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The Sixth Tripartite Presidents Meeting among NIER, CRAES and NIES

November 25~27, 2009

National Institute of Environmental Research

Chinese Research Academy of Environmental Sciences

National Institute for Environmental Studies

MINISTRY OF ENVIRONMENT

National Institute of Environmental Research
Republic of Korea


NIER(KOREA)
國立環境科學院
CRAES(CHINA)
中國環境科學研究院
NIES(JAPAN)
國立環境研究所
The Sixth Tripartite Presidents Meeting
25~28, 2009, Seoul, Korea


The Sixth Tripartite Presidents Meeting


NIER(KOREA)
CRAES(CHINA)
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The Sixth Tripartite Presidents Meeting





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The Sixth Tripartite Presidents Meeting among NIES, NIER and CRAES

Joint Communiqué

At the invitation of President Sueng-Joon YOON of the National Institute of Environmental Research (NIER) of Korea, President Wei MENG of the Chinese Research Academy of Environmental Sciences (CRAES) and President Shinichiro OHGAKI of the National Institute for Environmental Studies (NIES) of Japan visited Seoul, Korea, and attended the Sixth Tripartite Presidents Meeting (TPM6) from November 25 to 27, 2009. The meeting of the presidents was followed by its parallel workshop, the "International Workshop on Realization of Low Carbon Society through Climate Change Adaptation".

In their opening remarks, the presidents noted the friendly relations among NIER, CRAES and NIES in the area of environmental science and expressed their appreciation for the on-going collaboration and cooperation activities among the three institutes. President YOON reviewed the current priority research areas of the TPM and expressed the necessity for the three institutes to pool their efforts and wisdom in search of concrete answers to environmental challenges through cooperative research to raise awareness of the problems in the region.

President MENG re-emphasized the principle of TPM: “Friendship, Cooperation, Communication and Win-win”. He also stated the achievements made in environmental protection by the three institutes through TPM mechanism and further expressed CRAES’s strong interest in working with NIER and NIES in the national key Special Program on Water Pollution Prevention and Control.

President OHGAKI acknowledged the close geographic proximity of the three countries and reaffirmed the importance of considering environmental issues in conjunction with each other in order to achieve sustainable development. He also emphasized that a healthy environment cannot be achieved without the research cooperation which is possible under the TPM framework.

The three presidents exchanged information on the recent developments in each institute and shared the view of the global challenges we are facing. They agreed to strengthen cooperation to address the issues including climate change, realization of low carbon society, resource recycling and waste management.

Furthermore, the three institutes reviewed the progress of their activities in the priority research areas. The presidents expressed satisfaction with the steady development made in the collaboration on "Transboundary Air Pollution" and "Dust and Sand Storm" (DSS). Fresh water pollution prevention study has been carried out with Japan-China Water Environment Partnership and NIES welcomed the participation of NIER and CRAES to the partnership. NIER invited NIES and CRAES to attend the "POPs Forum" to be held in December 2009 in Qingdao, China.

NIER proposed a new cooperation project on Risk Assessment and Safety Guideline on Recycled Product. CRAES and NIES agreed on this proposal and emphasized that experts in this field from the three institutes should further discuss the implementation in detail at the earliest opportunity.

The three institutes acknowledged the importance of the exchange of experts for enhancing research collaboration and sharing information on environmental research in East Asia.

President Wei MENG offered to host the seventh meeting of TPM (TPM7) in China. He suggested that the timing of the Working Level Meeting would be in April or May, 2010 and TPM7 would be held in Qingdao, Shandong Province in late September, 2010. He proposed solid waste management as the topic of the parallel workshop at TPM7. The three presidents agreed to open the workshop to environment related experts from universities and research institutes from the three countries, as well as accepting the participation of Mongolia and India as observers of TPM7. CRAES suggested that the three institutes jointly organize a side event at the COP10 of CBD in October 2010 in Japan. NIES will approach the Ministry of the Environment, Japan, to discuss the possibility of this proposal.

The presidents expressed their satisfaction with the successful outcomes of the meeting. President Wei MENG and President Shinichiro OHGAKI extended their sincere gratitude to President Seung-Joon YOON for his warm hospitality and leadership of the TPM6.

November 27, 2009 in Seoul, Korea

Seung-Joon YOON

President, National Institute of Environmental Research, Korea

Wei MENG

President, Chinese Research Academy of Environmental Sciences, China

Shinichiro OHGAKI

President, National Institute for Environmental Studies, Japan

TPM6 Program

Wed. Nov. 25

11:50～15:35	Arrive at Incheon International Airport
16:30～18:00	Working Level Meeting delegation (Charlotte Hall, the 36th floor of Lotte Hotel)
18:30	Official Dinner hosted by NIER President (Charlotte Hall, the 36th floor of Lotte Hotel)

Thurs. Nov. 26 General Meeting (Onyx Hall, the 2nd floor of Lotte Hotel)

09:00～09:20	**Session 1 : Opening Remarks by Presidents**
09:20～10:40	**Session 2 : Overview of recent achievement and future research plan** (chaired by CRAES President)
10:40～11:00	Coffee Break
11:00～12:00	**Session 3 : Review of TPM activities** (chaired by NIES President)
12:10～14:00	Lunch (SamcheongGak, Korean restaurant)
14:00～15:00	**Session 3** (Continued)
15:00～15:20	Coffee Break
15:20～17:00	**Session 4 : Collaboration in the Future** (chaired by NIES President)
17:00	Meeting adjourned
18:30	Official Dinner hosted by CRAES president (Charlotte Hall, the 36th floor of Lotte Hotel)

Fri. Nov. 27 Workshop : Realization of Low Carbon Society through Climate Change Adaptation (Charlotte Hall, the 36th floor of Lotte Hotel)

09:00～09:10	**Opening Remarks by President of NIER**
09:10～10:25	**Session 1 : Introduction for Climate Change-Prediction and Impact Assessment** (Moderator : Dr. You-Deug HONG, NIER, Korea)
10:25～10:45	Coffee Break
10:45～12:00	**Session 2 : Global Climate Change Monitoring, Adaptation and Mitigation** (Moderator : Dr. Fan MENG, CRAES, China)
12:00～13:30	Lunch (Yongsusan, Korean restaurantl)
13:30～14:45	**Session 3 : Toward the Low Carbon Society (LCS)** (Moderator : Dr. Makoto SAITO, NIES, Japan)
14:45～15:05	**Closing Remarks by Presidents of CRAES and NIES**
15:05～15:25	Commemorative Photograph
15:25	Workshop adjourned
15:25～15:45	Coffee Break
16:20～17:00	**Signing ceremony of the 6th TPM Joint Communiqué (by three presidents)**
18:30	Official Dinner hosted by NIES president (outside Lotte Hotel)

Sat. Nov. 28 Leave at Incheon International Airport

General Meeting

Thu., Nov. 26 (Onyx Hall, the 2nd floor of Lotte Hotel)

09:00~09:20 **Session 1 : Opening Remarks by Presidents**

1-1 Opening address by President of NIER Korea

1-2 Keynote Speech (CRAES President)

1-3 Keynote Speech (NIES President)

09:20~10:40 **Session 2 : Overview of recent achievement and future research plan** (chaired by CRAES President) (each institute)

2-1 Achievement and research activities since TPM5 in CRAES, China
- Director, Yun ZHOU, CRAES, China

2-2 Research activities at NIES: Progress since last meeting
- Executive Director, Yoshifumi YASUOKA, NIES, Japan

2-3 Recent Achievements & Future Strategy of Environmental Research in NIER
- Director, Ho-Seok SONG, NIER, Korea

10:40~11:00 Coffee Break

11:00~12:00 **Session 3 : Review of TPM activities** (chaired by NIES President)

3-1 TPM Activities progress report
- Senior researcher, Hyun-Mi KIM, NIER, Korea

3-2 Progress of Sand Storm Project
- Director, Yunjiang YU, CRAES, China

3-3 Fresh water pollution prevention : Decentralized domestic wastewater treatment in rural areas in China
- Senior researcher, Motoyuki MIZUOCHI, NIES, Japan

12:00~14:00 Lunch (SamcheongGak, Korean restaurant)

14:00~15:00 **Session3** (Continued) (chaired by NIER President)

3-4 Transboundary air pollution
- Senior researcher, Im-Seok CHANG, NIER, Korea

3-5 Hazardous materials contamination, such as EDCs and POPs
- Director, Kyung-Hee CHOI, NIER, Korea

3-6 Air pollution, a regional challenge for Northeast Asia
- Director, Fan MENG, CRAES, China

15:00~15:20 Coffee Break

15:20~17:00 **Session 4 : Collaboration in the Future** (chaired by NIER President)

4-1 Proposal of New cooperative project
- Risk assessment and safety guideline on recycled products
- Senior researcher, Dong-Jin LEE, NIER, Korea

4-2 Exchange of experts

4-3 Revitalization of agreements

4-4 Next TPM7

other suggestions (if any)

17:00 Meeting adjourned

18:30 Official Dinner hosted by CRAES president
(Charlotte Hall, the 36th floor of Lotte Hotel)

Workshop : Realization of Low Carbon Society through Climate Change Adaptation

Fri. Nov. 27	(Charlotte Hall, the 36th floor of Lotte Hotel)
09:00~9:10	**Opening Remarks by President of NIER**
09:10~10:25	Session 1 : Introduction for Climate Change-Prediction and Impact Assessment **(Moderator : Dr. You-Deug HONG, NIER, Korea)** 1-1 A new version of the atmosphere ocean coupled Global Climate Model(GCM) 'MIROC' for climate change simulation - Dr. Tomoo OGURA, NIES, Japan 1-2 Climate change: its impacts on hydrology, Fresh water quality and stream ecology - Dr. Kyung-Hyun KIM, NIER, Korea 1-3 Impact Assessment of climate change on forest-steppe ecotone in Northern China - Dr. Shihai LU, CRAES, China
10:25~10:45	Coffee Break
10:45~12:00	Session 2 : Global Climate Change Monitoring, Adaptation and Mitigation **(Moderator: Dr. Fan MENG, CRAES, China)** 2-1 Industrial pollution reduction and green technologies - Dr. Yanping LI, CRAES, China 2-2 Observation of global carbon distribution by GOSAT and its role in Climate change research - Dr. Yoshifumi YASUOKA, NIES, Japan 2-3 Climate change: its impacts and adaptation - Dr. Chang-Geun SONG, NIER, Korea
12:00~13:30	Lunch (Yongsusan, Korean restaurantl)
13:30~14:45	Session 3 : Toward the Low Carbon Society (LCS) **(Moderator : Mr. Makoto SAITO, NIES, Japan)** 3-1 A voyage towards a low carbon society of Korea - Dr. You-Deug HONG, NIER, KOREA 3-2 Establishment of indicator system and scenarios of low carbon economy - Dr. Jiafeng FU, CRAES, China 3-3 Introduction of climate policy assessment and 2050 Japan and Asia low carbon society studies - Dr. Tatsuya HANAOKA, NIES, Japan
14:45~15:05	**Closing Remarks by Presidents of CRAES and NIES**
15:05~15:25	Commemorative Photograph
15:25	Workshop adjourned
15:25~15:45	Coffee Break
16:20~17:00	**Signing ceremony of the 6th TPM Joint Communiqu (by three presidents)**
18:30	Official Dinner hosted by NIES president (outside Lotte Hotel)

Session Ⅰ	Opening Remarks by Presidents

1-1 Opening address by President of NIER, Korea

- President. Seung-Joon YOON, National Institute of Environmental Research

1-2 Keynote Speech (CRAES President)

- President. Wei MENG, Chinese Research Academyof Environmental Sciences

1-3 Keynote Speech (NIES President)

- President. Shinichiro OHGAKI, National Institute for Environmental Studies

1-1 Opening address by President of NIER Korea

- President. Seung-Joon YOON, National Institute of Environmental Research

General Meeting of TPM6
Opening Address

President. Seung-Joon YOON
National Institute of Environmental Research

President Wei MENG of the Chinese Research Academy of Environmental Sciences (CRAES), President Ryutaro OHTSUKA of the Japanese National Institute for Environmental Studies (NIES) and all colleagues from CRAES, NIES and NIER.

It is my great honor to host the sixth Tripartite Presidents Meeting in Seoul, the capital city of Korea. I would like to extend my warmest welcome to all of you for coming all the way to discuss environmental issues in Northeast Asia.

Although this is my first participation in TPM since I took office as the President of the National Institute of Environmental Research last September, I have heard much of its significance and fruitful results from many people including my predecessor, Yun-Hwa KO. That helped boost my motivation to be enthusiastic as well as responsible in preparing this meeting.

Global communities are keeping an eye on the Northeast Asian region, where a quarter of the world's population lives and remarkable economic growth has been achieved during the last few decades. However, on the other hand, the rapid economic development has brought with it various environmental challenges such as water and air pollution. These problems would affect not only specific countries but also the Northeast Asian region, and even the entire world.

As you are aware, the 11^{th} Tripartite Environment Ministers Meeting last June identified that climate change, dust and sandstorm, and toxic chemical management are the major environmental concerns in Northeast Asia. In this regard, it has significant meaning to hold the TPM with the members of CRAES, NIES and NIER. Today, we gathered here to pool our efforts and wisdom in search of concrete answers to environmental challenges through cooperative research and thereby raise awareness of the problems in the region.

Since we reached an agreement to hold the TPM on an annual basis at the first gathering in 2004, we have successfully held this event for the past five years. We have performed several projects with strong cooperation, such as water quality improvement, long-range transboundary air pollutants, dust and sandstorm. But the project on chemical management has been cooperated with NIES and NIER, therefore, from now on, participation of CRAES would be encouraged. Based on the agreement of TPM, short-term training program has been launched among researchers from the three countries. Based on this agreement, NIER has performed three sessions of expert training program for researchers from China, with participation of an environmental expert from NIES as a lecturer. Last year, we shared opinions on how to develop our cooperation scheme and identified a couple of areas for further collaborative works including research programs on solid waste and climate change.

With our concerted efforts, the Tripartite Presidents Meeting among China, Japan and Korea has been emerging as an arena in which each institute shares experiences and expertise and discusses ways to achieve substantive outcomes.

Through the discussions and the joint workshop, which are scheduled to be held here today and tomorrow, we will seek constructive ways to promote joint research on pressing environmental issues and enhance research capacity and knowledge.
As far as I know, the TPM has been playing a key role in initiating research cooperation activities among the three countries. This time in particular, I hope we will be able to reach an agreement on new collaborative research plan in relation to resource circulation, which was discussed at the last working level meeting in May.

In closing, once again, I would like to express my deepest gratitude to all the delegates from CRAES and NIES for coming to participate in this meeting. I firmly believe that TPM6 will become the cornerstone for the improvement of the environmental conditions in Northeast Asia, and moreover, the whole world.

Thank you.

1-2 Keynote Speech (CRAES President)

- President. Wei MENG, Chinese Research Academyof Environmental Sciences

General Meeting of TPM6
Keynote Speech

President. Wei MENG
Chinese Research Academyof Environmental Sciences

Distinguished NIER president Prof. YOON Seung-Joon, NIES president Prof. OHGAKI Shinichiro, respected friends:

Good morning!

First of all, I'd like to congratulate, on behalf of the delegation and all the other members of CRAES, on the opening of TPM6 in Seoul, the capital of Korea.
Time flies as swiftly as an arrow, and years elapse as quickly as a shuttle. It is now already the sixth year, since the establishment of Tripartite President Meeting (TPM) mechanism under the Tripartite Environment Ministers Meetings (TEMM) Mechanism among China, Japan and Korea. During these six years, presidents of NIER, CRAES, and NIES met every year in TPM meetings, while our excellent experts joined in the parallel workshop to conduct academic discussions about hot environmental issues in fields of common interest. We are delighted to see that under our joint efforts, the cooperation of environmental protection research among Korea, China and Japan has been promoted and improved through each TPM meeting.

As summer goes and winter comes, stars are changing their position. It is our great joy to know former presidents of NIER: Dr. Rhee Deok-Gil, Dr. YOON Seong-Kyu and Dr. KO Yun-Hwa, and former presidents of NIES: Dr. GOHSHI Yohichi and Dr. OHTSUKA Ryutaro through TPM mechanism. We were working collaboratively in the establishment of TPM mechanism, making joint efforts in improving the meeting while trying to advance detailed cooperation among our three sides. Today, like the refreshing air, new presidents of NIER and NIES join us in TPM6. I hope that together with Prof. YOON Seung-Joon and Prof. OHGAKI Shinichiro, TPM mechanism will be further improved in the future.

No matter how our members change and how the scale of our key research areas is enlarged, there is one essential TPM principle that remains the same, which is "Friendship, Communication, Cooperation and All-Win". Although Korea, China and Japan are all located in Northeast Asia, the national situation is quite different from each other, with varied environmental problems and challenges. However, the common goal, for which our three institutes carry out environmental research, makes us join together to expatiate mechanism of environmental pollution through scientific research and develop technologies for controlling pollution emission, transportation and transformation, combating key national and regional environmental problems and providing solid basis for and strong support to our Environmental Ministries and government in the formulation of relevant policies as well as the effective implementation and management. Through scientific research cooperation among NIER, CRAES and NIES in field of environmental protection, regional environmental safety of Northeast Asia would be enhanced and improved greatly.

The holding of TPM6 is very important for the startup and orientation of the third turn of TPM. Up till now, we have already gained understanding with each other in terms of environmental research and relevant scientific applications. We are working to promote the implementation of detailed cooperative projects, such as the sand storm project. As for the deepening of tripartite cooperation, we are jointly seeking for environmental cooperation in broader fields, trying to stretch out updated suggestions and ideas for cooperation meeting new demands of social development, and put them into practice.

In TPM4 of 2007, I proposed two cooperative projects, one of which is about climate change, the hot issue of global environment. As far as I know, though our three institutes have already participated in part of IPCC activities at different scales, the impact of climate change on regional environment should get more attention. Thus, at that time, I proposed that joint research on the evolvement of typical ecosystem should be carried out among our three institutes from the perspective of global climate change's impact on ecosystem and biodiversity. Today, we are very pleased to see that issues of climate change adaptation will be discussed in the parallel workshop of TPM6, which is at the right time just before Copenhagen 2009: United Nations Climate Change Conference. This fully presents our TPM mechanism's sticking to the principle of "Friendship, Communication, Cooperation and All-Win", while keeping pace with the times.

From the very beginning of December, 2006, when CRAES, NIES and NIER jointly organized and held the "**TEMM8 Side Events of International Workshop on Regional Ecology and its Environmental Effect—Dust storm, its impacts and mitigation countermeasure**" in Beijing, the development and cooperation of TPM mechanism has already gained recognition from each of our Environmental Ministry. Our tripartite collaboration is going on harmoniously and developing sustainably. I hope that new presidents of NIER and NIES would continue providing your understanding and support, so that under our joint efforts, we are able to advance the tripartite cooperation to a new prosperous stage. Currently, Chinese government is carrying out "National Special Programme of Water Pollution Control and Treatment". I hope that our three institutes would grasp this opportunity and enhance tripartite cooperation in water pollution control under the framework of this Special Water Programme.

Finally, I would like to wish a great success of TPM6 and the parallel workshop. Look forward to excellent presentations in our meeting and further cooperation among NIER, CRAES and NIES.

Thank you!

1-3 Keynote Speech (NIES President)

- President. Shinichiro OHGAKI, National Institute for Environmental Studies

General Meeting of TPM6

Keynote Speech

President. Shinichiro OHGAKI
National Institute for Environmental Studies

Ladies and Gentlemen, good morning, and on behalf of the delegation from NIES, firstly I would like to express my sincere thanks to the president of NIER, YOON Sueng-Joon, and his colleagues for making all the arrangements for this important meeting. I am delighted to attend the TPM meeting with President Wei MENG of CRAES and his colleagues, as the new president of NIES.

I would like to give a short power point presentation this morning. I will talk about one concept of environmental studies and I would also like togive a brief introduction to our research institute.

Last week I visited the Three Gorges Project in mainland China and enjoyed collaboration with the Yangtze River Committee. I found this very interesting model of the Three Gorges Project in the visitor center at the site. As you can see, the dam is located here at the center of 500km radius and 1000km radius circles and Beijing is located almost 1000km from here. This is a photo of the visitor center of this project and this is the dam itself. However, unfortunately it was very foggy, so we could not see the whole dam clearly in this photograph.

Following this trip and seeing this model, I made the following map. We can see our neighborhood, or our sustainable development area, with 1000km radius circles from Tokyo, from Seoul, and from Beijing. This image shows how close geographically our countries are to each other; there is only 1000km between each of us, and all our environment is connected. Therefore, we must consider our sustainable development in conjunction with each other in these areas.

We started using the expression "sustainable development" in 1992 at the United Nations Conference on Environment and Development in Rio de Janeiro. Another similar phrase is "sustainable human development". In reference to these terms, I often think about what is the meaning of "sustainable"? I think it has a very vague meaning. If we consider what is NOT sustainable, this means "to come to an end". What does not come to an end? That is an important point because nearly everything comes to an end, for example movies, books, symposiums, dynasties, or empires. We want to have sustainable development; therefore we want something to NOT come to an end. So, what do we NOT want to come to an end? For example, beautiful landscape, historical heritage, fish ecological species, or traditional cultures, etc. These are all things which are related to a healthy environment.

A healthy environment cannot be achieved by one country. Therefore,we must engage in research collaboration, especially with our neighborhood countries. The NIES charter says "research that fosters and protects a healthy environment for present and future generations". Maybe we should also extend this to include regional areas, international areas and the world.

