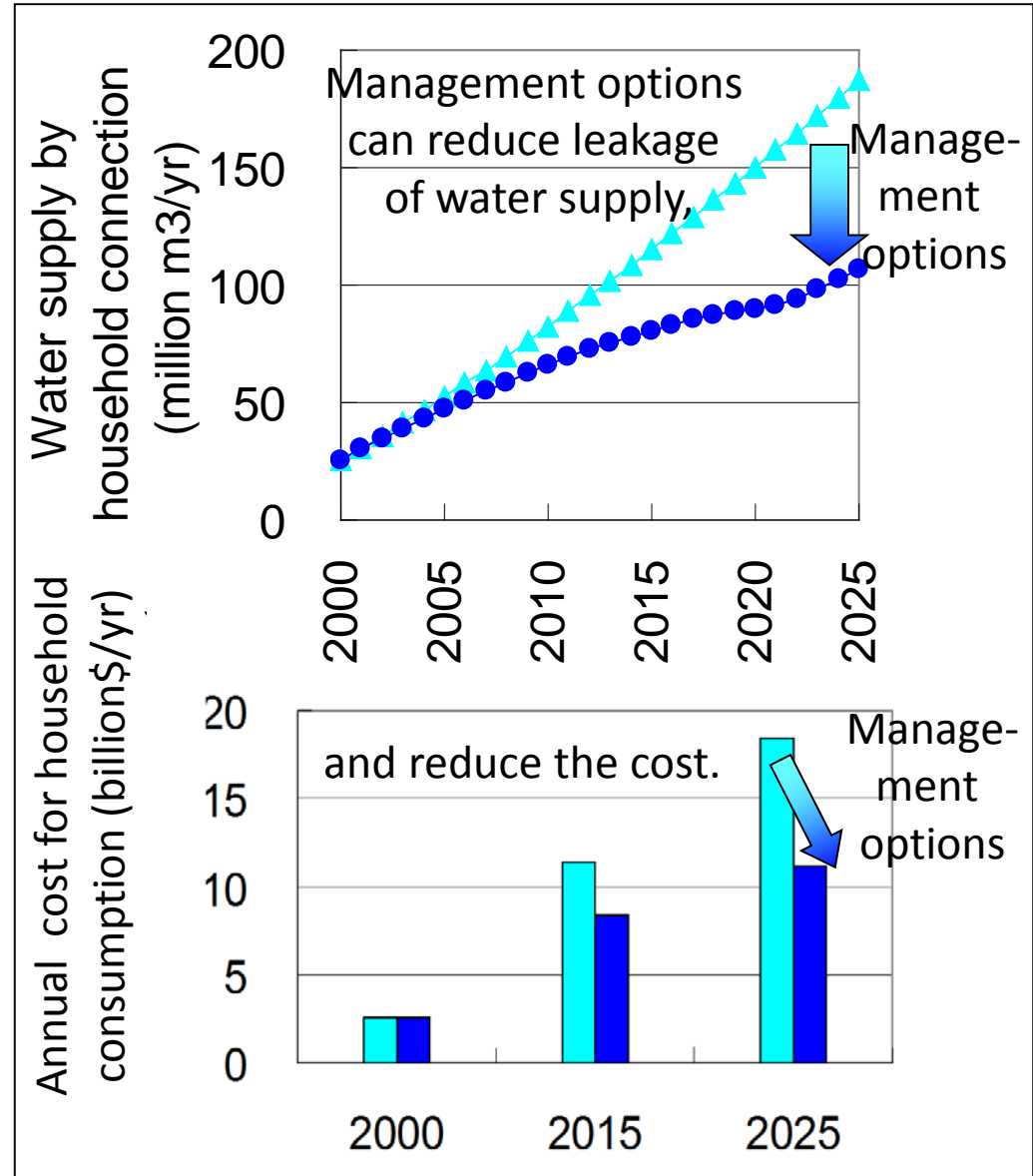
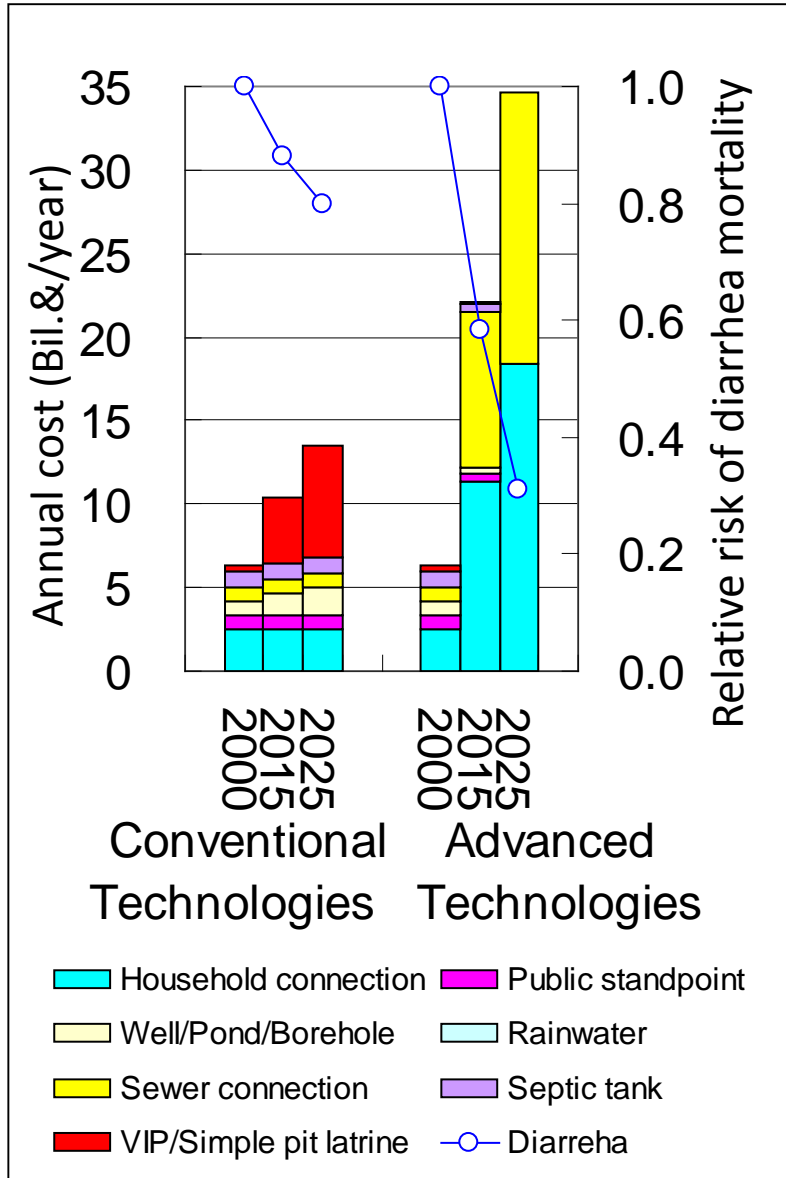
- Transport Infrastructure Technologies
- 3R, Material Substitutes, Renewable Energy
- Process Technologies
- Urban Planning, Behavioral Changes



