Review of modelling approaches

- AIM Model -

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IIASA

The world in 2050 Interactive Science Meeting (TWI2050)
Can Asia Change the World through Leapfrogging?

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

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

Examples of issues to be tackled:
- Economic Leapfrogging development to LCS
- Energy: competition of biomass energy and food production
- Material: Social infrastructure and low materialization
- Lifestyle: Tradition, Diversity in Asia
- Institution: Barriers and policy plans to remove barriers
- Transportation: Low carbon transportation

Realization of Low Carbon Society with high quality of live

- Development of qualitative scenarios
- Development of actions and roadmaps
- Capacity building
- Analysis of Asian perspectives

Elements considered in scenarios and/or roadmaps
- Energy Production, Energy Service Supply
- Social Capital, Tradition, rule
- Social Infrastructure
- Domestic Institutions
- Other Environmental Problems
- International
- International Policy
- Trades
Top-down models

Environmental damage
Maintenance

Outputs
Environmental indicators, economic development, ...

Bottom-up models

AIM/Energy
AIM/Agriculture
AIM/Air
AIM/Water

Issues
Land use
Crop productivity
Municipal solid waste
Water demand
Water availability
Risk of water shortage
Access to safe water
Risk of hunger
Diarrhea incidence
Air pollutant emission
Urban air quality
Energy system

Economy

Environmental service
Feedback from ecosystem
to socio-economy

Environment
water, air, land, ...

Economy
Production
Consumption
Investment
Price

Drivers
GDP, population, technologies, ...

SDB (Strategic Data Base)
Innovation options

Models of the AIM family
How to deploy our study to real world

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

India
Bangladesh
Cambodia
China
Korea
Vietnam
Japan

India
BD
Cambodia
China
Korea
Vietnam
Japan

http://2050.nies.go.jp/LCS
Layers of changes needed in structures, institutions, processes and mechanisms for a low carbon society

- Financing mechanisms
- Low carbon infrastructures
- Education for behavioral change
- Channels for learning transfer
- Conflict resolution with local stakeholders
- Integrated policy making process & institutions
- Holistic socio-economic-political paradigm & structures
6 GHGs emissions pathways in Asia and comparison with 2 °C target pathways

- Emissions constraints of achieving 2°C-3°C were calculated based on UNEP Gap Report
- Future global economy-wide carbon prices scenarios (US$/tCO₂)

<table>
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<th>Scenario name</th>
<th>2013</th>
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</table>

Source) modified from Hanaoka et al, Environmental Pollution (2014)
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.

Source) modified from Hanaoka et al, Environmental Pollution (2014)
Risk of hunger in the 21st 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.

Population at hunger risk

The most pessimistic scenario (SSP3)

- Rest of Africa, 39%
- India, 23%
- Rest of South America, 16%
- Middle East, 16%
- Rest of Asia, 16%
- Former Soviet Union, 16%

Land use change

Food consumption per capita

Hasegawa et al., 2015
Thank you for your attention!

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