Now I would like to move on to the introduction of my institute. Maybe President MENG Wei, you know about NIES very well by now. This is a bird’s eye view of NIES. This slide shows our observation and monitoring sites around Japan; Cape Ochi-Ishi where you visited during the last TPM. This shows the brief history of the institute. We started from 1974 as the National Institute for Environmental Studies. The English name has always been the same, but the Japanese name changed in 1990. In 2001 NIES became an incorporated administrative agency and the governance system changed. Now we are now here, in the second five-year plan 2006-2010, and this is the research framework for this second five-year plan.

These are our 4 main priority programs: climate change and sustainable material cycles, environmental risk and Asian environment, and this is the system of our divisions. This shows our human resources. We have 254 permanent staff who are almost all researchers. We also have visiting researchers or contract researchers numbering roughly 600. This shows our budget. The left-hand side shows the revenues and the right-hand side shows the expenditures which are roughly 14 billion yen. Finally this shows some of our recent activities in the dissemination of our research findings to the public of all age groups.

Thank you very much. Kamsamnida

The 6th Tripartite Presidents Meeting (NIER,CRAES and NIES)
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Seoul, Korea

Environmental Studies - Our Duty

OHGAKI, Shinichiro
National Institute for Environmental Studies (NIES)

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Photo: 091119 Ohgaki

Our neighbourhood for Sustainable Development

Sustainable Development

United Nations Conference on Environment and Development,
Rio de Janeiro, June 1992

Sustainable Human Development

Amartya SEN
Prof., Welfare Economics
Nobel Laureate in Economic Science, 1998
Doctor, honoris causa (名誉博士), The University of Tokyo, 2002

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What is Sustainable Human Development?

Development can be seen ... as a process of expanding the real freedoms that people enjoy. Focusing on **human freedoms [or capabilities]** contrasts with the narrower views of development, such as identifying development with the growth of gross national product, or with the rise in personal incomes, or with industrialization, or with technological advance, or with social modernization.

--Amartya Sen, *Development as Freedom*

What is Capability?

Economic, political, legal, and other social arrangements should be evaluated according to how they expand people's capabilities.

People's capabilities are ・・・・a diverse set of the things people value such as the ability to be nourished, to learn, to be at peace, to travel, to go about without shame, to be friends, to contemplate higher matters, to take action on causes that matter, to have meaningful work.

(source : Web site of Human Development and Capability Association)

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What is "sustainable" ?
"Not sustainable" is "to come to the end".

Every thing comes to the end.

---- movie film, book, symposium, ,,,dynasty, empire, civilization(?)

What does not come to the end?

What do we want not to come to the end?

-----beautiful landscape, historical heritage, ,,, fish species, ,,
traditional culture, ,,, enough food ,,
water supply(?), healthy water environment(?), ,,,,,,,

>>>>>>>>>>> Healthy Environment and Collaboration

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Charter

The National Institute for Environmental Studies (NIES) strives to contribute to society through **research that fosters and protects a healthy environment for present and future generations.**

Proud to work at NIES and keenly aware of our individual responsibilities, we will pursue high level research based on a firm understanding of the interaction between nature, society, and life on our planet.

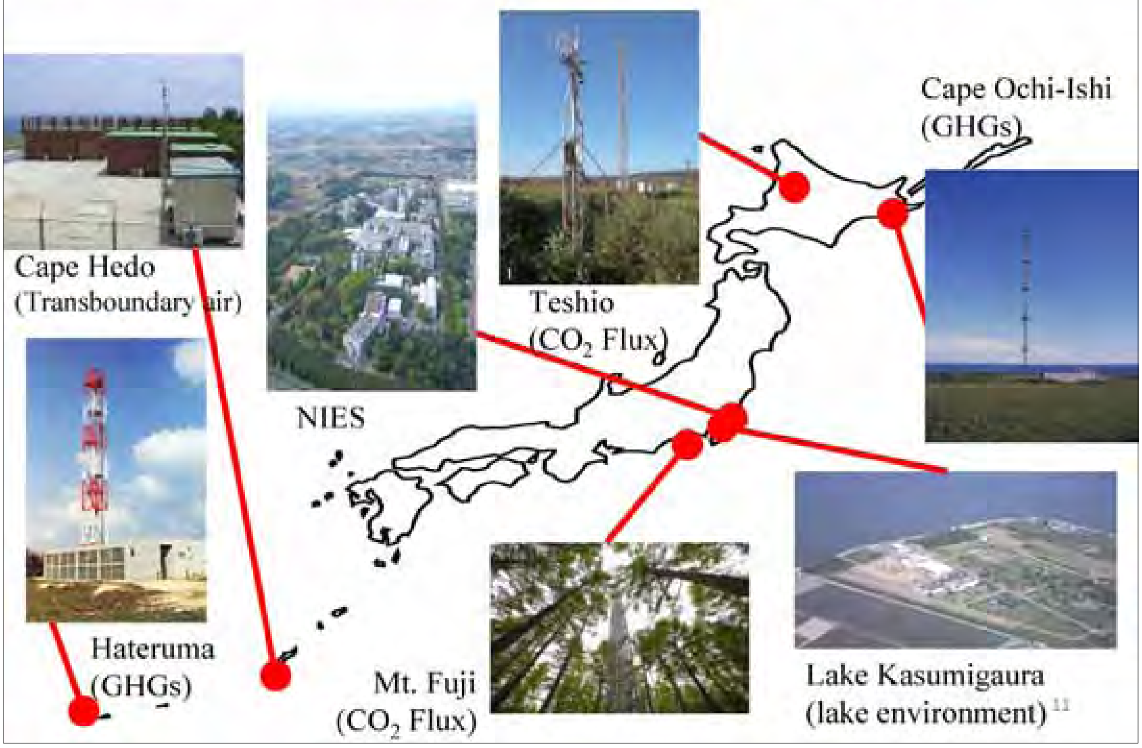
NIES Vision

NIES Logo

Bird's Eye View of NIES Main Campus in Tsukuba

National Institute for Environmental Studies

NIES Research Facilities around Japan



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Brief History of the Institute

July 1971 Environment Agency 環境庁established

March 1974 National Institute for Environmental Studies (NIES) 国立公害研究所 established

July 1990 Restructuring of NIES, 国立環境研究所to include global environmental research

January 2001 Environment Agency to Ministry of the Environment 環境省

April 2001 NIES as an incorporated administrative agency 独立行政法人

April 2001 First five-year plan (2001-2005) commenced

April 2006 Second five-year plan (2006-2010) commenced

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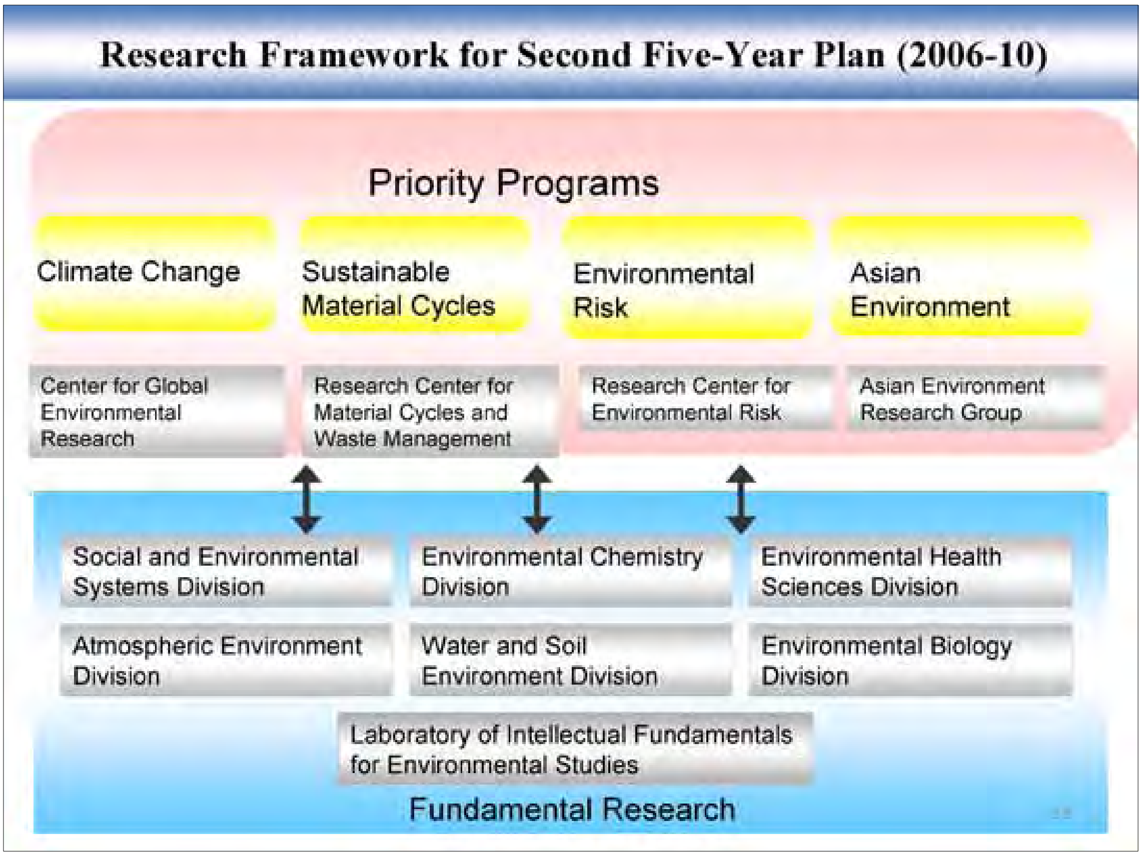
Research Framework for Second Five-Year Plan (2006-10)
Priority Programs
Climate Change
Sustainable Material Cycles
Environmental Risk
Asian Environment
Center for Global Environmental Research
Research Center for Material Cycles and Waste Management
Research Center for Environmental Risk
Asian Environment Research Group
Social and Environmental Systems Division
Environmental Chemistry Division
Environmental Health Sciences Division
Atmospheric Environment Division
Water and Soil Environment Division
Environmental Biology Division
Laboratory of Intellectual Fundamentals for Environmental Studies
Fundamental Research


2008 Open Symposium in Sapporo
Dissemination of Research Findings
Summer Science Camp 2008 in Hateruma,
NIES Open House 2008
(Total no. of 4,627 visitors)
2008 Open Symposium in Tokyo
(Total no. of 958 visitors for both events)


고맙습니다.
Thank you
ありがとうございました
謝謝
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Session Ⅱ	**Overview of recent achievement and future research plan** (chaired by CRAES President)

2-1 Achievement and research activities since TPM5 in CRAES, China

- Director, Yun ZHOU, CRAES, China

2-2 Research activities at NIES: Progress since last meeting

- Executive Director, Yoshifumi YASUOKA, NIES, Japan

2-3 Achievement and research activities in NIER

- Director, Ho-Seok SONG, NIER, Korea

2-1 Achievement and research activities since TPM5 in CRAES, China

- Director, Yun ZHOU, CRAES, China

中国环境科学研究院
Chinese Research Academy Of Environmental Sciences

自然和谐 厚积薄发

Achievement and Research Activities since TPM5 of CRAES

Zhou Yun

Main Contents

- Background Information
- Main Research Areas
- 2008-2009 Main Research Projects and Activities
- Main Achievements
- International Cooperation

Background Information

- Established on December 31, 1978
- Affiliated to the Ministry of Environmental Protection
- The largest government-owned, non-profit environmental research institution in China
- 405 permanent staff and around 400 other researchers

Background Information - Mandate

- Carrying out innovative and fundamental research on environmental protection
- Providing strategic, foreseeing and comprehensive scientific and technical support to national environmental management and decision-making
- Developing engineering technologies and providing consulting services regarding significant environmental issues

Background Information - Budget

Revenue	Expenditure
Fiscal 2007 334 million	Fiscal 2007 278 million
Fiscal 2008 311 million	Fiscal 2008 307 million

Background Information - Research Framework

Research Institute 6

- Institute of Atmospheric Environment
- Institute of Water Environment
- Institute of Ecological Environment
- Institute of Solid Waste Disposal and Treatment
- Institute of Water Pollution Control
- Institute of Atmospheric Pollution Control

Research Center 2

- Center for Environmental Safety
- Center for Cleaner Production and Circular Economy

Technical Service Center 2

- Environmental Impact Assessment Center
- Environmental Engineering Design Center

Technical Support Unit 5

- Environmental Standard Institute
- National Cleaner Production Center
- Chemical Registration Center
- Vehicle Emission Control Center
- Environmental Information Institute

Ministerial Level Key Laboratories 5

- Eco-effect and Risk Assessment of Chemicals Lab
- Lake Pollution Control Lab
- Eco-industrial Lab
- Estuary and Costal Environment Lab
- Regional Ecological Process and Function Evaluation Lab

Main Research Areas

Atmospheric Environment

- Regional atmospheric process and air quality simulation
- Aerosol and acid precipitation chemistry
- Atmospheric brown clouds and emission characteristics of particles and VOCs
- Testing and assessment of vehicle fuel additives
- Development of flue gas desulphurization and dust removal technologies, flue gas mercury and NO_x emission control technologies of coal-fired boilers

Main Research Areas

Water Environment

- Lake eutrophication control
- Biogeochemical process of typical pollutants in lakes, rivers and coastal zones
- Mechanism of habitat degradation of rivers and coastal areas
- Pollution control and ecological remediation technologies of rivers and estuaries
- Integrated watershed management
- Transition and transformation, risk assessment, pollution control and remediation technology of ground water pollution
- Reuse, recycle and safety assessment of urban waste water, etc.

Main Research Areas

Ecological Environment

- Ecological monitoring and assessment methodology
- Ecological structure and process
- Ecosystem service function
- Biodiversity assessment and monitoring
- Ecological effect assessment and prevention technologies of invasive alien species
- Risk assessment of genetically modified organisms
- Impact of climate change on ecosystem structure and function

Main Research Areas

Solid Waste

- Development of solid waste and hazardous waste property identification, landfill, contaminated sites remediation, and resource recycling and recovery technologies
- Survey of POPs contaminated sites

Main Research Areas

❖ Environmental Safety

- Ecological and chemical safety risk assessment
- Integrated assessment of the impact of climate change on society, economy and ecosystem
- Development of green house gases inventory and reduction strategy
- Regional soil environmental quality survey
- Environmental impact and risk assessment of soil contamination, and eco-remediation and environmental management strategy of contaminated sites, etc.

Main Research Areas

❖ Cleaner Production and Circular Economy

- Material metabolism and process simulation
- Eco-industrial park planning and design
- Pollution reduction efficiency assessment
- Development of cleaner production laws and regulations
- Development of sector cleaner production standard
- Cleaner production auditing methodologies
- Training of national cleaner production auditors

Main Research Areas

❖ Climate Change

- Climate Change Impact Center of MEP (1996)
- Climate Impact Assessment and Countermeasure Sub-committee of National Climate Committee (2006)

Main Research Areas

❖ Climate Change

- Low carbon economy
- GHGs emission inventory
- Impact of climate change on ecosystem function, biodiversity and nature reserves
- Climate change adaptation and mitigation strategies in the areas of atmospheric environment and ecological conservation
- Technical support to climate change negotiations, development of environmental standard related to climate change

2008 – 2009 Main Projects and Activities

1 Special Programme on Water Pollution Control and Treatment 2008 -2020

- Control pollution discharge
- Improve monitoring and supervision capacity
- Improve water quality
- Ensure drinking water safety
- Break through key technologies, improve innovation ability for water pollution control and management

15

Special Programme on Water Pollution Control and Treatment

Special Programme on Water Pollution Control and Treatment

- Total: 33 projects, 238 sub-projects
- CRAES: 5 projects, 19 sub-projects
  - Project of Ecological Function Zoning and Quality Objective-oriented Management of Basin Water Environment
  - Research and Pilot Project of Water Environmental Risk Assessment and Early Warning Technology
  - Key Safeguard Technologies and Comprehensive Demonstration Project of Songhuajiang River Water Pollution Prevention and Control and Water Quality Safety

17

Special Programme on Water Pollution Control and Treatment

- Technology Integration and Engineering Demonstration of Comprehensive Water Pollution Control and Treatment in Liaohe River Basin
- Demonstration Project of Taihu Lake Eutrophication Control and Treatment Technology

2008 – 2009 Main Projects and Activities

2 First National General Survey on Pollution Sources

- Calculation methodology of national/sector industrial pollution source generation and emission coefficient
- Calculation of industrial pollution source generation and emission coefficient
- User's manual for industrial pollution source generation and emission coefficient
- Calculation of national vehicle emission coefficient
- Calculation of mercury emission from thermal power plants

2008 – 2009 Main Projects and Activities

3 Environmental Protection Macro-strategy

- Water Environmental Protection Strategy
- Ocean Environmental Protection Strategy
- Ecological Conservation Strategy
- Solid Waste Pollution Prevention and Control Strategy

2008 – 2009 Main Projects and Activities

4 Environmental Evaluation of Wenchuan Earthquake

- Drinking water source and water pollution evaluation and countermeasures in earthquake-hit areas
- Solid waste pollution evaluation and control measures
- Environmental safeguard policy for the resettlement areas
- Technical guideline for drinking water source protection
- Emergency response plan for drinking water safety
- Technical guideline for surface water quality monitoring and drinking water sources

Relevant Guidelines and Plans Developed by CRAES and Issued by MEP after the Wenchuan Earthquake

MEP Announcement No. 14, 2008	Technical Manual on Centralized Drinking Water Source Conservation in Quake-hit Area (Temporary)
	Technical Scheme on Emergency Response to Drinking Water Safety in Quake-hit Area (Temporary)
	Monitoring Technology Guideline on Surface Water Quality and Centralized Drinking Water Source (Temporary)
MEP Announcement No. 15, 2008	Guideline on Relic Clean-up and Waste Management after the Earthquake (Trial)
	Environmental Protection Technical Manual on Transitional Resettlement Area in Quake-hit Area (Temporary)
MEP Announcement No. 23, 2008	Environmental Protection Technical Manual on Re-production of Industries and Enterprises in Quake– hit Area (Temporary)

2008 – 2009 Main Projects and Activities

5 Planning for Experimental Area Construction of Eco-Environmental Conservation for Huangnan State

- Temperature increase at 0.50℃/10a > 0.28℃/10a in Qinghai; > global scale at 0.075℃/10a; > China scale at 0.11℃
- Analyzed the economic value of carbon sink of the ecosystem:
  - USD 91 million economic loss avoided
  - Chicago Climate Exchange Price: USD 97 million
  - European carbon trading market: Euro 83 million
- 6 policy recommendations for ecosystem conservation in Huangnan State

Main Achievements

- 12 National Scientific Progress and Technological Invention Awards
- 100 Provincial/Ministerial Scientific Progress and Technological Invention Awards
- 80 patents
- More than 700 publications


International Cooperation
EMECS 8 International Conference
Sino-German Workshop on Nature Conservation & Sino-European Workshop on Sustainable Planning and Management of Ecocity/Ecoprovince
Sino Italian Environmental Regional Risk Assessment Project with the Venice Science and Technology Park
Risk Assessment and Management of Contaminated Sites Project with Venice University of Italy
13th World Lake Conference
Transboundary Water Pollution Management Project and River Health and Environmental Flow in China Project sponsored by AusAID
German-Chinese Cooperation Platform for the Conservation of Species Rich, Highly Carbon-Sequestering Ecosystems


中国环境科学研究院
Chinese Research Academy Of Environmental Sciences
自然和谐 厚积薄发
Thank you for your attention!