# Assessment of Safe Water/Sanitation Technologies and Management Options



- Illustrative example of India's case -



# Topics at 7<sup>th</sup> Annual Meeting LCS-RNet

- Visions of the transformation of energy systems
- Urban dynamics, rural development and decarbonization
- The CBDR principle revisited: From burden sharing to picking the benefits of cooperation
- Triggering the transformation in a challenging financial context
- INDCs and SDGs: Funding challenges and benefits of cooperation.

# Ten Actions toward Low Carbon Asia

## Action 1 Hierarchically Connected Compact Cities: Urban Transport

- Compact cities with well-connected hierarchical urban centers
- A seamless and hierarchical transport system
- Low carbon vehicles with efficient road-traffic systems

## Action 2 Mainstreaming Rail and Water in Interregional Transport

- Formation of industrial corridors using a low carbon transport system
- Establishment of an intermodal transport system incorporating rail and water
- Reduction of CO<sub>2</sub> emissions from vehicles and aircraft

## Action 3 Smart Ways to Use Materials that Realize the Full Potential of Resources

- Production that dramatically reduces the use of resources
- Use of products in ways that extend their lifespan
- Development of systems for the reuse of resources

## Action 4 Energy-Saving Spaces Utilizing Sunlight and Wind: Buildings

- Improvement of the energy-efficiency performance of buildings
- Application of high-efficiency equipment to buildings including heating/cooling equipment
- Visualization of energy-saving efforts

## Action 5 Local Production and Local Consumption of Biomass

- Sustainable co-production of biomass energy and food
- Low carbon energy systems using local biomass resources in rural areas
- Improvement of living environments with intensive biomass utilization

## Action 6 Low Carbon Energy System Using Local Resources

- Promotion of sustainable local energy systems with renewables
- Creation of smart energy supply and demand systems
- Enhanced energy security by integrating low carbon energy sources and fossil fuels effectively into an energy system

## Action 7 Low Emission Agricultural Technologies

- Water management in rice paddies
- Highly efficient fertilizer application and residue management
- Recovery and use of methane gas from livestock manure

## Action 8 Sustainable Forestry Management

- Forest protection and effective plantation
- Sustainable peatland management
- Monitoring and management of forest fires

## Action 9 Technology and Finance for a Low Carbon Society

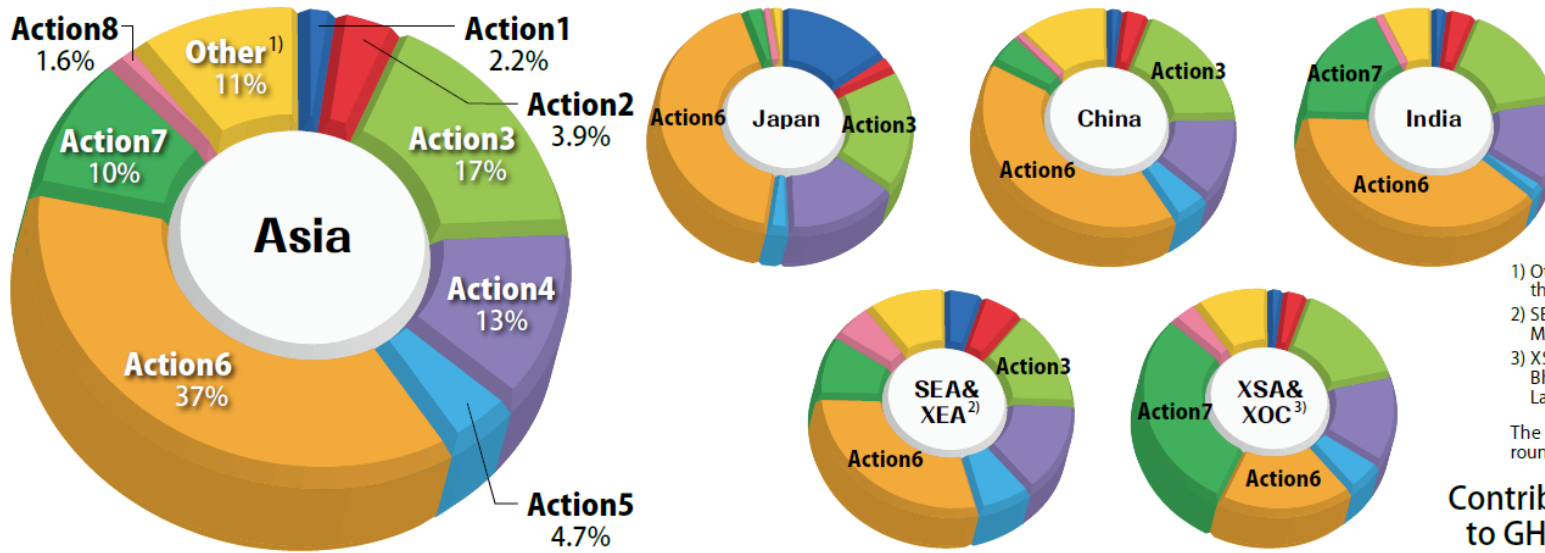
- Promote private-sector R&D for LCS
- Establish adequate funding to support R&D and technology diffusion
- Foster environmentally conscious consumers who choose low carbon products

