What we have done last 20 yrs, what we will do in next 20 yrs

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16th AIM International Workshop

20 Feb 2011
For the opening ceremony of the Center for Global Environmental Research (CGER) in October, 1990, Prof. Nishioka ordered us to prepare some attractive figures.

CO2 emissions in 2100

3°C increase
Asia-Pacific Integrated Model (AIM)

AIM project started
- ERI (China), IIM (India), MoE (Indonesia), Seoul U (Korea)
- Training workshop at COP8, India

Japan LCS Project (FY2004-FY2008)
- Japan-UK Joint Project (FY2006-FY2007)
- LCS-RNet (FY2009-)
- AIM training side event (2005-)

Asia LCS Project (FY2009-FY2015)
- JST/JICA SATREPS Project (FY2011-FY2015)

Low Carbon Society
- COP side event (2002-)
- Malaysia
- Indonesia, Thailand, Vietnam
- 2050

AIM Training WS (2002-)
COP3

1990 AIM
1994
1997
2001
2004
2006
2008
2009
2010
2011
2050

AIM project started
First, AIM/Enduse Model was developed

- **Energy**
  - Oil
  - Coal
  - Gas
  - Solar
  - Electricity etc.

- **Energy technology**
  - Blast furnace
  - Power generation
  - Air conditioner
  - Fluorescent
  - Automobile etc.

- **Energy service**
  - Crude steel products
  - Electricity
  - Cooling demand
  - Lighting
  - Transport volume etc.

**Energy consumption**
- CO2 emissions

**Technology selection**

**Energy service demands**

**Energy database**
- Energy type
- Energy price
- Energy constraints
- CO2 emission factor

**Technology database**
- Technology price
- Energy consumption
- Supplied service amounts
- Technology share
- Lifetime

**Socioeconomic scenario**
- Population growth
- Economic growth
- Industrial structure
- Employment
- Lifestyle
Other AIM models have been developed and used for climate change analysis. Appropriate temporal scale is different:

- **Short-term**
  - Base Year: 2005
  - Horizon: 2020 to 2030

- **Middle-term**
  - Base Year: 2005
  - Horizon: 2030 to 2050

- **Long-term**
  - Horizon: 2050 to 2100

Due to data constraints of future technology information and service demands, Enduse model analyzes scenarios with horizons of 2030, and up to 2050 at most.

To utilize Enduse model for Low Carbon Society scenario study toward 2050, it is essential to discuss outlook for innovative technological development and future service demands considering changes in social structure.

How to forecast outlook for innovative technological development?

How to estimate future service demands considering changes in social structure?
Each year, we had AIM international workshop
AIM, Past and Future

1990.7  Start of AIM Project
1992  Enduse model of Energy consumption, AIM/enduse
1993~94  AIM 1st version

1993  Global Long-term Scenario
1994.11  Nikkei Prize
1995.6  Start of International Collaboration
1996.2  Start of AIM International Workshop
1997.8  Start of AIM Training
1998~  AIM/material
2000  AIM/trend
2002~  AIM Strategic Database
2002~  AIM/ecosystem

1992  Enduse model of Energy consumption, AIM/enduse

1994  IS92 Evaluation
1994 ECO-Asia(LTPP)
2000.4  IPCC SRES
2000  GEO2
2001.4  IPCC TAR
2002~ APEIS(IEA)
2002  GEO3
2004  MA Report
****  IPCC Forth AR

1996~97  Dispute on Japan’s Reduction Target for COP3
1997.12  COP3
2001  Three Scenarios toward Eco Society
2003  Dispute on Carbon Tax

2000  GEO2
2000  AIM/trend
2002~  AIM Strategic Database
2002~  AIM/ecosystem

2000  GEO2
2000  AIM/trend
2002~  AIM Strategic Database
2002~  AIM/ecosystem

2002~  APEIS(IEA)
2003  Dispute on Carbon Tax

2004  MA Report
****  IPCC Forth AR

Japan’s Scenario to Low Carbon Society

By Y. Matsuoka at Memorial Workshop for Morita-san
It is possible to reduce GHG emissions drastically. Pathways should be identified.

Global emissions should be reduced by half by 2050. Japanese target: 60-80%

Shuzo Nishioka, Junichi Fujino; NIES COP11 and COP/MOP1 side event
Global Challenges Toward Low-Carbon Economy (LCE), Dec.3, 2005
LCS visions in Japan
two different but likely future societies

<table>
<thead>
<tr>
<th>Vision A</th>
<th>Vision B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vivid, Technology-driven</td>
<td>Slow, Natural-oriented</td>
</tr>
<tr>
<td>Urban/Persinal</td>
<td>Decentralized/Community</td>
</tr>
<tr>
<td>Technology breakthrough</td>
<td>Self-sufficient</td>
</tr>
<tr>
<td>Centralized production/recycle</td>
<td>Produce locally, consume locally</td>
</tr>
<tr>
<td>Comfortable and Convenient</td>
<td>Social and Cultural Values</td>
</tr>
<tr>
<td>2%/Cap/year GDP growth</td>
<td>1%/Cap/year GDP growth</td>
</tr>
</tbody>
</table>

http://2050.nies.go.jp
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
How to reach the Japan LCS?