2-2 Research activities at NIES: Progress since last meeting

- Executive Director, Yoshifumi YASUOKA, NIES, Japan

For the 6th Tripartite Presidents Meeting in November 2009 (Seoul)

Research Activities

at the National Institute for Environmental Studies (Japan)

Progress

since Last Meeting

Yoshifumi YASUOKA
Executive Director
NIES, JAPAN

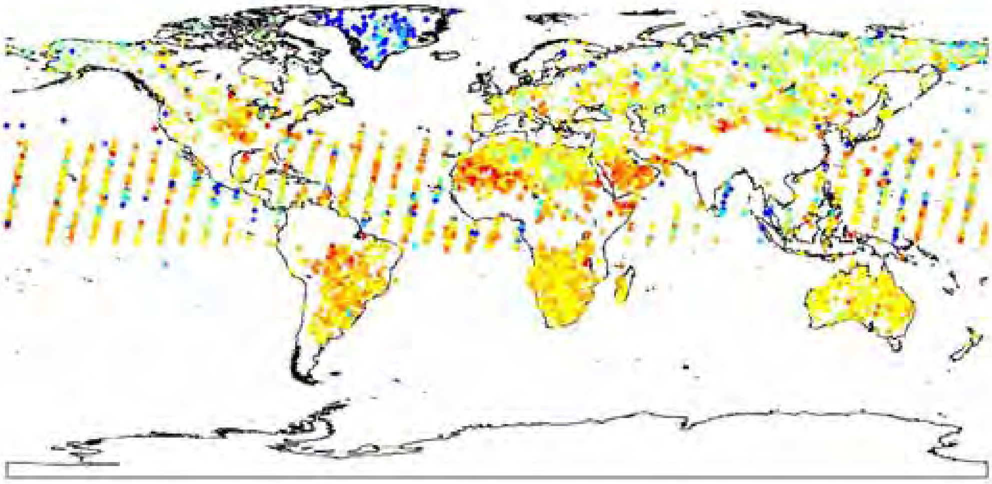
GOSAT("IBUKI") was successfully launched

MoE, JAXA and NIES

January, 23, 2009

Global CO2 Distribution (column density)

(2009/08/04-08/19)

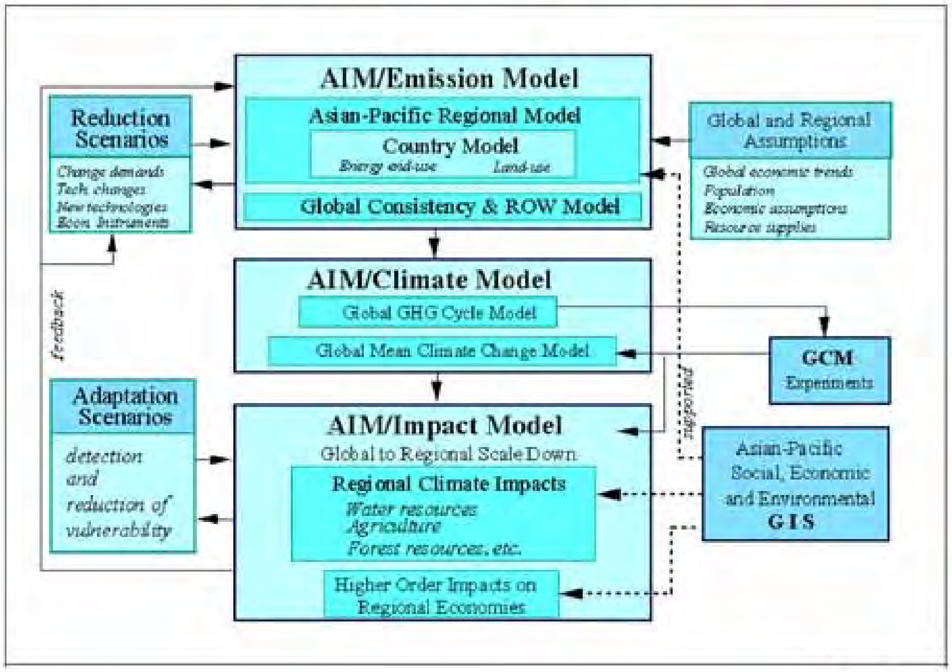


un-calibrated and un-validated

NIES, MoE, JAXA

Press release

Asian-Pacific Integrated Model (AIM)



Masui, et.al.

PM Hatoyama pledged emissions cut of 25% by 2020

Japan will try to cut greenhouse gas emissions by 25 percent from 1990 levels as its midterm target for 2020, Prime Minister Yukio Hatoyama announced.

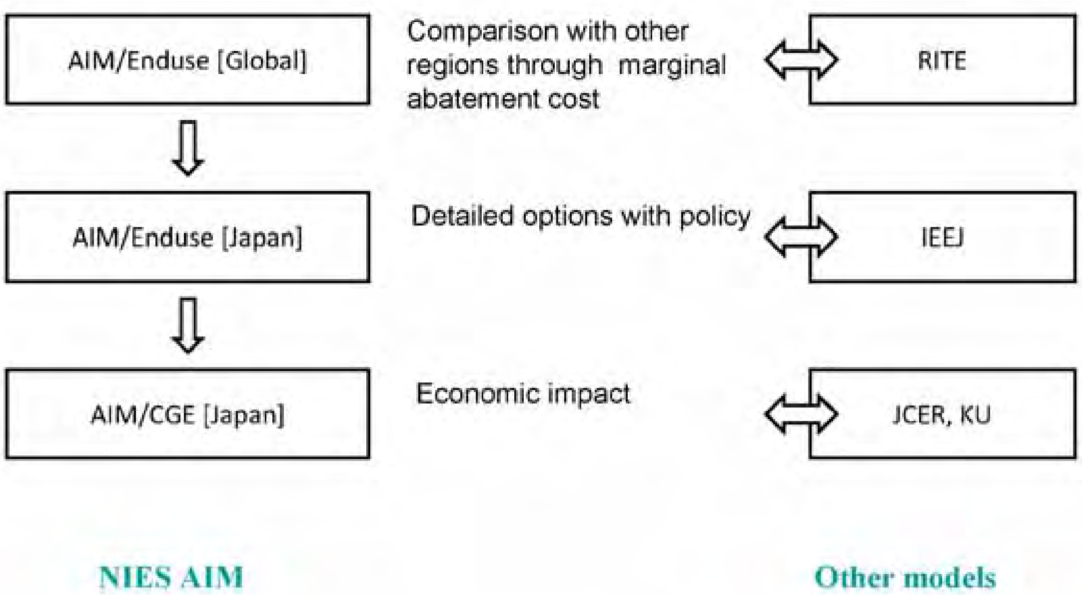
Japan Times, 2009/9

Reduction of 50% of current GHG by 2050

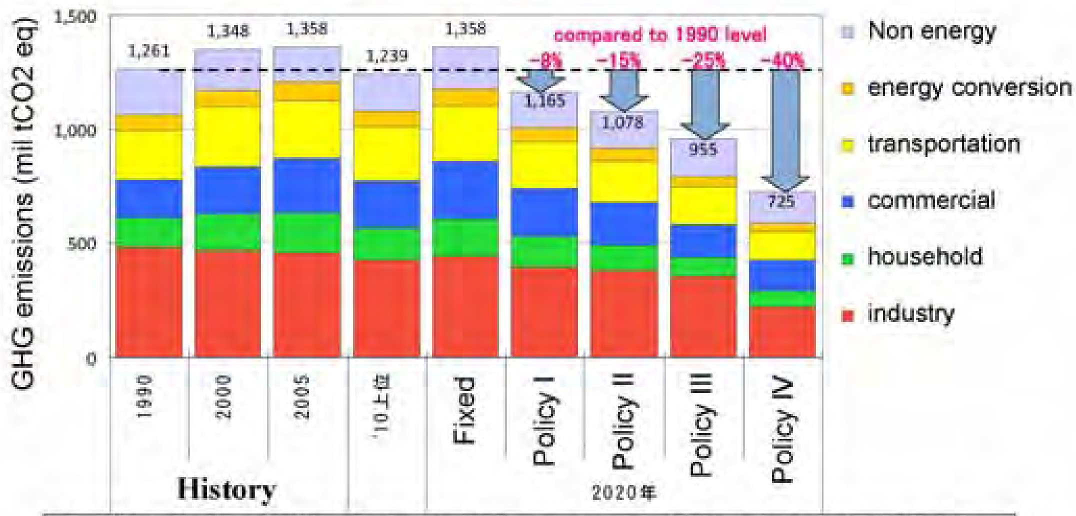
in the world (Cool Earth 50)

2007/5 PM Abe, G-8 approved

Contribution of AIM for Midterm Target Decision



GHG emissions in 2020



1. 25% reduction of GHG emissions in 2020 compared to 1990 level is technically feasible without any degradation of activity level.
2. In the case of 40% reduction, the activity level should be shrunk.
3. Annual cost (additional cost) to achieve the target:
    1. Policy I: 1.4-1.8 trillion yen
    2. Policy II: 2.3-2.9 trillion yen
    3. Policy III: 5.7-6.9 trillion yen

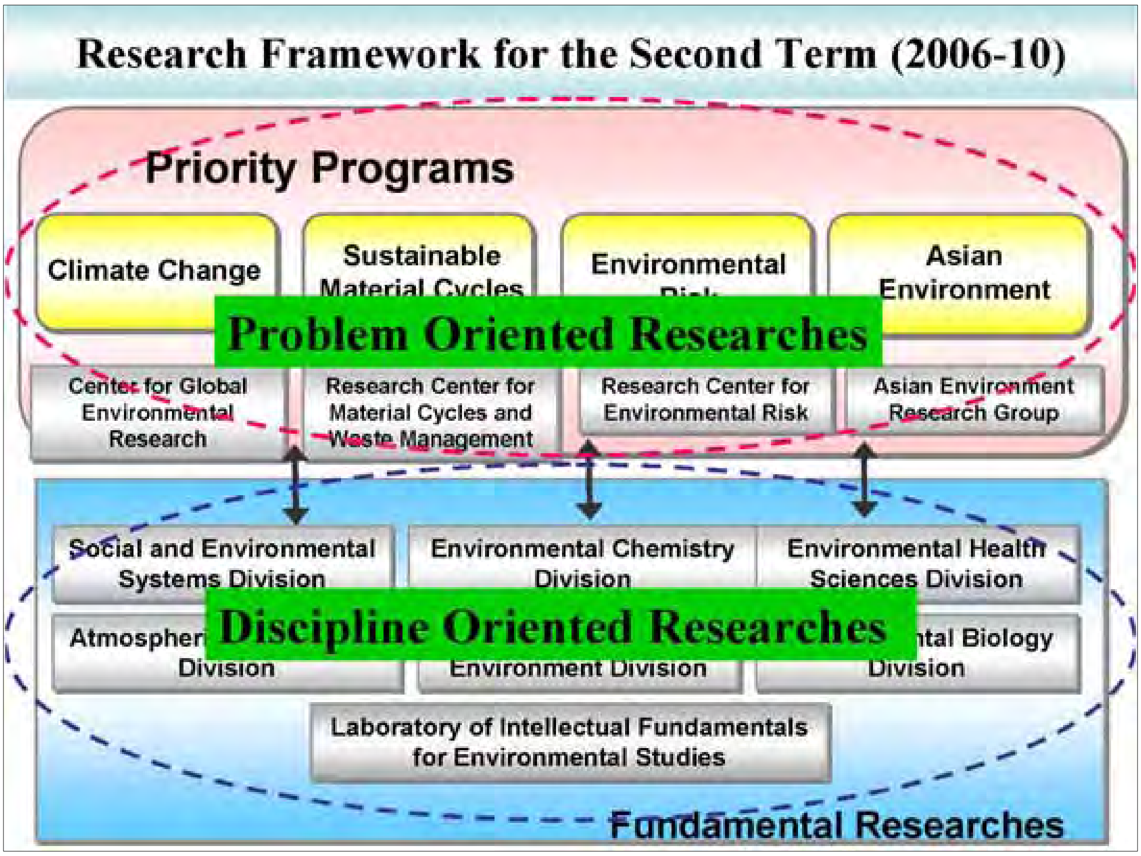
Masui, et.al.

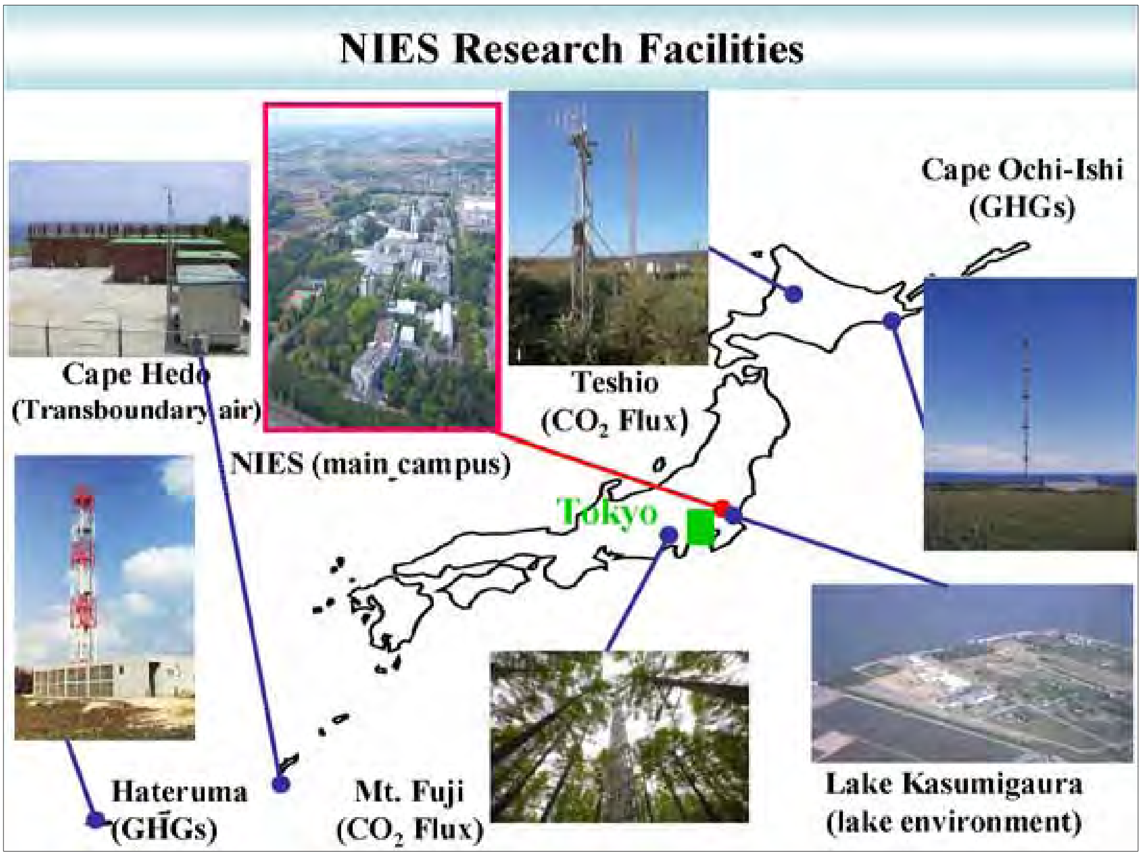
For the 6th Tripartite Presidents Meeting in November 2009 (Seoul)

Research Activities

at the National Institute for Environmental Studies (Japan)

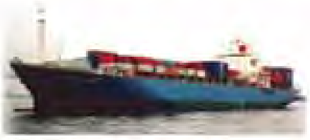
Overview


Research Framework for the Second Term (2006-10)
Priority Programs
Climate Change
Sustainable Material Cycles
Environmental Risk
Asian Environment
Problem Oriented Researches
Center for Global Environmental Research
Research Center for Material Cycles and Waste Management
Research Center for Environmental Risk
Asian Environment Research Group
Social and Environmental Systems Division
Environmental Chemistry Division
Environmental Health Sciences Division
Discipline Oriented Researches
Division
Environment Division
Division
Laboratory of Intellectual Fundamentals for Environmental Studies
Fundamental Researches


NIES Research Facilities
Cape Ochi-Ishi (GHGs)
Cape Hedo (Transboundary air)
NIES (main campus)
Teshio (CO_2 Flux)
Tokyo
Hateruma (GHGs)
Mt. Fuji (CO_2 Flux)
Lake Kasumigaura (lake environment)

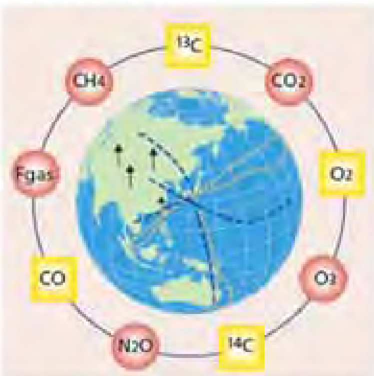
Monitoring Baseline Water Quality at Lake Mashu (Hokkaido)

GHG Monitoring Facilities



Commercial Ocean Liner (Southern Cross)

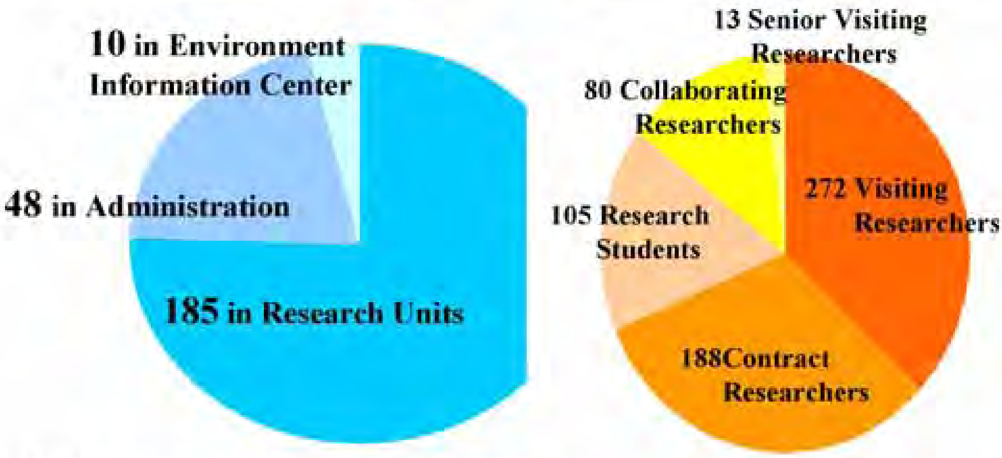
Commercial Air Liner (JAL)



Monitoring Network over Ocean, Land and Atmosphere

Human Resources

243Permanent Staff | **658 Other Researchers**



Half of researchers is involved in priority programs

As of April 2009

Budget

Revenues

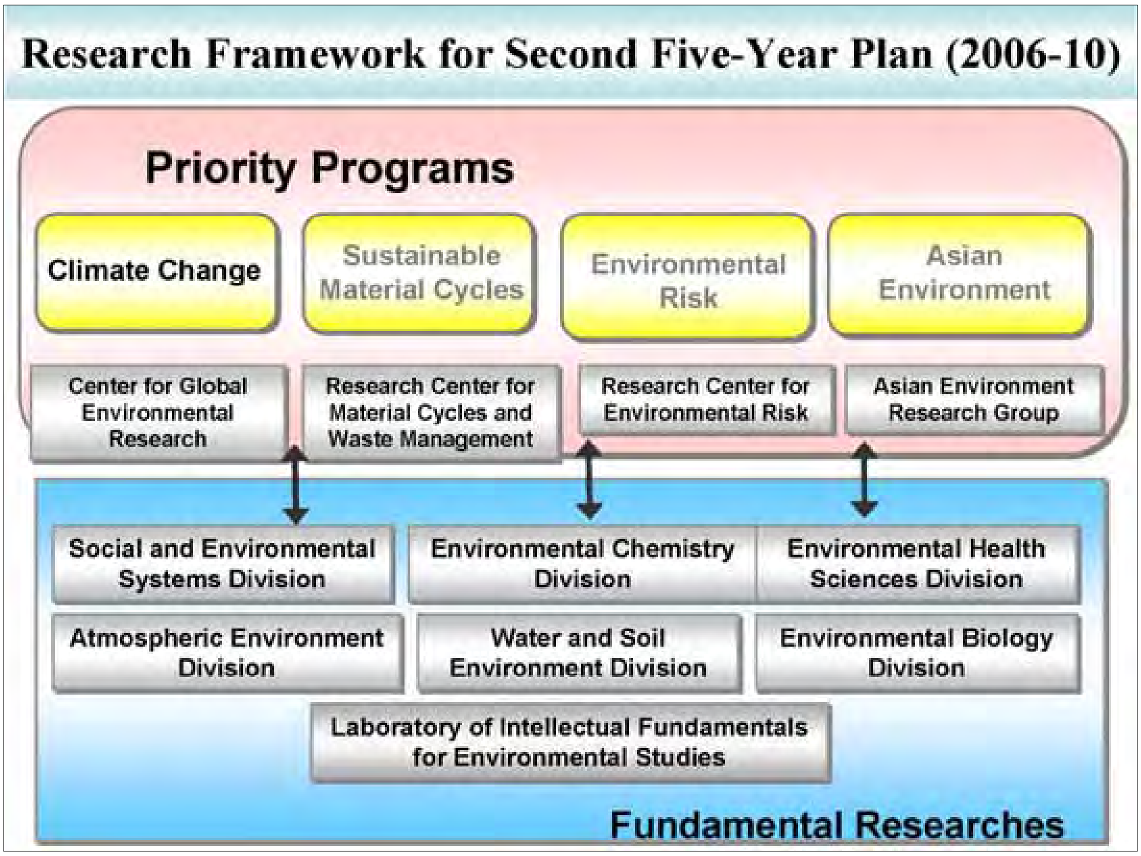
Category	Fiscal 2009
Operating grant	9,292,000
Subsidy for facilities	534,000
Commissioned work	4,055,000
Total	**13,881,000**

(unit: thousand yen)

140 Million USD

Expenditure

Category	Fiscal 2009
Project costs	6,052,000
Facility Improvements	534,000
Expenses for Commissioned work	4,055,000
Personnel expenses	2,818,000
General administrative expenses	502,000
Total	**13,961,000**