## Action 10 Transparent and Fair Governance that Supports Low Carbon Asia

- Create an efficient administrative management framework
- Establish fair and transparent business practices
- Improve literacy with respect to environmental policies and technologies

(Note: Three illustrative approaches are mentioned for each Action; However, the list and priority of approaches will be specific to a country or region)

# GHG reduction by action



1) Other: CH<sub>4</sub> and N<sub>2</sub>O emissions from other than agriculture and livestock  
 2) SEA&XEA: Southeast Asia, Korea (DPR), Mongolia, Republic of Korea, and Taiwan  
 3) XSA&XOC: Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, Pakistan, Sri Lanka, and Small Island States in Oceania

The total is not always 100% because of rounding error.

Contribution of Ten Actions to GHG Reduction in Asia

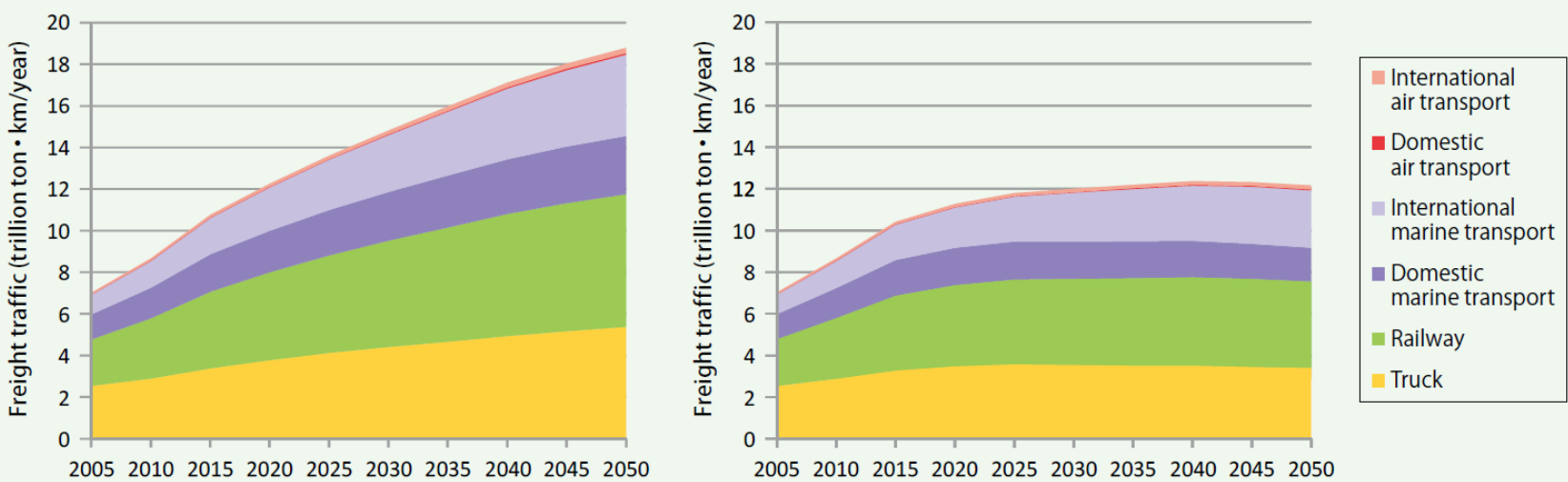


Fig. 2-1 Freight traffic: Reference scenario (left) and LCS scenario (right)



# Final energy consumption in the industrial sector: Reference scenario (left) and LCS scenario (right)