Early Investment can reduce cost and enhance energy efficiency of countermeasures and gain multi-benefits e.g. energy security, business power, comfortable live space, walkable city, happy life!
Analysis of mid-term target setting in Japan by AIM model

1. AIM/Enduse[Global]
   - How much should we reduce GHG emissions?

2. AIM/Enduse[Japan]
   - Technological potential to reduce GHG emissions
   - Policies to develop & deployment technologies

3. AIM/CGE[Japan]
   - Economic impacts by the implementation of climate change policies
   - Effects of carbon pricing

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Equal total abatement cost per GDP
Abatement cost per GDP: 0.74%

Marginal abatement cost curve for 25% GHG reduction

Additional investment ('11 – '20 total)
Energy reduction expense ('11 – '20 total)
Energy reduction expense ('21 – '30 total)

Energy reduction expense
-36 -43 -50
-35 -42 -49
-50 -49 -48
-49 -48 -47
-48 -47 -46
-47 -46 -45
-46 -45 -44
-45 -44 -43
-44 -43 -42
-43 -42 -41
-42 -41 -40
-41 -40 -39
-40 -39 -38
-39 -38 -37
-38 -37 -36
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-12 -11 -10
-11 -10 -9
-10 -9 -8
-9 -8 -7
-8 -7 -6
-7 -6 -5
-6 -5 -4
-5 -4 -3
-4 -3 -2
-3 -2 -1
-2 -1 -0
-1  0  1

- NonCO2 + CO2 (non fuel)
- CO2 (Fuel Combustion)
- GHG
2. Where are we heading? Findings from Chapter 3

Global emissions, GtCO$_2$e

53 GtCO$_2$e in the least ambitious pledge case$^1$
- Unconditional pledges
- “Lenient” rules$^2$

Median estimate of 44 GtCO$_2$e

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$^1$ This is the median estimate of modelling groups, estimates range from 52-57 GtCO$_2$e (20$^{th}$ to 80$^{th}$ percentile)

$^2$ This relates to rules surrounding the use of surplus emission units (particularly those carried over from this commitment period of the Kyoto Protocol) and LULUCF accounting

Source: Adapted from The Emissions Gap report, UNEP, 2010
2. Where are we heading? Findings from Chapter 3

Global emissions, GtCO$_2$e

- 49 GtCO$_2$e in the most ambitious pledge case\(^1\)
  - Conditional pledges
  - “Strict” rules

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\(^1\) This is the median estimate of modelling groups, estimates range from 47-51 GtCO$_2$e (20th to 80th percentile)

Source: Adapted from The Emissions Gap report, UNEP, 2010

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Transition to LCS: How?

Design of LCS
How to achieve LCS?
Asian LCS scenarios 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

High Energy Locked-in Type Development
With High Damage on Economy and Natural System

Low Carbon World

Encouraging the framing for LC policy in each Asian country
Assistance for international negotiations with scientific basis
Networking among LCS research in Asia
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

http://2050.nies.go.jp/LCS
New Project led by Dr. Masui

Theme 1: Asia low carbon society
(Fujino et al.)

Subtheme 2: Mid & long term target setting and policy evaluation
(Hanaoka et al.)

Theme 3: Research on international institution and negotiation
(Kameyama et al.)

Technology, Model, Quantitative analysis

End of Kyoto commitment period

International trend

Link with other researches

Adaptation
Sustainable Development
Risk of climate change
Asia group
Risk communication
Database

IPCC AR5
RIO +20
COP17 (New protocol?)
NIES 3rd period research plan

2011
2012
2013
2014
2015
2020
2030
2050
Modeling and Policy Analysis to tackle with climate change

Copenhagen Country pledges

Technology Model

Copyright emission path

Technology Transfer

Kyoto Target

Economic Model

GHG450ppm Stabilization path

Visions of LCS?
Socio-economic condition where GHG emissions are reduced by half

Target of each country?

Dynamic optimization model

50% reduction

2008～2012 2020
First Commitment

2100～

Emission path and socio-economic condition to stabilize the climate change below 2°C target?
Modeling and Policy Analysis to tackle with climate change

Transition Phase

GHG emission path

Technology Transfer

Kyoto Target

Visions of LCS?
Socio-economic condition where GHG emissions are reduced by half

Target of each country?

Finance

Waste

Water

Energy

Food

Health care

GHG450ppm Stabilization path

Less than 2°C increase

50% reduction

2008～2012 2020
First Commitment

2050

2100～

Emission path and socio-economic condition to stabilize the climate change below 2°C target?
AIM model contribution

- National/local government
- Development agency
- Private/Business
- NGOs
- Research Institutes & Universities
- LCS–RNet
- IPCC/AR5
- EMF
- AMF
- AMPARE
- UNEP/GEO5
Major themes

• New scenario development with integration of adaptation, mitigation, and development
• Roadmap to achieve a low carbon society
• Better understanding of transition to a low carbon society
• More comprehensive treatment of regional aspects of climate change
• Climate change in the context of other dimensions (e.g. poverty, energy security, food security, water security, biodiversity loss, ...)

AIM
ASIA-PACIFIC INTEGRATED MODEL
International Cooperation toward Low Carbon Society


LCS-RNet: supported by G8EMM

UK
EU

China
Japan
USA

Promote researches on Asia LCS

- Organize side events on LCS at COP11-16
- International comparison on mitigation potential at OECD meeting/UNFCCC SBSTA

The 15th AIM International Workshop

AIM training workshop at NIES

LCS model building capacity workshop at Bangkok
Thank you for your contribution!