Research Framework for Second Five-Year Plan (2006-10)
Priority Programs
Climate Change
Sustainable Material Cycles
Environmental Risk
Asian Environment
Center for Global Environmental Research
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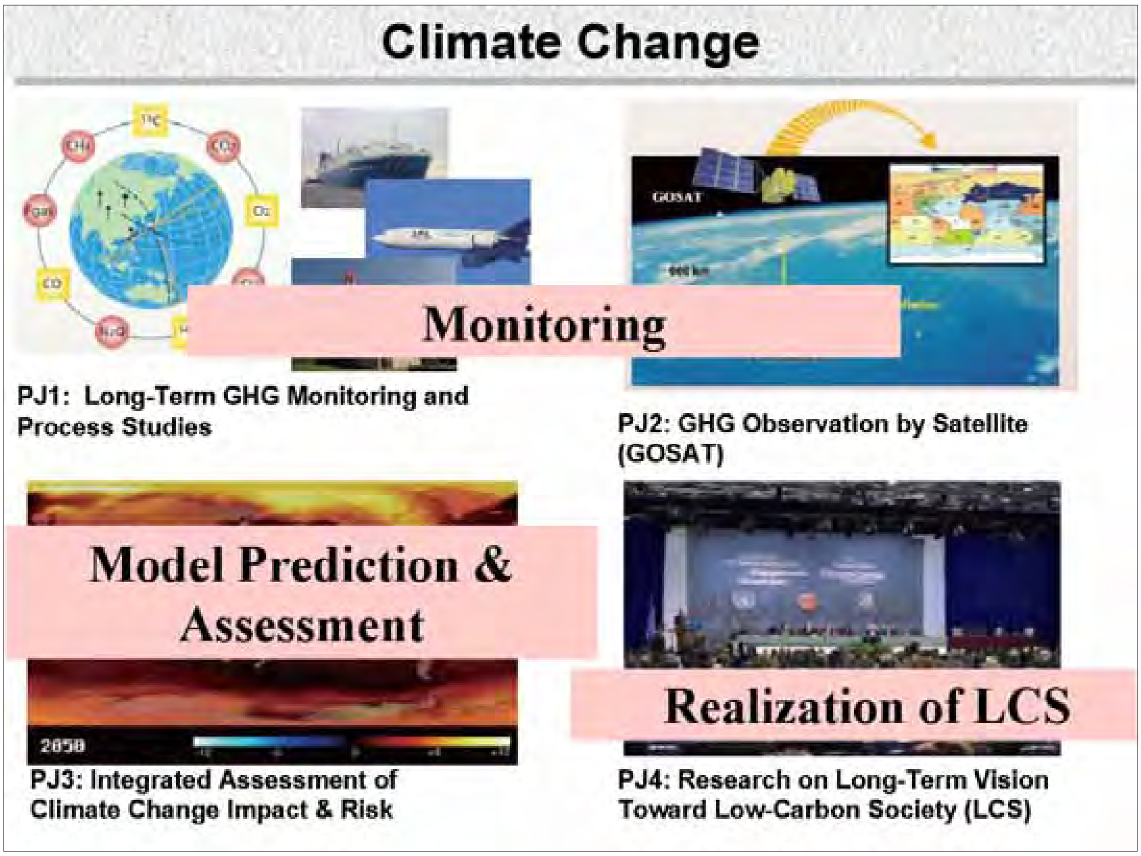
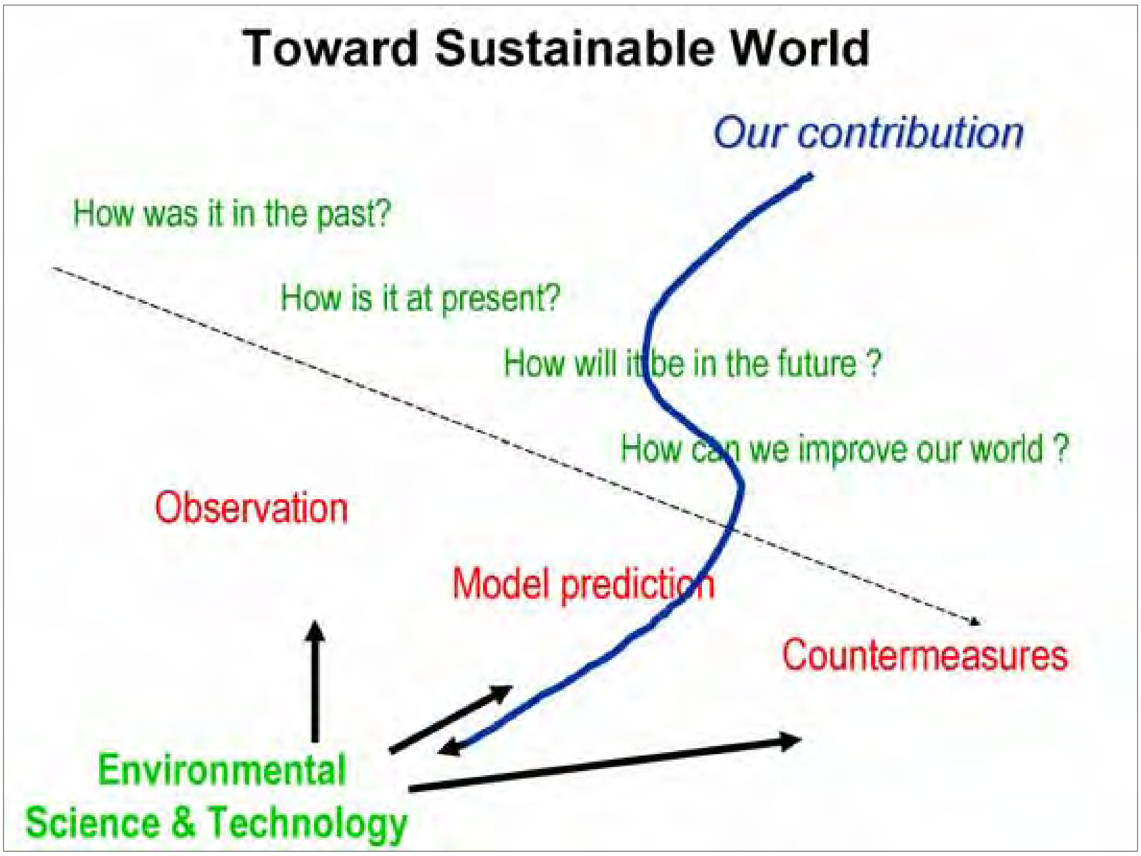
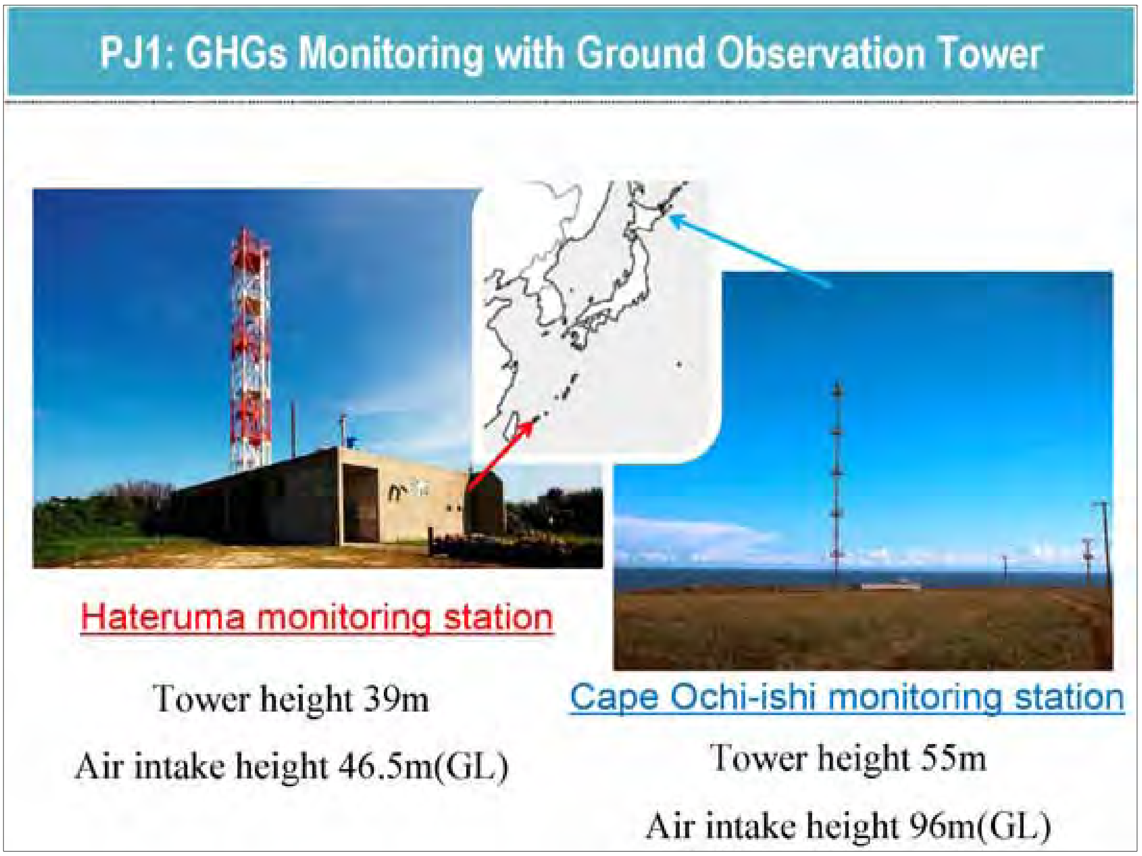
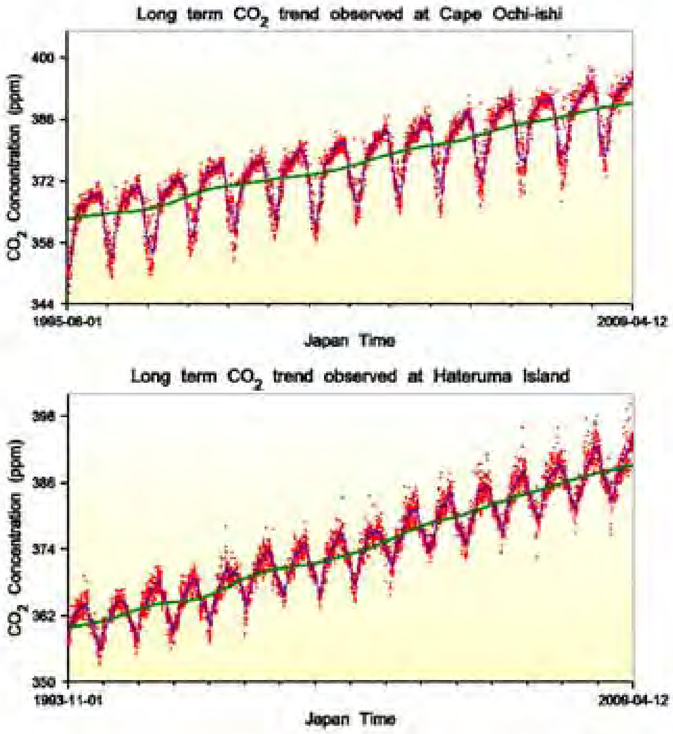
Environmental Biology Division
Laboratory of Intellectual Fundamentals for Environmental Studies
Fundamental Researches


Climate Change
Monitoring
PJ1: Long-Term GHG Monitoring and Process Studies
PJ2: GHG Observation by Satellite (GOSAT)
Model Prediction & Assessment
Realization of LCS
PJ3: Integrated Assessment of Climate Change Impact & Risk
PJ4: Research on Long-Term Vision Toward Low-Carbon Society (LCS)


Toward Sustainable World
Our contribution
How was it in the past?
How is it at present?
How will it be in the future ?
How can we improve our world ?
Observation
Model prediction
Countermeasures
Environmental
Science & Technology


PJ1: GHGs Monitoring with Ground Observation Tower
Hateruma monitoring station
Tower height 39m
Air intake height 46.5m(GL)
Cape Ochi-ishi monitoring station
Tower height 55m
Air intake height 96m(GL)

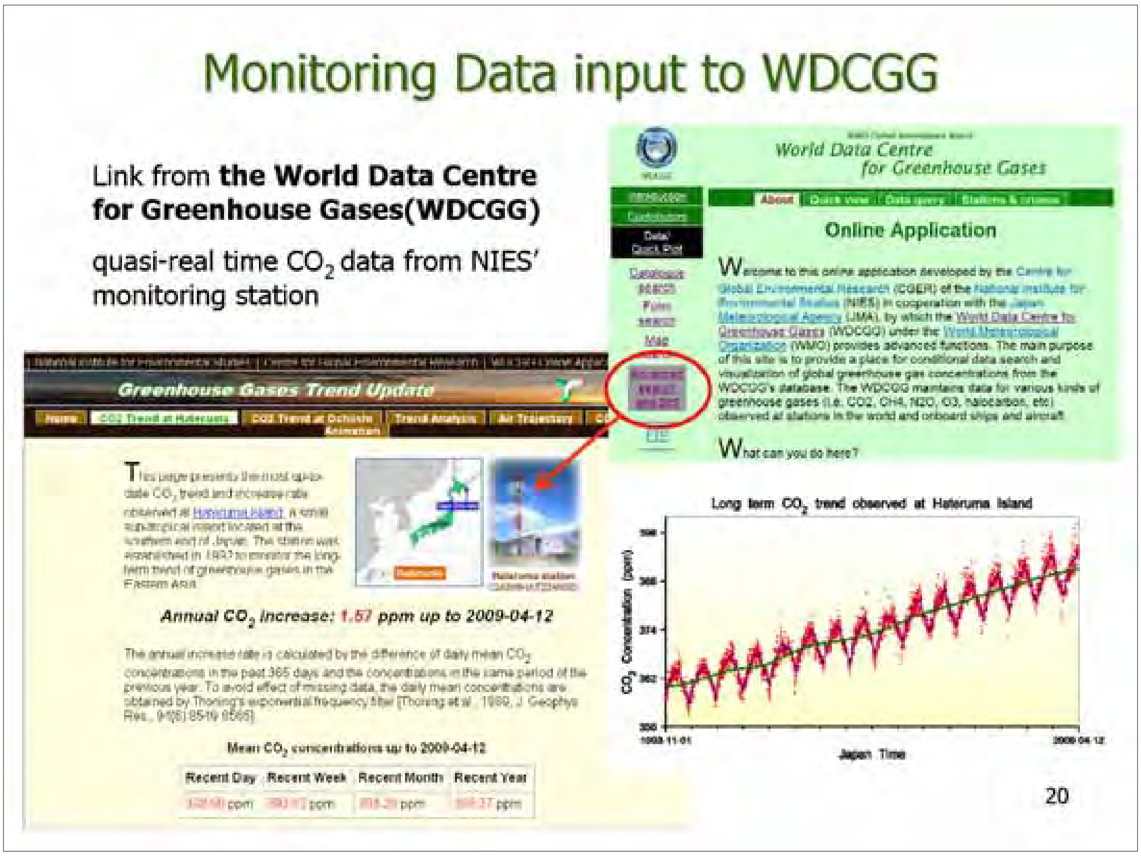
Long-term CO_2 trend

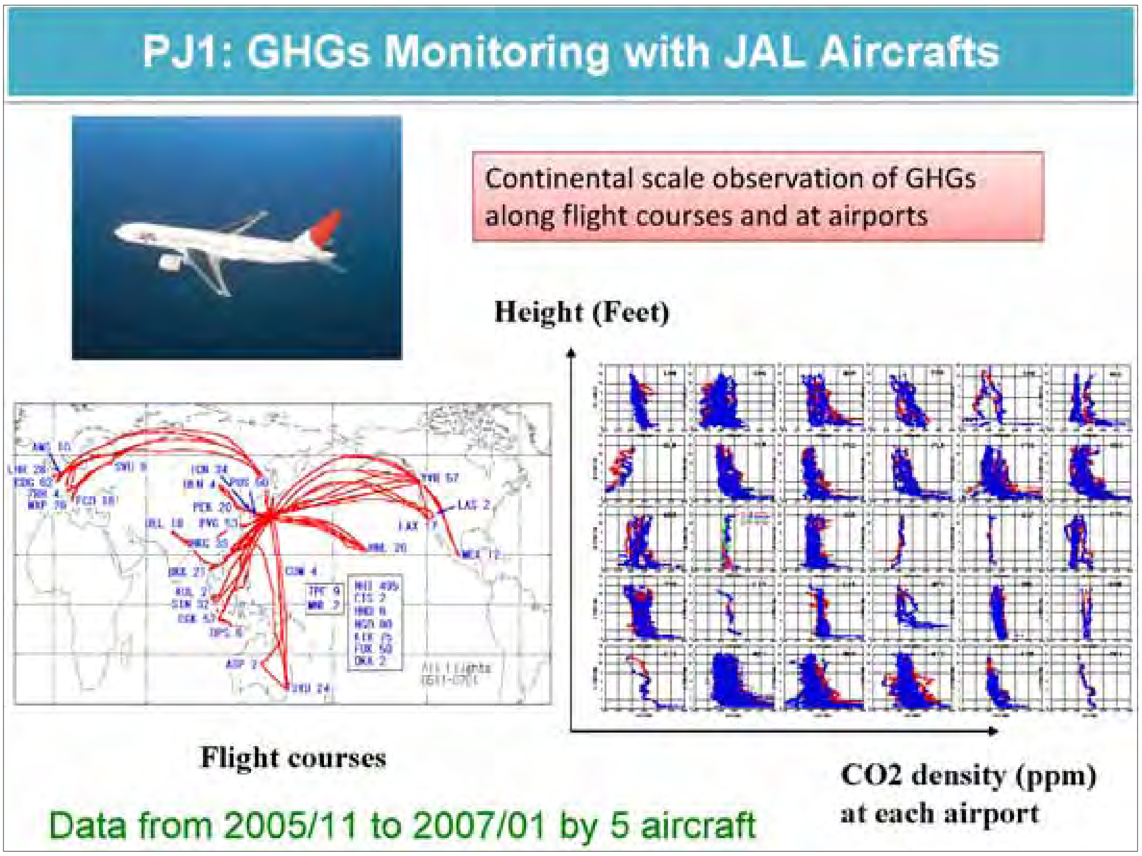


広兼2

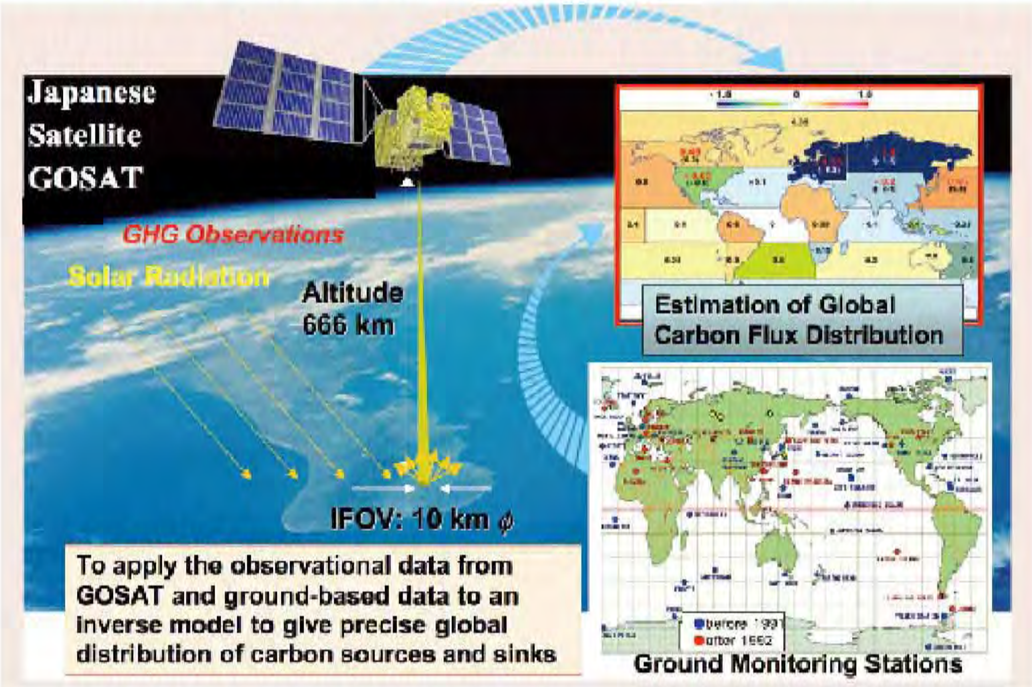
スライド 19

広兼2　このページの図の時間軸をそろえる必要があります。
また、最新データまでデータを加えることができるとベター。
さらに、同緯度の波照間データとハワイのマウナロアデータの比較もあるとわかりやすい。
広兼@広報・国際, 2009/11/10


Monitoring Data input to WDCGG
Link from the World Data Centre for Greenhouse Gases(WDCGG)
quasi-real time CO_2 data from NIES' monitoring station
World Data Centre for Greenhouse Gases
Online Application
Greenhouse Gases Trend Update
Annual CO_2 increase: 1.57 ppm up to 2009-04-12
Mean CO_2 concentrations up to 2009-04-12
Recent Day
Recent Week
Recent Month
Recent Year
Long term CO_2 trend observed at Hateruma Island
Japan Time
20


PJ1: GHGs Monitoring with JAL Aircrafts
Continental scale observation of GHGs along flight courses and at airports
Height (Feet)
Flight courses
CO2 density (ppm) at each airport
Data from 2005/11 to 2007/01 by 5 aircraft

PJ2: Greenhouse gas observation from space (GOSAT; launched on Jan. 23, 2009)

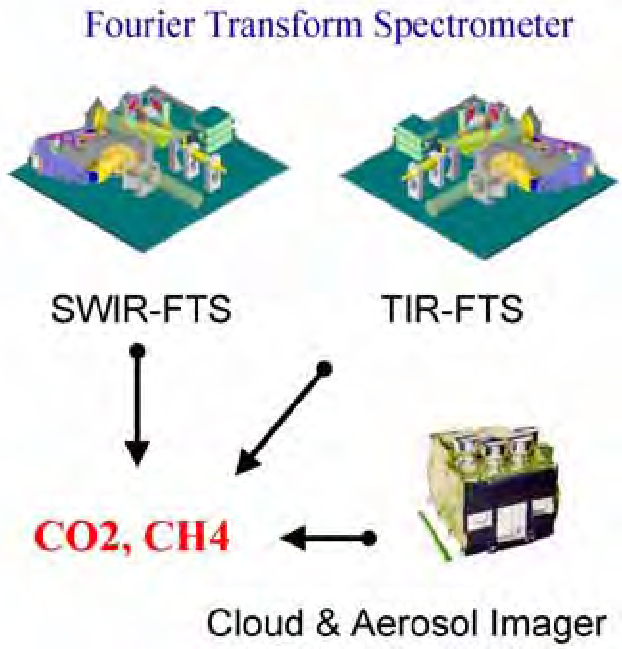


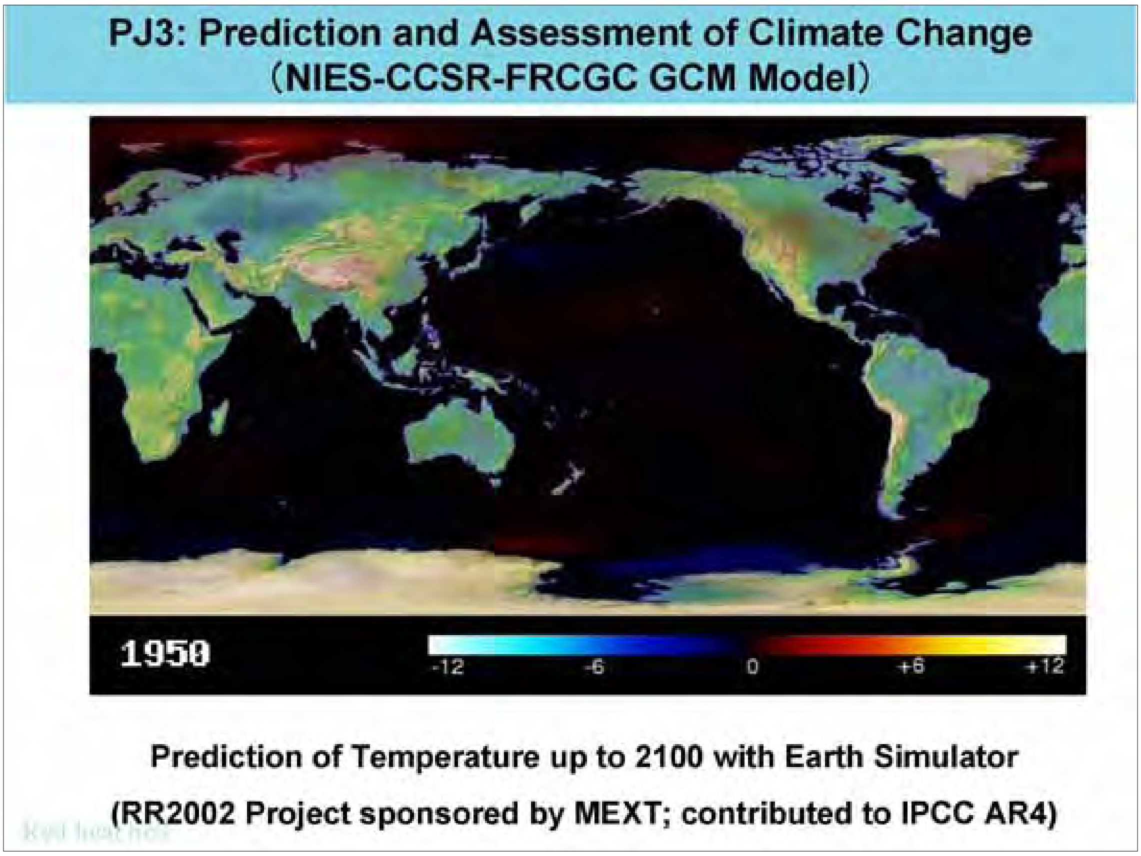
GOSAT ("IBUKI")

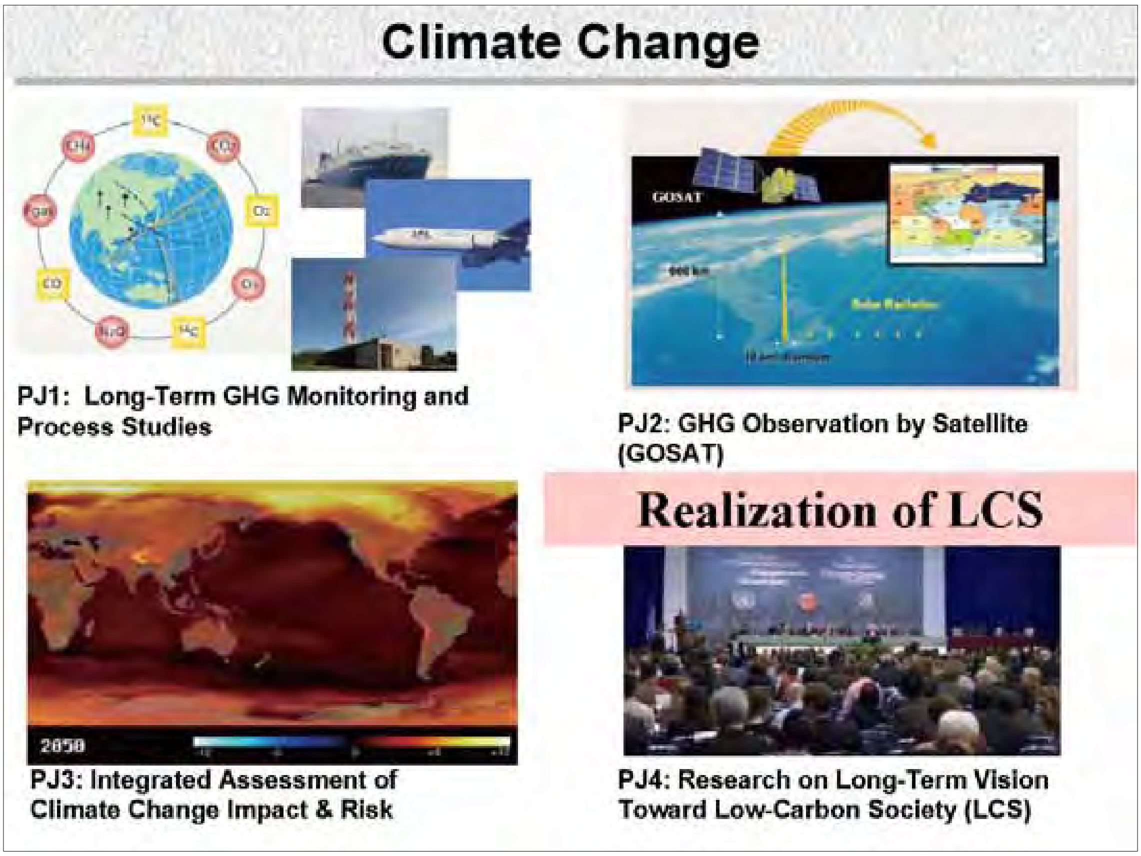
Green House Gases Observing Satellite

Launched successfully on Jan. 23, 2009, and named as "IBUKI"

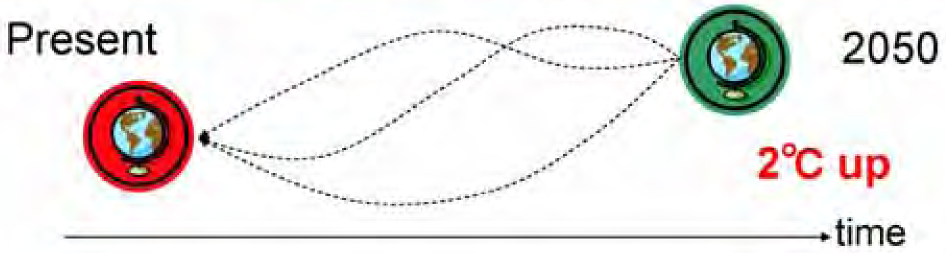
MoE, JAXA, NIES




PJ3: Prediction and Assessment of Climate Change
(NIES-CCSR-FRCGC GCM Model)
1950
-12
-6
0
+6
+12
Prediction of Temperature up to 2100 with Earth Simulator
(RR2002 Project sponsored by MEXT; contributed to IPCC AR4)


Climate Change
PJ1: Long-Term GHG Monitoring and Process Studies
GOSAT
PJ2: GHG Observation by Satellite (GOSAT)
2050
PJ3: Integrated Assessment of Climate Change Impact & Risk
Realization of LCS
PJ4: Research on Long-Term Vision Toward Low-Carbon Society (LCS)

PJ4: Research on Long-Term Vision Toward Low-Carbon Society (LCS)



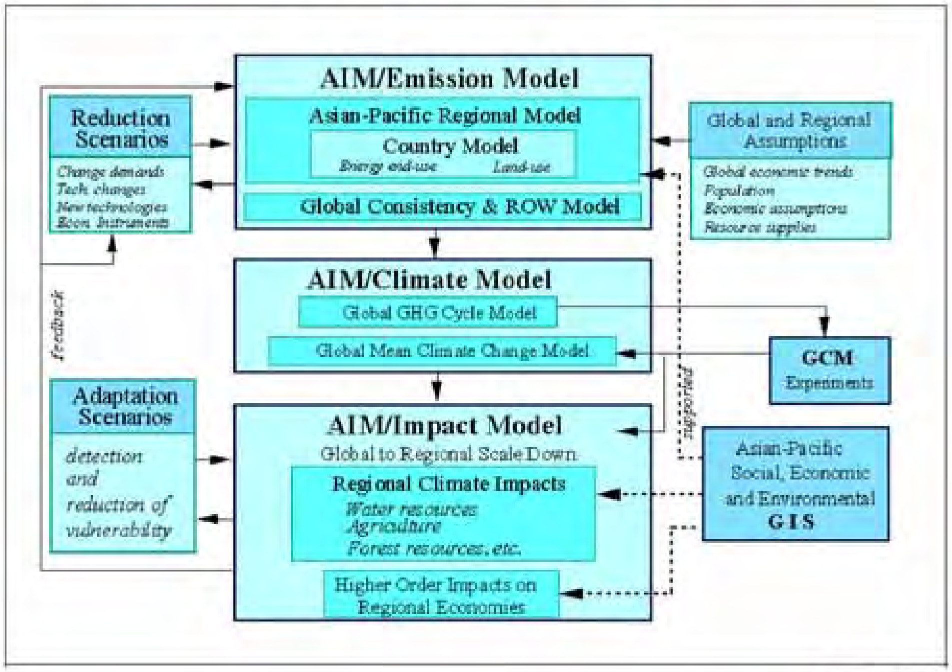
Set the upper limit of the global average temp. increase at 2℃

⇒ global average GHG density **below 475ppm**

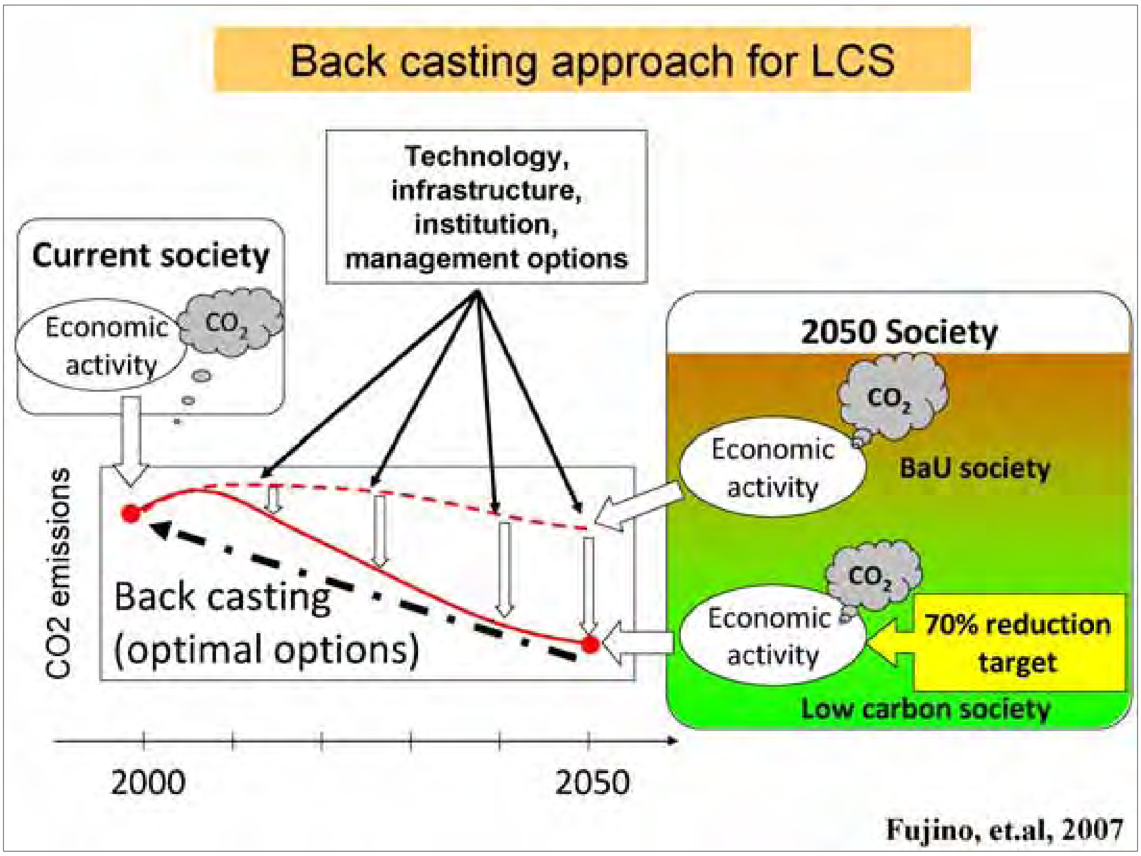
⇒ global GHG reduction rate in the world **at 50%**

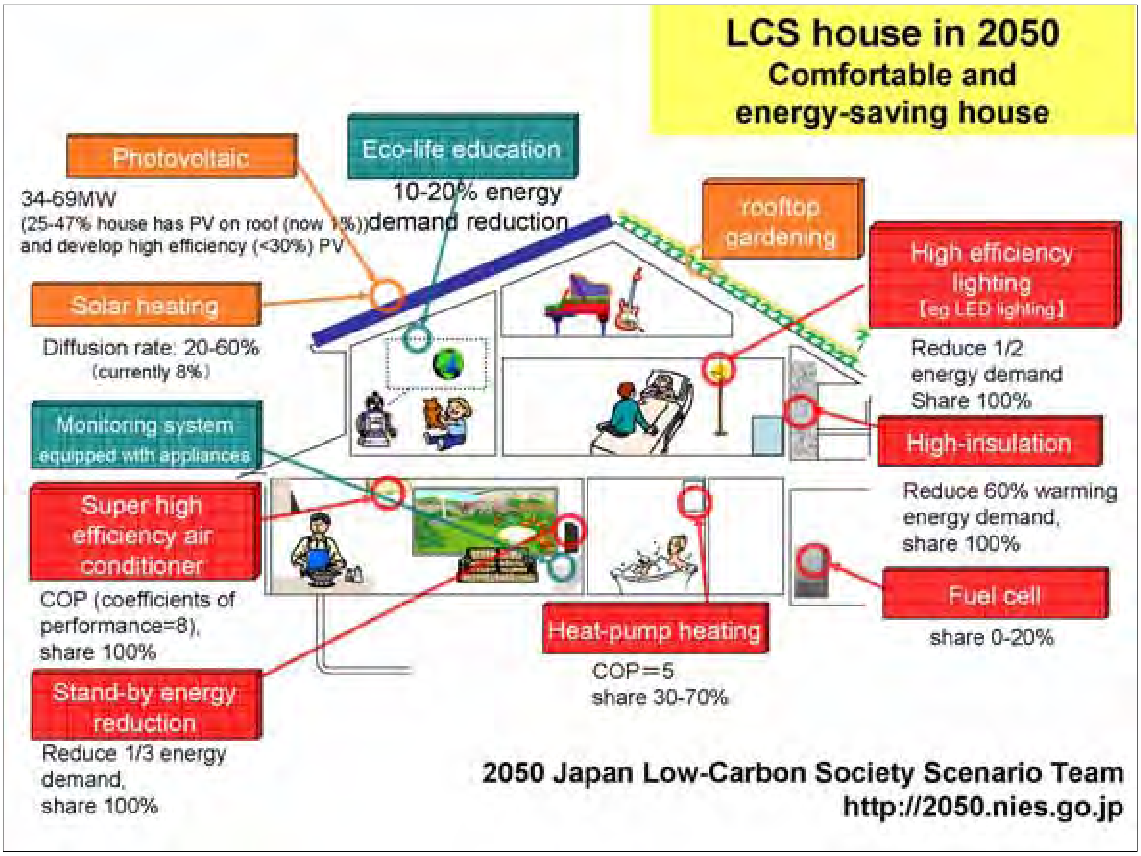
⇒ developed countries reduction rate **around 60-80%**

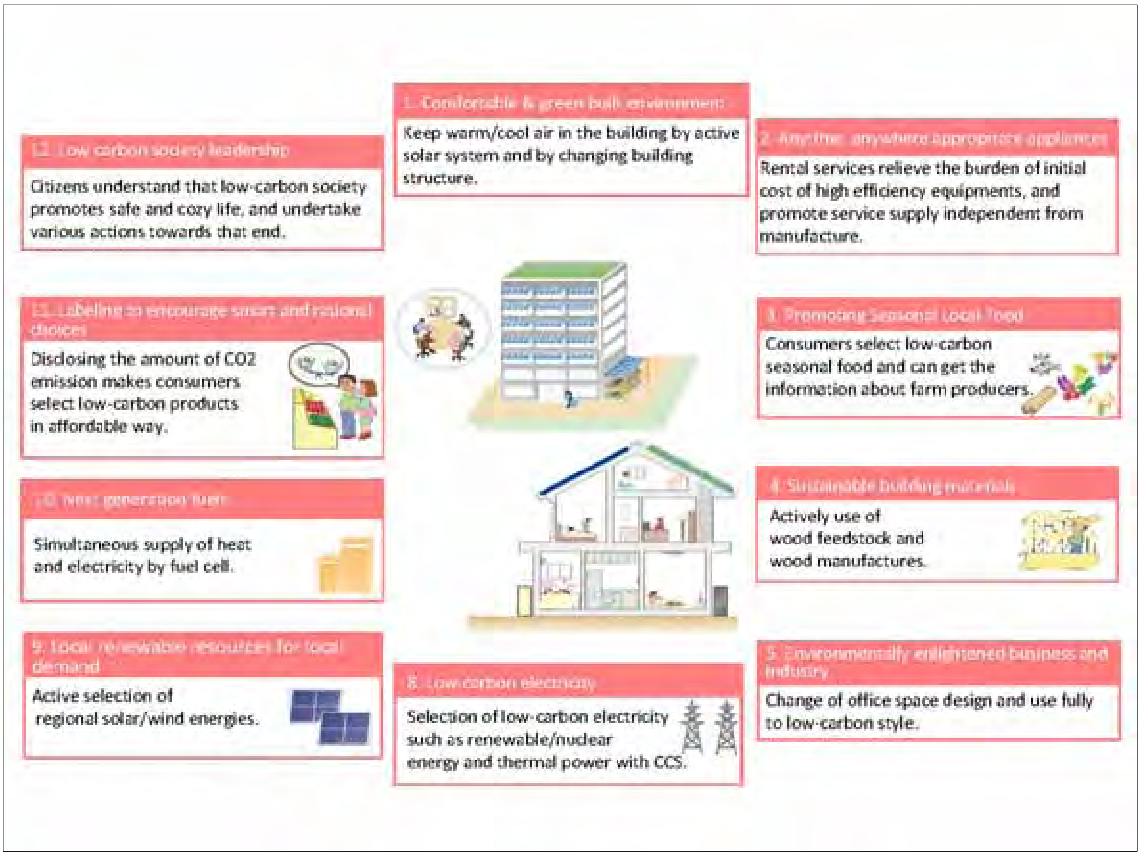
Asian-Pacific Integrated Model (AIM)

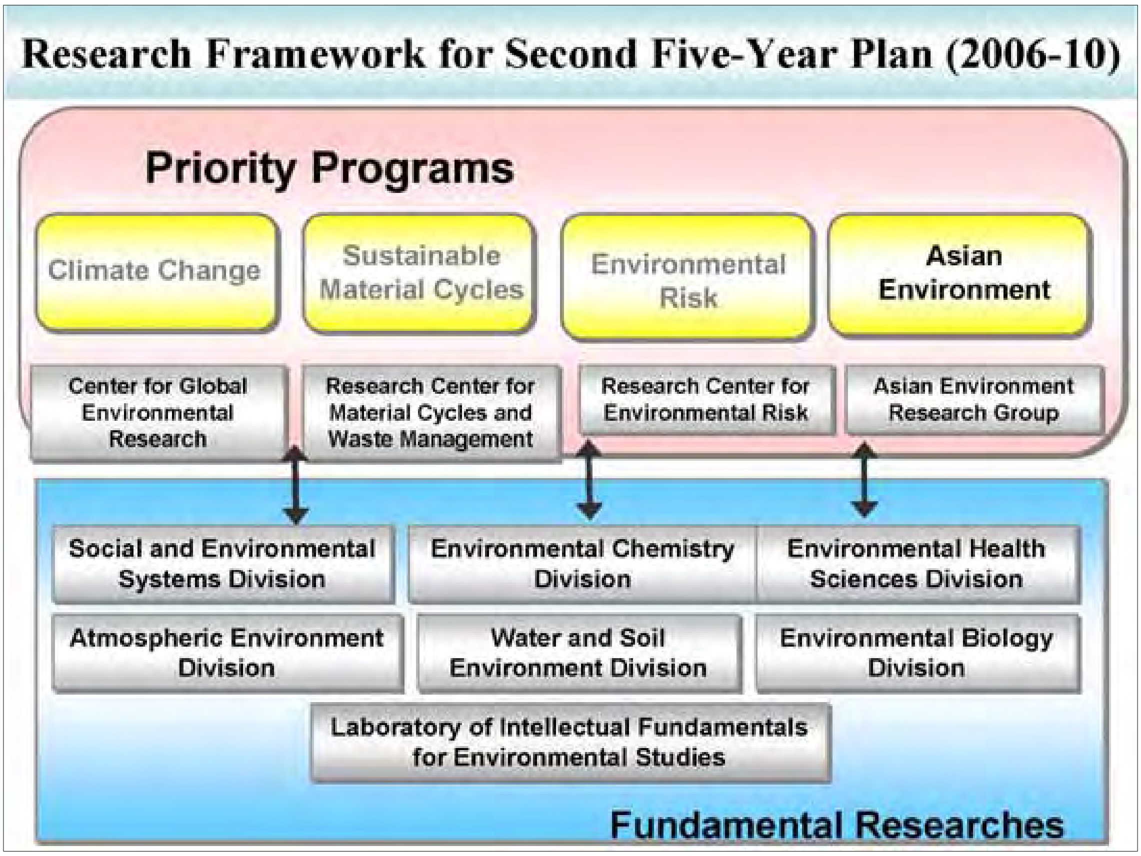


Masui, et. al.


Back casting approach for LCS
Technology, infrastructure, institution, management options
Current society
Economic activity
CO_2
2050 Society
CO_2
Economic activity
BaU society
CO_2
Economic activity
70% reduction target
Low carbon society
CO2 emissions
Back casting (optimal options)
2000
2050
Fujino, et.al, 2007


LCS house in 2050
Comfortable and energy-saving house
Photovoltaic
34-69MW
(25-47% house has PV on roof (now 1%)) and develop high efficiency (<30%) PV
Eco-life education
10-20% energy demand reduction
rooftop gardening
High efficiency lighting
[eg LED lighting]
Reduce 1/2 energy demand
Share 100%
Solar heating
Diffusion rate: 20-60%
(currently 8%)
Monitoring system equipped with appliances
High-insulation
Reduce 60% warming energy demand, share 100%
Super high efficiency air conditioner
COP (coefficients of performance=8), share 100%
Fuel cell
share 0-20%
Heat-pump heating
COP=5
share 30-70%
Stand-by energy reduction
Reduce 1/3 energy demand, share 100%
2050 Japan Low-Carbon Society Scenario Team
http://2050.nies.go.jp


1. Comfortable & green built environment
Keep warm/cool air in the building by active solar system and by changing building structure.
2. Anytime, anywhere appropriate appliances
Rental services relieve the burden of initial cost of high efficiency equipments, and promote service supply independent from manufacture.
3. Promoting Seasonal Local Food
Consumers select low-carbon seasonal food and can get the information about farm producers.
4. Sustainable building materials
Actively use of wood feedstock and wood manufactures.
5. Environmentally enlightened business and industry
Change of office space design and use fully to low-carbon style.
8. Low carbon electricity
Selection of low-carbon electricity such as renewable/nuclear energy and thermal power with CCS.
9. Local renewable resources for local demand
Active selection of regional solar/wind energies.
10. Next generation fuels
Simultaneous supply of heat and electricity by fuel cell.
11. Labeling to encourage smart and rational choices
Disclosing the amount of CO2 emission makes consumers select low-carbon products in affordable way.
12. Low carbon society leadership
Citizens understand that low-carbon society promotes safe and cozy life, and undertake various actions towards that end.


Research Framework for Second Five-Year Plan (2006-10)
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Sustainable Material Cycles
Environmental Risk
Asian Environment
Center for Global Environmental Research
Research Center for Material Cycles and Waste Management
Research Center for Environmental Risk
Asian Environment Research Group
Social and Environmental Systems Division
Environmental Chemistry Division
Environmental Health Sciences Division
Atmospheric Environment Division
Water and Soil Environment Division
Environmental Biology Division
Laboratory of Intellectual Fundamentals for Environmental Studies
Fundamental Researches

Asian Environment (1)

PJ1:

Development of Assessment Method for Asian Atmospheric Environment

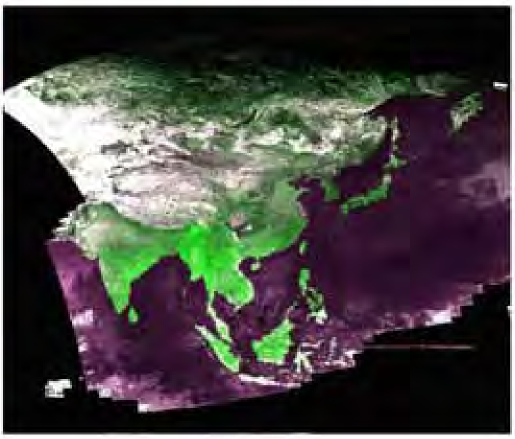
PJ2:

Development of Water-Circulation & Natural Material Cycles Assessment Method in East Asia

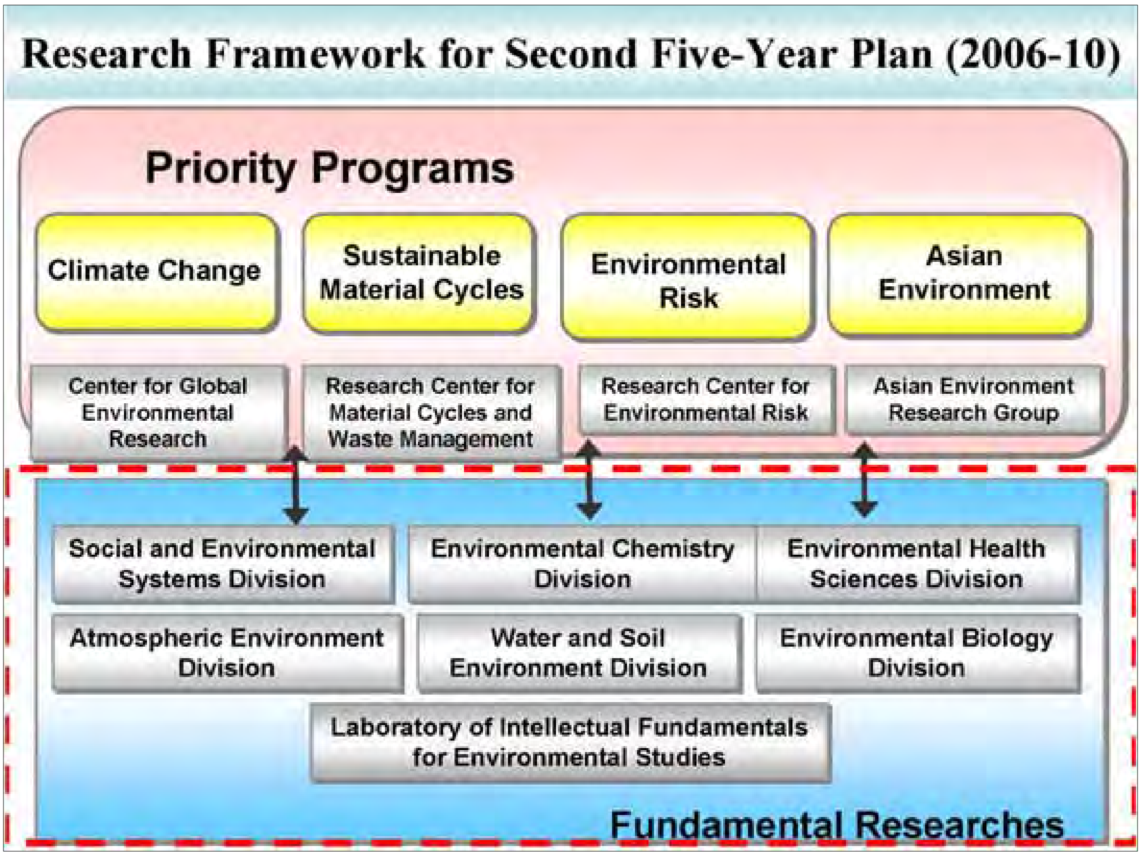
Asian Environment (2)

PJ3:

Environmental Impact Assessment Method for Watershed Ecosystems



Observation of Land Surface Parameters from Satellite (NOAA/AVHRR, MODIS)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Environmental Risk
Asian Environment
Center for Global Environmental Research
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Social and Environmental Systems Division
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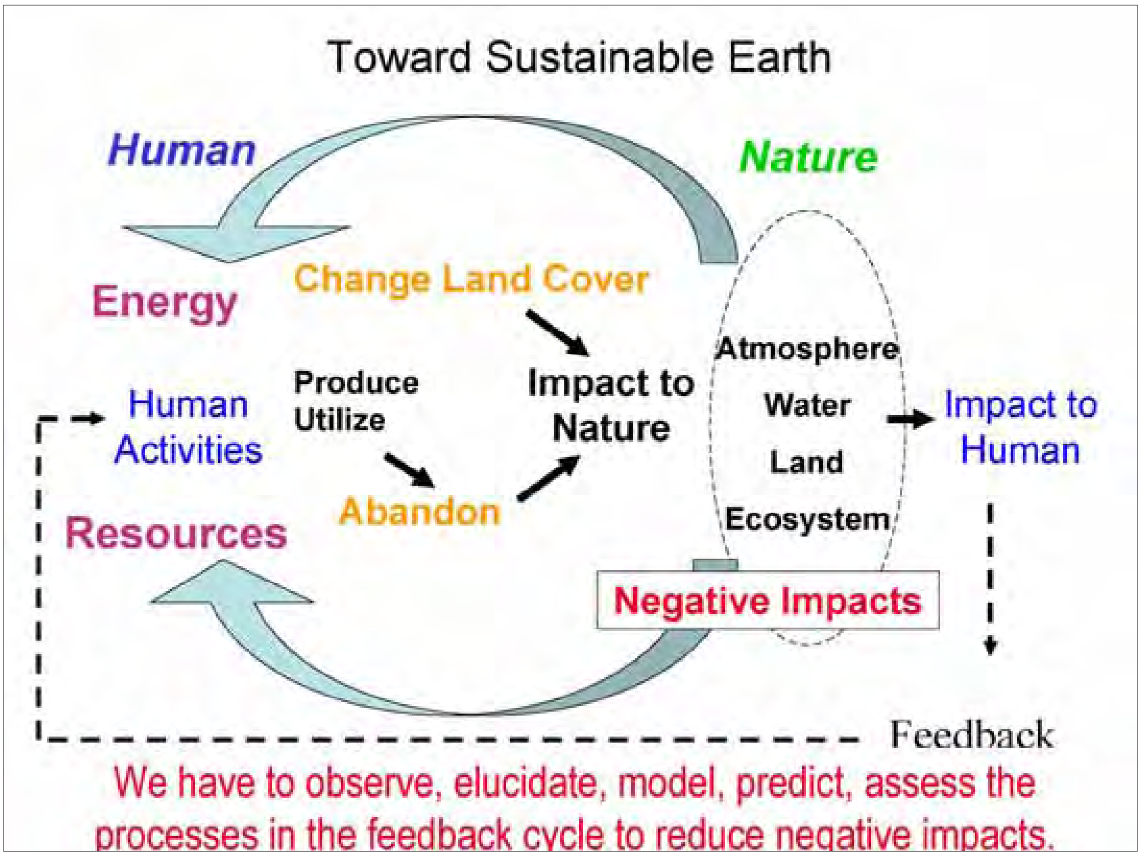
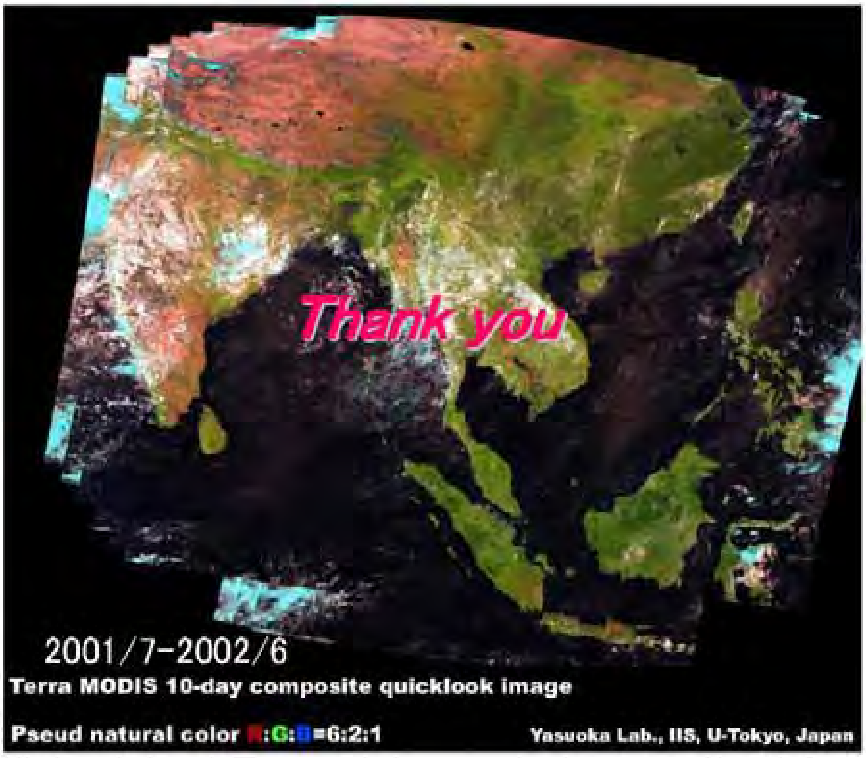
Atmospheric Environment Division
Water and Soil Environment Division
Environmental Biology Division
Laboratory of Intellectual Fundamentals for Environmental Studies
Fundamental Researches


Toward Sustainable Earth
Human
Nature
Energy
Change Land Cover
Human Activities
Produce
Utilize
Impact to Nature
Abandon
Atmosphere
Water
Land
Ecosystem
Impact to Human
Resources
Negative Impacts
Feedback
We have to observe, elucidate, model, predict, assess the processes in the feedback cycle to reduce negative impacts.

Toward Sustainable Earth

Any one single country
may not cover the whole issues over
global atmosphere, ocean, land and
human systems.

We need collaboration!



2-3 Recent Achievements & Future Strategy of Environmental Research in NIER

- Director, Ho-Seok SONG, NIER, Korea

Recent Achievements & Future Strategy of Environmental Research in NIER

Director Ho-Seok Song
Research Planning Division

National Institute of Environmental Research

CONTENTS

National Institute of Environmental Research


HISTORY
July 1978
Established as the National Environmental Protection Institute (NEPI) under the Ministry of Health and Social Affairs
Jan. 1980
NEPI was incorporated into the Environmental Administration
July 2000
Relocated to Environmental Research Complex in Incheon
July 2005
Renamed the National Institute of Environmental Research
Mar. 2007
Created the Environmental Health Research Department
Feb. 2009
Changed organization to strengthen research planning and government policy-making
National Institute of Environmental Research


ORGANIZATION
1 Office, 4 Departments, 15 Divisions and 6 Centers
President
Research Strategy and Planning Office
4 divisions
Environmental Health Risk Research Department
5 divisions
Climate and Air Quality Research Department
4 divisions
Water Environment Research Department
5 divisions
Ecology Research Department
3 divisions
Resource Recirculation Research Center
Transportation Pollution Research Center
Environment Research Centers of Four Major Rivers
National Institute of Environmental Research

HUMAN RESOURCES

Permanent staff

person(%)

Research	220 (75.1)
Administration	30 (10.2)
Technical Assistance	43 (14.7)
Total	293 (100)

Doctorates of permanent research staff

PhDs	127 (57.7)
MSs	91 (41.4)
BSs	2 (0.9)
Total	220 (100)

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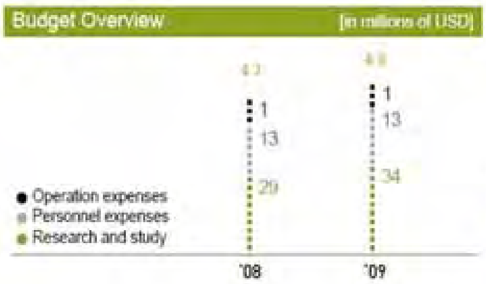
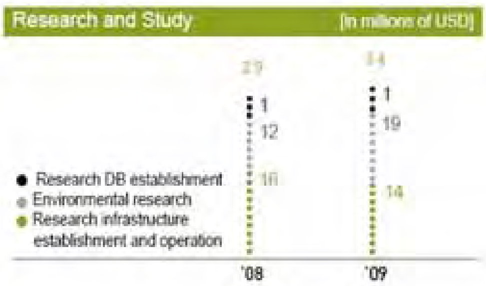
BUDGET





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RESEARCH in 2009

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Environmental Health Risk Research

Research on nanomaterials

Background

The advancement of nanotechnology is increasing chances of environmental and human exposure to various nanomaterials

Contents

- Develop and study methodologies of risk assessment of nanomaterials
  - Assess toxicity of silver nanoparticles and titanium dioxide nanoparticles
  - Study carcinogenicity and mutagenicity of carbon nanotubes
- Investigate exposure to nanomaterials and develop safety guidelines

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Environmental Health Risk Research

Research on PPCPs

Background

PPCPs (Pharmaceuticals and Personal Care Products) have been detected at various concentrations in some rivers of Korea, raising public concern

Contents

- Investigate PPCPs in environmental matrices to determine exposure pathways, levels and sources
  - Measure presence of PPCPs in surface water and groundwater
- Assess toxicity of PPCPs

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Environmental Health Risk Research

National Environmental Health Survey

Background

The national environmental health survey assesses exposure of the public to toxic pollutants and provides scientific basis for national environmental health policies

Contents

- General survey
  : conducted on a regular basis and statistical data will be released
- High risk areas
  : industrial parks and mines
- Vulnerable groups
  : young children, the pregnant and elderly

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Climate and Air Quality Research

GHG-CAPSS

Background

NIER operates GHG-CAPSS (Greenhouse Gas-Clean Air Policy Support System) to provide a reliable statistical data on climate change in Korea, particularly in preparation for Post-Kyoto negotiations

Contents

- Estimate the amount of GHG emissions in compliance with IPCC Guidelines
  - Monitor GHG emission from industrial processes and natural sources
- Provide regional and sectoral assessment of GHG emissions

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Climate and Air Quality Research

Indoor Air Research

Background

Environmental health problems are often caused by airborne substances originating not outdoors, but indoors

Contents

- Measure concentration of formaldehyde and volatile organic compounds in apartment buildings before occupation and at certain intervals
- Revise pollutant test methods for building materials and set up a better standard
- Inspect the use of ACM (Asbestos Containing Material) building material and check the friability within buildings

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Climate and Air Quality Research

Evaluation on low-emission fuels and devices

Background

Motor vehicles may be one the main culprit of air pollution, particularly in urban areas

Contents

- Analyze emission and combustion characteristics of six different types of biodiesel; soybean, waste frying, jatropha, rapeseed, palm oil and HDB
- Test emission reduction devices on vehicles on a regular basis; DPF and DOC

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Water Environment Research

Research on Norovirus contamination

Background

Norovirus causes approximately 90% of epidemic non-bacterial outbreaks of gastroenteritis around the world

Contamination of soil and groundwater by norovirus is a particular concern in Korea

Contents

- Investigate the use and management of groundwater across the country
- Evaluate individual and combined water treatment methods, which include chlorine, ozone, UV, activated sludge, and Membrane Filtration

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Water Environment Research

Investigation and Evaluation on aquatic ecosystem

Background

Securing a healthy aquatic ecosystem is important because it performs many environmental functions such as recycling nutrients, water purification, recharging ground water and providing habitats for wildlife

Contents

- Investigate the aquatic ecosystem health with samples taken at 720 sites in streams and 10 sites in estuaries
- Develop ecosystem health indicators

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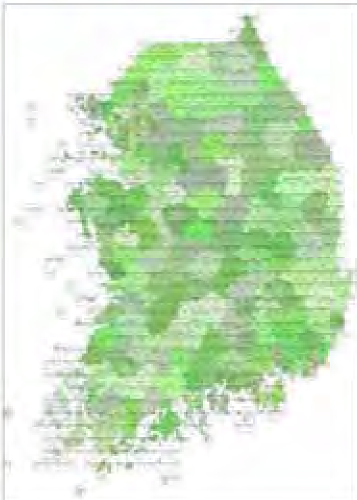
Ecology Research

Ecosystem survey and GIS-DB



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Ecology Research

Research on invasive alien species

Background

Invasive alien species have become one of the most serious ecological concerns in Korea

Contents

- Identify current status and conditions conducive to expansion of invasive species
- Assess risks of invasive species
- Search and declare new invasive alien species

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STRATEGY for FUTURE RESEARCH

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STRATEGY for FUTURE RESEARCH

Future Research Projects

- **Background and Significance**
  - *Support government policy-making on the Low-carbon and Green Growth strategy*
  - *Protect human health and preserve ecological soundness*
  - *Develop proactive measures for sudden environmental changes caused by climate change*
- **NIER set 6 key research areas**
  - *70 research activities under 19 subjects*

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Future Research Projects

6 Key research areas

- Research on climate change adaptation to support realization of a low carbon society
- Research on environmental health based on environmental risk
- Research on creating and restoring an ecosystem in which humanity and nature coexist in harmony
- Research on improving healthy water environment
- Research on creating a resource-circulating society to achieve the Green Growth
- Research on scientific foundation of air quality management to improve living environment

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I. Climate change adaptation to support realization of a low carbon society

Study climate change impacts on ecosystems

- Detect change of ecosystem CO_2 flux caused by global warming
- Establish ecosystem impact model under global warming through experiments on ecological transformation of major species

Develop climate change forecasting system with high technology

- Improve plan for implementation of geostationary environment monitoring spectrometer on satellite
- Calculate emissions with data from satellite

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II. Environmental health based on environmental risk

Examine health impacts of indoor toxic substances

- Develop risk assessment technology and evaluation methods of health impacts
- Study health impacts of new pollutants such as nanomaterials, allergen, and light

Conduct research on toxicity/risk prediction

- Assess toxicity assessment with toxicogenomics
- Predict and examine the toxicity and risk of trace chemicals

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III. Restoration of the ecosystem in which humanity and nature coexist in harmony

Monitor transformation of ecosystem through long-term ecological research

- Conduct long-term research on ecological diversity and seasonal phenomenon due to transformation of ecosystems
- Study ecological species which are sensitive to climate change

Identify factors of environmental pollution by utilizing environmental specimen bank (ESB)

- Secure environmental specimens, develop storage technologies and chemical analysis techniques

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IV. Creation of healthy water environment

Develop scientific tools for IT-based river management

- Analyze and predict change of land use with high-resolution satellite images, GIS and serial map
- Analyze outflow patterns of pollutants through spatial statistics and remote probe
- Introduce real-time environmental monitoring systems with Ubiquitous Sensor Network (USN)

Develop integrated risk assessment systems of toxic substances in water environment

- Examine movement of toxic substances in land, air and water to identify impacts on water quality

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V. Resource-circulating society to achieve Green Growth

Establish measures for using waste organic materials as alternative energy for oil

- Identify emission characteristics of toxic substances from solid fuels
- Suggest calculation methods and appropriate rate of energy recovery

Study disposal, reduction and safe treatment of hazardous waste

- Develop applied technologies of waste asbestos treatment and molten slag recycling

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VI. Air quality management to improve living environment

Perform international joint research on long-range transboundary air pollutants

- Establish monitoring system for new transboundary air pollutants such as ABC and POPS across Northeast Asia

Study methods for zero vehicle emissions

- Test and certify key technologies of Green Car and analyze supply conditions and economic feasibility

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Thank You !
National Institute of
Environmental Research

SessionⅢ	**Review of TPM activities** (chaired by NIES President)

3-1 TPM Activities progress report

- Senior researcher, Hyun-Mi KIM, NIER, Korea

3-2. Progress of Sand Storm Project

- Director, Yunjiang YU, CRAES, China

3-3. Fresh water pollution prevention : Decentralized domestic wastewater treatment in rural areas in China

- Senior researcher, Motoyuki MIZUOCHI, NIES, Japan

3-4 Transboundary air pollution

- Senior researcher, Im-Seok CHANG, NIER, Korea

3-5 Hazardous materials contamination, such as EDCs and POPs

- Director, Kyung hee-CHOI, NIER, Korea

3-6 Air pollution, a regional challenge for Northeast Asia

- Director, Fan MENG, CRAES, China

3-1 TPM Activities progress report

- Senior researcher, Hyun-Mi KIM, NIER, Korea


The 6th TPM, Seoul, Korea '09.11.25-28
TPM Activities Progress Report
Hyun-Mi Kim Ph.D.
Research Planning Division
National Institute of Environmental Research


The 6th TPM, Seoul, Korea '09.11.25-28
History of TPM
1 Beijing, China '04.02.16~02.19
2 Tsukuba, Japan '05.10.12~10.14
3 Seogwipo, Korea '06.05.15~05.19
4 Chengdu, China '07.05.12~05.18
5 Hokkaido, Japan '08.11.24~11.29
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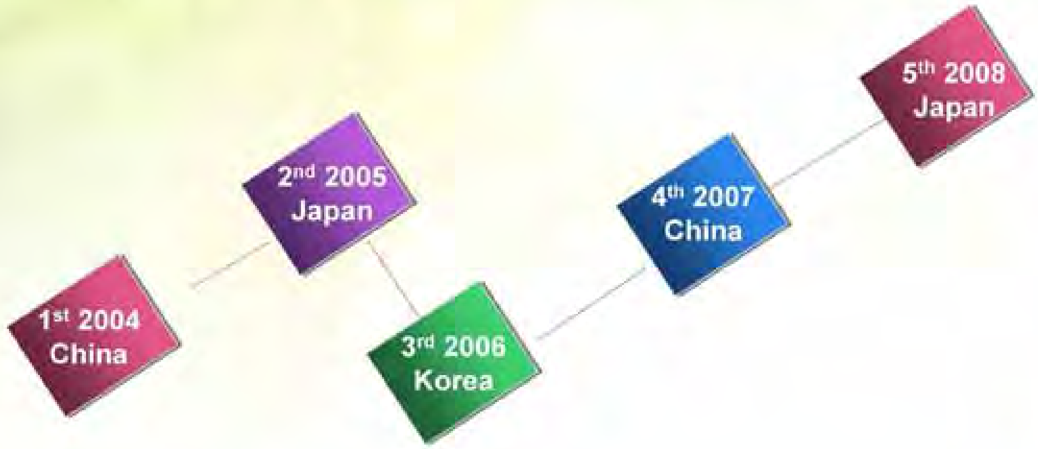
The 6th TPM, Seoul, Korea '09.11.25-28

Summary of TPM



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Summary of TPM1

1st 2004
China

◆ Common agreement to hold TPM annually in accordance with order of three countries

◆ To try utilization for international organization fund

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Summary of TPM2

2nd 2005
Japan

- ◆ Deduction of Six cooperative research projects for TPM
- ◆ Agreement to hold annual workshop and working level pre-meeting for TPM

Deduction of the Co-operative TPM Projects

1. Fresh Water Pollution (NIER CRAES, NIES)
2. Transboundary Air Pollution (NIER, CRAES, NIES)
3. Dust and Sand Storm (NIER, CRAES, NIES)
4. Harzadous Chemicals Pollutants (NIER & NIES)
5. Urban air pollution/Vehicle exhaust
6. Migrating Birds and Wetland

Summary of TPM3

3rd 2006
Korea

- Agreement of research about monitoring and environmental effect with DSS(dust and sand storm)
- To discuss about participation of other Asian countries to TPM

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Summary of TPM4

4th 2007
China

- Establishing cooperative research project about DSS(dust and sand storm)
- Agreement the training program of environmental expert among three countries

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Summary of TPM5

5th 2008 Japan

- To progress the cooperative research project about Transboundary air and fresh water pollution
- To discuss about the prospective research of Fresh water pollution

Research Areas of Cooperation in TPM

Deduction of the Co-operative TPM Projects

- Fresh Water Pollution (NIER, CRAES, NIES)
- Transboundary Air Pollution (NIER, CRAES, NIES)
- Dust and Sand Storm (NIER, CRAES, NIES)
- Harzadous Chemicals Pollutants (NIER & NIES)
- Urban air pollution/Vehicle exhaust
- Migrating Birds and Wetland
- Climate change
- Solid waste


The 6th TPM, Seoul, Korea '09.11.25-28
TEMM 11 (June 12-13, Beijing, China) Cooperation Area
• Environmental education, environmental awareness and public participation
• Climate Change
✓ Low Carbon Society, Green Growth
• DSS (Dust and Sand Storm)
• Pollution Control (Air, Water, Marine Environment)
• Environment-Friendly Society/3R/Sound Resource Recycle Society
• Transboundary Movement of E-Waste
• Sound Management of Chemicals
• Environmental Governance in Northeast Asia
• Environmental Industries and Technology
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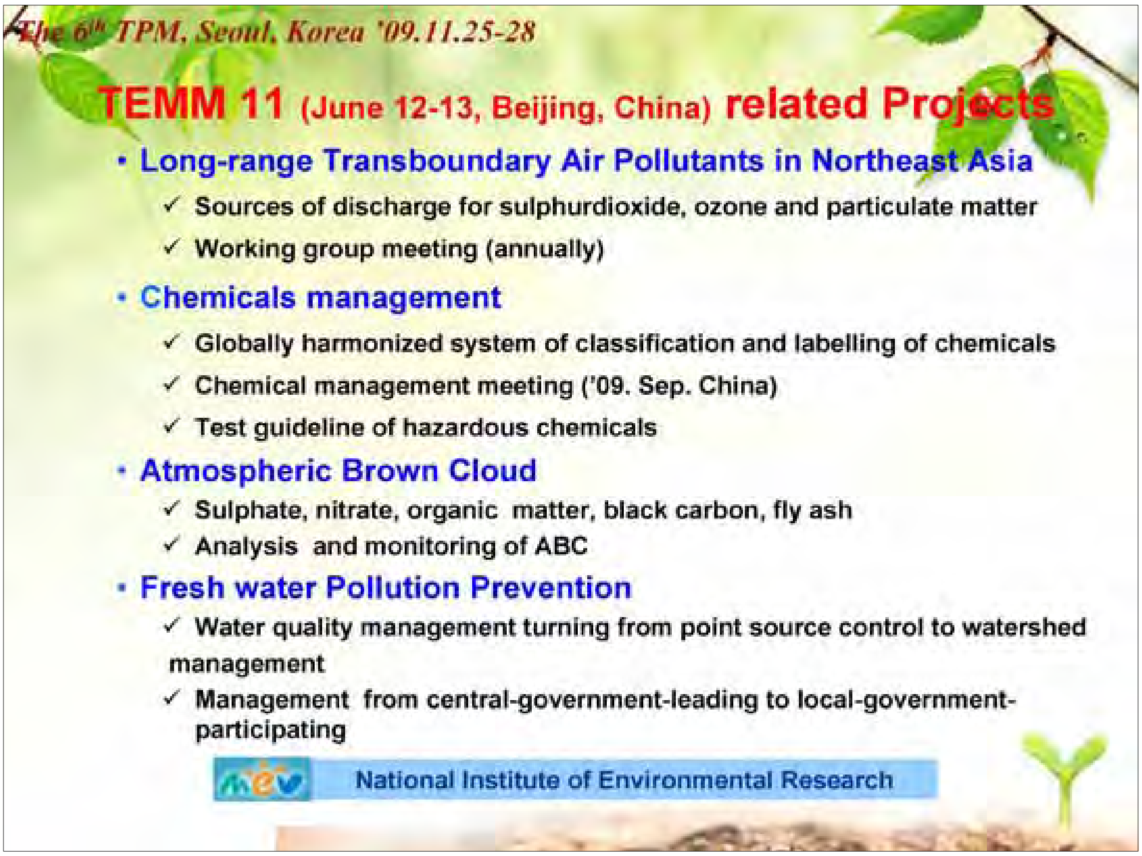
The 6th TPM, Seoul, Korea '09.11.25-28
TEMM 11 (June 12-13, Beijing, China) related Projects
• Long-range Transboundary Air Pollutants in Northeast Asia
✓ Sources of discharge for sulphurdioxide, ozone and particulate matter
✓ Working group meeting (annually)
• Chemicals management
✓ Globally harmonized system of classification and labelling of chemicals
✓ Chemical management meeting ('09. Sep. China)
✓ Test guideline of hazardous chemicals
• Atmospheric Brown Cloud
✓ Sulphate, nitrate, organic matter, black carbon, fly ash
✓ Analysis and monitoring of ABC
• Fresh water Pollution Prevention
✓ Water quality management turning from point source control to watershed management
✓ Management from central-government-leading to local-government-participating
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The 6th TPM, Seoul, Korea '09.11.25-28

TEMM 11 (June 12-13, Beijing, China) related Projects

- **Chemicals management**
  - ✓ Globally harmonized system of classification and labelling of chemicals
  - ✓ Chemical management meeting ('09. Sep. China)
  - ✓ Test guideline of hazardous chemicals
- **Atmospheric Brown Cloud**
  - ✓ Sulphate, nitrate, organic matter, black carbon, fly ash
  - ✓ Analysis and monitoring of ABC (super site:Jeju, Go-san)
- **Fresh water Pollution Prevention**
  - ✓ Water quality management turning from point source control to watershed management
  - ✓ Management from central-government-leading to local-government-participating

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TEMM 11 (June 12-13, Beijing, China) related Projects

- **Dust and Sand Storm**

✓ Joint Research Group on DSS among Korea, Japan and China Meeting in July 2008 where environmental experts and government officials of the three countries first meet to develop specific plans and discussed the measures to implement them.

✓ Because scientific approach about creation and development of DDS, accurate monitoring and forestation at the site is essential to build a fundamental solution to the problems

✓ The results of joint research are expected to play a pivotal role to build an effective and practical cooperative structure among the three countries.

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Fresh Water Pollution-1

- **Outline of the project**
  - ✓ **Development of Research and Policy-making study to prevent and control pollution of lake water**

- **Review of Joint activities**
  - ✓ **To held annual international symposium and seminars (8 symposiums, '03 ~'08)**

    *Theme of '08 symposium : The comparison of ecological function between degraded wetlands and restored one in Western Taihu Lake

  - ✓ **To provide the training program on water quality management schemes among three countries ('03 ~'08)**

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Fresh Water Pollution-2

- **Research project improvement and suggestion**
  - ✓ **Pattern analysis of climate elements and biota change using historical data**
  - ✓ **Analysis of prospective ecosystem change according to proposed scenarios**
  - ✓ **Provision of guidelines on the effects of climate change on ecosystem**
  - ✓ **Development of model predicting future changes in ecosystems through pattern analysis**

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Transboundary Air Pollution-1

- **Outline of the project**
  - ✓ Monitoring and modeling of long-range transport of air pollutants among Korea, Japan and China

- **Review of Joint activities**
  - ✓ Joint research has been conducted among the three countries starting from'00(1st stage: '00~'04, 2nd stage: '05 ~'07, 3rd stage: '08 ~'12)
  - ✓ To establish database on national background concentrations Produce S-R relationships for SOx and NOx
  - ✓ To hold the international workshops about Transboundary air pollution among Korea, Japan and China in Nov. 2008 & 2009(Jeju, Korea)

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Transboundary Air Pollution-2

- **Research project improvement and suggestion**
  - ✓ To estimate S-R relationship for NOx, Ozone and PM
  - ✓ To update the emission inventory of air pollutants in Northeast Asia
  - ✓ To establish a monitoring system employing aerial measurement and satellite retrieval
  - ✓ To need government-level agreement to approve of disclosing the results of this joint research

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Dust and Sand Storm-1

- **Review of Joint activities**
  - ✓ The Steering Committee for joint research on DSS
    - ❖ 1st meeting, Jan. '08 Tokyo
    - ❖ 2nd meeting, Jul. '08 Seoul
    - ❖ 3rd meeting, Apr. '09 Beijing
  - ✓ Working Group I & II for joint research on DSS
    - ❖ Working group I
      - :Intensive analysis of DSS
      - :Developing monitoring capability of DSS
    - ❖ Working group II
      - : Analysis of factors on ecological restoration of desertification area

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Dust and Sand Storm-2

- **Research project improvement and suggestion**
  - ✓ To evaluate the status of implementing the project on response to DSS in Northeast Asia
  - ✓ To discuss the improvement of the DSS research plan in coming working group or steering committee of DSS from now on
  - ✓ To provide sufficient scientific basis on the environmental and socio-economic impacts of DSS

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Hazardous Chemicals Pollution-1

- **Outline of the project**
  - ✓ To build the management capacity of EDCs and POPs
    - EDCs: endocine-disrupting chemicals
    - POPs: Persistent organic pollutants

- **Review of joint activities**
  - ✓ Joint researches have been conducted and symposia have been held with Korea and Japan from '01 (the 8th meeting, Iwate, Japan, Feb. '09)
  - ✓ Joint research areas are:
    - ❖ Harmonization of analytical methods on POPs ('02 ~'08)
    - ❖ Biomarker study of EDC using medaka and daphnia ('03 ~'07)
    - ❖ Comparison of POPs levels in freshwater fish ('06 ~'09)
    - ❖ Comparison of monitoring data for Perfluorinated Chemicals('06 ~'09)

* Implementing arrangement between the MOE of the Republic of Korea and the MOE of Japan on joint research and cooperation concerning endocrine disrupting chemicals, dioxins, furans and polychlorinated biphenyls

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The 6th TPM, Seoul, Korea '09.11.25-28

Hazardous Chemicals Pollution-2

- **Research project improvement and suggestion**
  - ✓ To expand the research area of Korea-Japan project
    - ❖ Harmonization of analytical methods for dioxins and POPs/new POPs
    - ❖ Cooperative research on bioaccumulation on POPs and relative chemicals
    - ❖ The 9th Joint symposium with NIER and NIES will be held in Korea (Feb. '10)
    - ❖ Recommendation of the participation of CRAES to this joint project
  - ✓ POPs forum will be held with Korea and China
    - (Dec.'09 Chingdao, China)
    - ❖ Theme: Policy of POPs management, environmental monitoring of POPS (1st forum, June '09, KIST, Korea; 2nd forum Dec. '09, China)
    - ❖ Recommendation of the participation of NIES to this forum

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New research projects of TPM6
-Suggested in TPM5
- discussed in TPM6 WLM
Risk Assessment and safety guideline on recycled product
Certification system on hazard of recycled product
Using safer and environmentally-friendly recycled products to prevent environmental pollution
Making priority order of recycled products for risk assessment
Developing methodology of risk assessment on recylced products
Sharing the roles and research output of each institute
NIER
National Institute of Environmental Research


The 6th TPM, Seoul, Korea '09.11.25-28
Environmental Expert Training Program(NIER)
-The Capacity Development for Environmental Science Expert from China-
Jump
3rd
'09 3.26 - 4.10
• The third Chinese expert training program (10 person)
✓ Environmental lectures about air, water pollution and circulation of resources etc.(8 lectures)
✓ Japanese lecturer from NIES
Growth
2nd
'08 11.10 - 11.25
• The Second Chinese expert training program (8 person)
✓ Hazardous waste management
✓ Indoor air quality management
✓ Environmental health research
Start
1st
'07 3.26 - 4.10
• The First Chinese expert training program (12 person)
✓ Water management (river basin)
✓ Transportation pollution research
✓ Management of automotive pollution control
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- **Mutual exchange of experts among China, Japan and other countries to secure high-quality human resources**
  - ✓ Safety of nano particle (Risk assessment division)
  - ✓ Environmental health effect assessment and environmental disease prevention (Environmental epidemiology division)
  - ✓ Analysis method of hazardous materials in children's products and POPs persisting in the environment (Chemicals behavior research division)
  - ✓ Development of numerical modeling on contribution of each pollution source (Air Quality Research division)
  - ✓ Comprehensive evaluation on watershed environment changed by climate change (Water pollution cap system research division)
  - ✓ Standard utilization for national environment specimen bank (Ecosystem assessment division)
  - ✓ Evaluation methods for future green transportation (Transportation pollution research center)
  - ✓ Study on efficiency of waste-to-energy and heat recovery, study on treatment and behavior of harzadous waste such as PCB (Resource recirculation research center)

Current Status of Agreements

Arrangement : NIER and CRAES

Cooperative framework regarding environmental research

Memorandom of Understanding : NIER and CRAES

Establishment of environmental science and technology exchange center

Arrangement: NIER and NIES

Cooperative framework regarding the environmental technologies


The 6th TPM, Seoul, Korea '09.11.25-28
Thank you !
See you next TPM7, China !

3-2 Progress of Sand Storm Project

- Director, Yunjiang YU, CRAES, China

Joint research on DSS among Korea, Japan and China

CRAES

Study on Sandstorm's Impact on Environment and Ecology

Pro. Yunjiang Yu

2009. 12.15

1

Outline

- Cooperation background
- The work plan on DSS of China
- The research progress on DSS of China
- The future joint research plan on DSS of China

2

◆Cooperation background

3

Joint proposal review from the fifth Tripartite Presidents Meeting of CRAES, NIES and NIER (TPM 5)

1. The source, transportation and the impact on the environment of sand dust

- Pollution characterization of dust sand aerosol

Choose representative monitoring spots in countries and regions (Korea and Japan) at leeward direction of sandstorm source area, sandstorm occurring region and sandstorm to conduct monitoring of aerosol pollution characterization with simultaneous monitoring scheme.

- Physical chemical characterization of dust sand aerosol

Conduct monitoring of aerosol size and concentration spectrum distributions to obtain continuous results of multi-stations, analyzing comprehensively the micro-topography, inorganic chemical components, organic components (including spore and pollen element), mineral element, particle topography and component of collected particulate filter sample.

4

- Deposition mechanism and rule of dust sand aerosol during its transportation

Monitor the deposition character and velocity of dust sand aerosol during transportation in different regions, simulating and studying deposition velocity of dust sand aerosol of different sizes under different meteorological conditions.

- Transformation characterization of dust sand aerosol during transportation

Study the transformation and metamorphose characterization and mechanism of dust sand aerosol during transportation, through comparison and analysis of aerosol's physical chemical characterization in countries and regions (Korea and Japan) at leeward direction of sandstorm source area, sandstorm occurring region and sandstorm.

5

2. Establishment sandstorms forecast and movement model

Based on various existing models, for example 'DSS Forecasting Model Based on SVM' and 'DSS Model Based on GA-neural Network' etc, establishing more accurate early forecast and transport model and verifying them by the use of monitoring data.

The forecast model will provide both short-term (early warning) and long-term (seasonal) predictions. Long-term forecasting will depend heavily on data derived from ground surface monitoring and on verification of prediction model output.

6

3. Sandstorm's impact on regional ecosystem

- Sandstorm's impact on temporal and spatial variation of land utilization type

By analysis the relationship between dust storm and surface (land cover and vegetables coverage degree) in Northern China , it is revealed what relationship the land cover and vegetable coverage degree have with the form of dust storm and change.

- Sandstorm's impact on land cover and vegetables coverage degree

It is of significance both in theory and practice to reveal the interaction between these two phenomena. Based on mass data of temporal and spatial variation of land utilization type from investigation, a study will be made of sand-dust storms on land desertification.

7

4. Study on the preventing sandstorm and restoration technology of vegetation

- Assessment on ecological carrying capability of different grassland in sandstorm source areas

The monitoring and assessment on ecological carrying capability of different kinds of grassland will be studied in sandstorm source and route areas.

- Impact of different grassland utilization regulations and intensities on sandstorm in source areas

The impact of grazing pattern, time and intensity on sandstorm will be studied in sandstorm source areas in order to develop the best grassland utilization measures and control the origin of the sandstorm.

8

Study and assessment on different control models

Appling the engineering measures, the vegetation restoration results and sand preventing effects will be studied by the different influencing factors including vegetation structure, seed disposal technology, planting time and pattern.

9

5. Sandstorm's Impact on Human Health

Epidemiological survey

Select survey locales according to environmental monitoring results and relevant data to study the harm of dust sand aerosol on respiratory system, cardiovascular system and immune system etc. Corresponding database should be established on the basis of study on groups of all ages especially the sensitive groups (the old and the children), with appropriate environmental epidemiological questionnaire designed through expert demonstration. After adjustment of social economical status and hazard recognition degree, odds ratio of each effect should be calculated using statistical methods, to find out whether there is apparent difference in each undesirable effect's occurrence. Then the potential hazardous factors would be analyzed with environmental monitoring data involved.

10

Environmental toxicological experiment

According to data and results of epidemiology and field investigation, physiological and biochemical experiments on animal should be conducted with indoor modeling experiments involved. Then the pathogenic mechanism would be studied further from the aspects of numerator level and gene level to probe into the imperiling way and feature of effect of dust sand aerosol on organisms.

11

◆ The work plan on DSS of China

12

The Second Steering Committee Meeting for Joint Research on DSS among Korea, Japan and China was held in Seoul, Korea on July 18, 2008.

During this meeting , the participants discussed and made the "Research Plan (2008-2010) consented :

13

- 2008: Improve monitoring and assessment methods for ecosystem restoration in desertificated areas by China, Korea and Japan.

--- Establish a joint research group
---Review restorative practices implemented in China
---Make a check-up list of restoration projects in social, economic and natural perspectives
---Select study sites with the consent of three parties
---Collect source data based on methods of existing monitoring, analysis and assessment
---Develop an assessment method for ecosystem restoration projects

14

2008 : Work plan of China

- Provide relevant information on ecosystem restoration projects
- Review restoration projects
- Select the demonstration region (sites), and the field survey of the status
- Review vegetative restoration technology in practices

15

Research Schedule (2008)

Time / Details	Timeline (month) 8	9	10	11	12	1	2	3	4	5	Research budget (KRW)	Weight (%)
Collect basic information on restoration projects												20
Make a check-up list												20
Joint field survey												20
Collect source data												10
Improve assessment methods for ecosystem restoration												30
Rate of progress	15	5	20	5	5	5	5	10	20	10		100
Date requested for the interim report	January 15, 2009											
Date requested for the draft final report	June 31, 2009											

16

- 2009: To develop an advanced model for ecosystem restoration in desertificated areas by China, Korea and Japan.

---Conduct joint field survey and verify assessment methods, where applicable

---Analyze the natural and socio-economic impacts on sustainable development based on check up list

---Suggest an advanced model, based on the analysis of the determinants of project success

17

2009 : Work plan of China

- The Third Steering Committee Meeting for Joint Research on DSS among China, Japan and Korea was held in Beijing, China on April 14, 2009.

During this meeting, The participants of China reported the '09 Research plan:

- Review vegetation restoration measures of degraded and sandy grassland in Inner Mongolia steppe
- Assessment on the technologies of vegetation restoration and the methods of management

Outline

- The research progress on DSS of China

19

1. Relevant Information Collection

20

1) Some results from National tenth five-year plan science and technology key project

Temporal and Spatial Distribution of sandstorm,China(1954-2000)

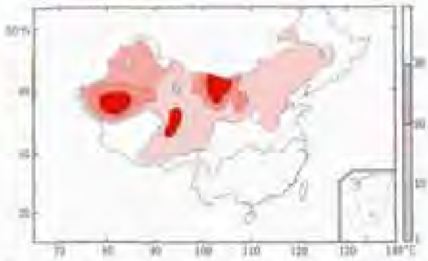


Fig1. Spatial Distribution of Sand-dust Storm Weather in China

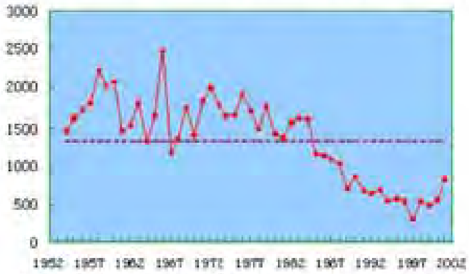


Fig2. The total number of sandstorm days from 1954 to 2000 in China

- Sandstorm high-incidence regions: Inner Mongolia、Xinjiang 、Gansu 、Qinghai

- During 47 years, the emergence of sandstorms showed a descending trend , which is higher during the 50-60 period, into the 70s for the declining situation, at least in 1997, by the age of 90 after 1997,dust storms was an increasing trend.

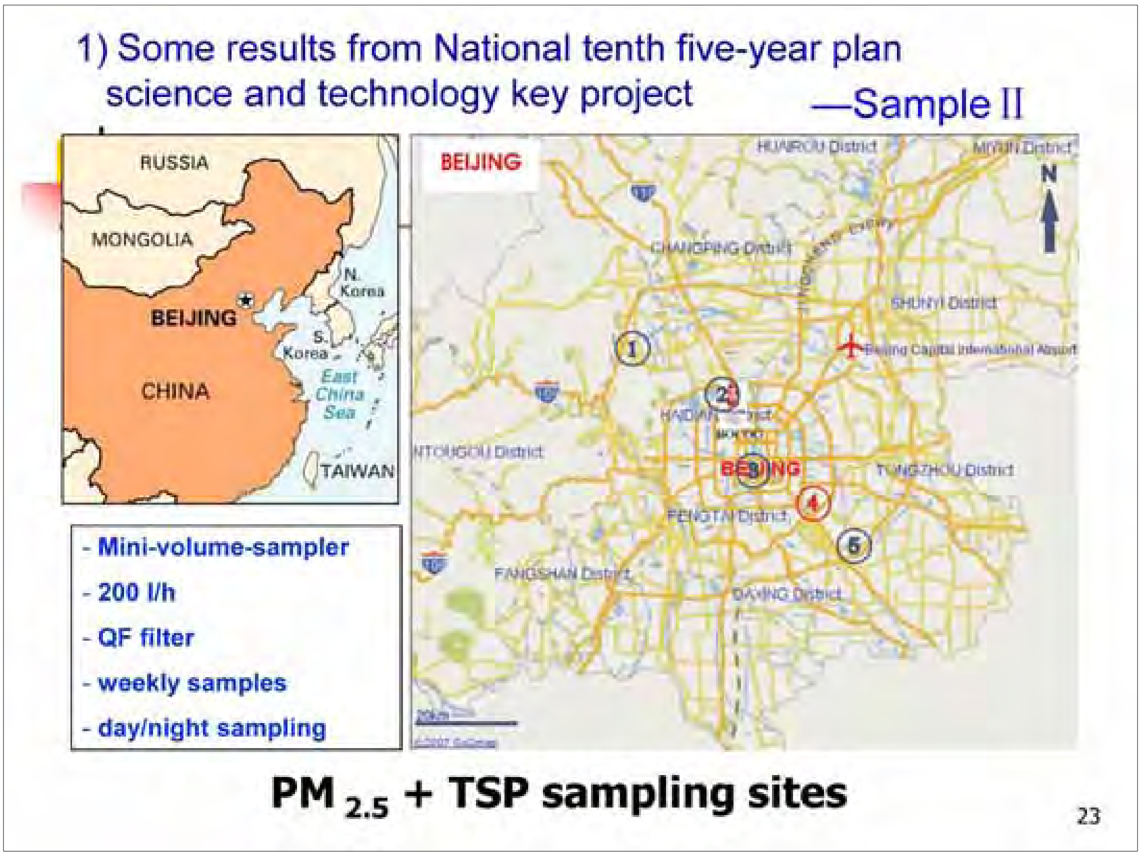
21

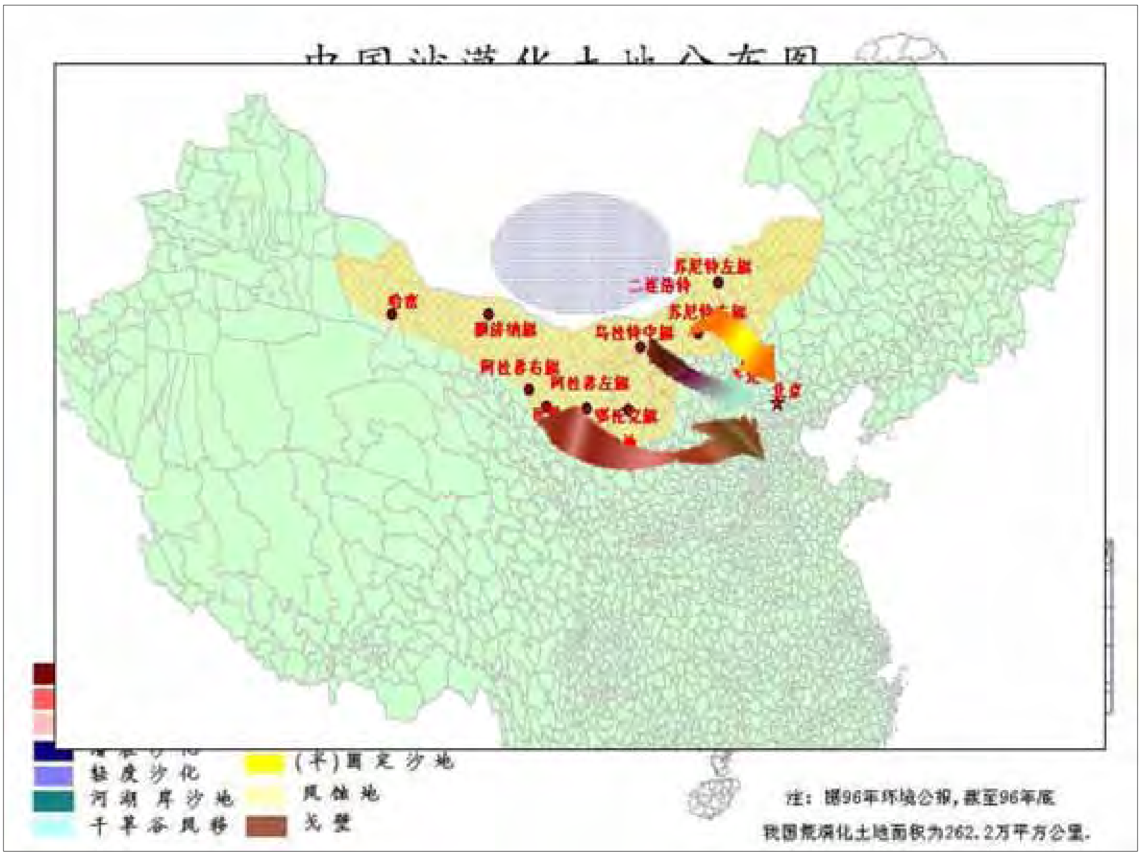
1) Some results from National tenth five-year plan science and technology key project

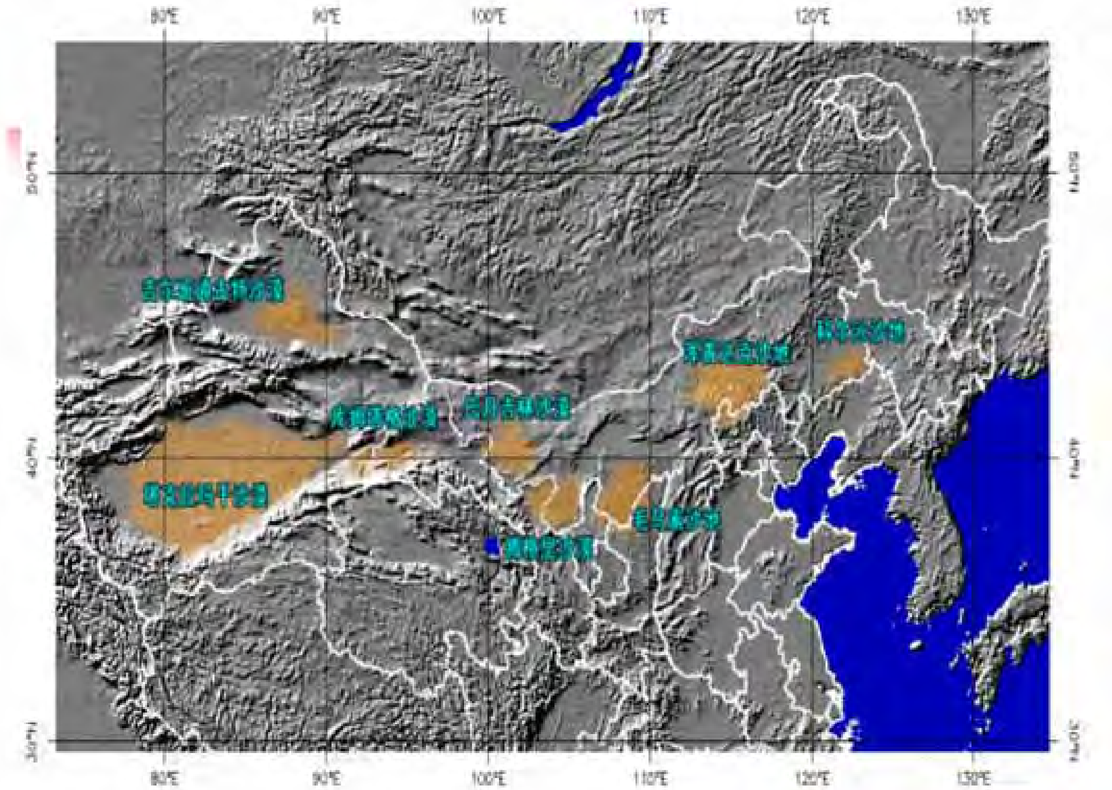
Sand dust monitoring—Sample I

Monitoring sites and affected areas

22


1) Some results from National tenth five-year plan
science and technology key project
—Sample II
RUSSIA
MONGOLIA
N. Korea
BEIJING
S. Korea
CHINA
East China Sea
TAIWAN
BEIJING
N
- Mini-volume-sampler
- 200 l/h
- QF filter
- weekly samples
- day/night sampling
PM 2.5 + TSP sampling sites
23


二连浩特
阿拉善右旗
阿拉善左旗
轻度沙化
河湖岸沙地
(半)固定沙地
风蚀地
戈壁
注：据96年环境公报，截至96年底
我国荒漠化土地面积为262.2万平方公里.



2) Desertification Monitoring in China

Indicator system for desertification monitoring and valuation

In recent ten years, more progresses were made in the studies of indicator system for desertification monitoring and evaluation.

- Physical and Biological indicators: Soil erosion, Soil salinization, Overgrazing, Vegetation coverage etc.
- Economic indicators: land use patterns, Population's pattern and ratio, Cropland unit yield etc.

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2) Desertification Monitoring in China

Three times national desertification surveys were carried out in 1994, 1999 and 2004.

- The 3rd National Monitoring Survey for Desertification and Sandification was implemented by the State Forestry Administration and with the involvement of several sectors as agriculture, water conservancy, environmental protection and meteorology in 2004

27

2) Desertification Monitoring in China

- A National Geography Information Management System for Desertification and Sandification was established.

◆ **Scope of monitoring**:

Arid, semi-arid and sub-humid area, distributed generally in 10 provinces belonging to North and West China, with 270 counties involved. Key monitoring area was farm-pastoral transitional zone in North China.

◆ **Contents of monitoring** :

- The status of desertification land distribution
- macroscopic data in arid areas for the state, provinces
- Countermeasures and suggestions for desertification combating are put forward based on analysis.

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2) Desertification Monitoring in China

China's Desertification monitoring system

Three levels of desertification monitoring.

(1)The National Desertification Monitoring Centre:
To provide timely data for central government in making strategic policy and specific measurement for desertification combating and land protection,

(2) **Provincial Sub-center**
In charge of province monitoring.

(3) **Desertification monitoring station**
Sequential investigation and record- area, type and degree in the representative zone of each station, and to sub-center and national center.

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3) China's Key Projects on desertification Prevention and Control from 2000 to 2010

- There are 22 projects, the total budget is about 4080 billion ￥and project areas will reach 16697 billion ha from 2002 to 2010.
- The essential strategy in combating desertification in China is to control structure and function of agro-forest complex ecosystem, rationally use water and land resources, so as to promote a virtuous cycle within ecosystem.

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NO.	Project name	Purpose	Sponsored party and agency	Implement organization	Location	Period	Budget	Project area
1	The Natural Forest Protection Project	Restoration of natural forest resources, sand prevention and control, controlling soil and water losses.	State Forestry Administration,P.R.China	Various counties Local government	Inner Mongolia, Jilin, Heilongjiang, Hainan, Xinjiang autonomous regions and municipalities in 17 of 734 counties, 167 forestry bureau.	2000-2010	962×10^{8} CNY	117,000,000 ha
2	The Three-North Shelterbelt Project	Establish large-scale protection forest system in our country sandstorm and soil erosion serious area of Three-Norths	State Forestry Administration,P.R.China	Various counties Local government	northwest, northeast and north China, 13 provinces 551 counties.	1978-2050	1200×10^{8} CNY	409,600 ha
3	The project of Conversion from Cropland to Forest and Grassland (PCCFG)	Prevention and control soil erosion and desertification, and improve the ecological environment.	State Forestry Administration,P.R.China	Various counties Local government	In addition to Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong outside of the 25 provinces, autonomous regions and the Xinjiang Production and Construction Corps.	1999-2010	1500×10^{8} CNY	343,333 ha

……

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2. Select the demonstration region (sites) and the first Joint field survey

32

- **Date: 6 April to 12 April, 2009**
- **Survey Line: BJ-Huhhot-Oders-Linhe**

7 April	**Survey to loess Plateau**
8 April	**Survey to Muus Sandland**
9 April	**Survey to Kubuqi Desert**
10 April	**Survey to Tengli Desert**
11 April	**Survey to Badanjin Desert**

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Joint ecological forestry project between China and Korea in Kubuqi desert ,Inner Mongolia.

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3. Survey for Restoration Effects of Project for control of Desertification —— Cases of Kubuqi Desert and Mu Us sandland

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The following information was collected and provided to the Korea participants for Restoration Effects

- **Information of afforestation**
- **Information of environment**
- **Information of society & economy**

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Survey for Restoration Effects of Project for Protection of Desertification

Research Network for Desertification among Korea, China, and Japan

*** Information of afforestation**

The name of project	Beijing-Tianjin Sandstorm Source Control Project	Region	Mu Us Sandland—Wushen Banner
Period	2000.10	Organization	National Development and Reform Commission
The purpose of project	Iimprove ecological environment amd sandstorm source control of Beijing-Tianjin area		
The national of financial funding	Chinese government	The organization of financial support	
The country annual rainfall/period	250-440mm,6-9month,85%	The wind velocity/ direction	3.5-4.5m/s, NW
The area of afforestation		The number of trees for afforestation	
Survival rate	85%	The date of planting	04/2001;04/2002
Layout of the area	Have	Size of hole (diameter & depth)	60×80cm
The equipments	Irrigation		
The direction		Slope	
the point of GPS	E 108°17'36"—109°40'22"		N 37°38'54"—39°23'50"
The width between tree / Width of row	5~8m	Width of column	10m

······

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Survey for Restoration Effects of Project for Protection of Desertification

Research Network for Desertification among Korea, China, and Japan

*** Information of afforestation**

The name of project	Beijing-Tianjin Sandstorm Source Control Project	Region	Kubuqi Desert—Dalate Banner
Period	2000.10	Organization	National Development and Reform Commission
The purpose of project	Iimprove ecological environment amd sandstorm source control of Beijing-Tianjin area		
The national of financial funding	Chinese government	The organization of financial support	
The country annual rainfall/period	200mm, 6-9month,80%	The wind velocity/ direction	3.5-4.0m/s, NW
The area of afforestation		The number of trees for afforestation	
Survival rate	85%	The date of planting	04/2001;04/2002
Layout of the area	Have	Size of hole (diameter & depth)	60×80cm
The equipments	Irrigation		
The direction		Slope	
the point of GPS	E109°100'—110°45'		N 40°00'—40°30'
The width between tree / Width of row	5~8m	Width of column	10m
The width between tree / Special note			

······

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4. Review vegetative restoration technology in practices

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- **Stabilizing sands technique**
  (biological, engineering techniques)
- **Shelterbelt techniques system**
  (in oasis, in pasture of sandy land)

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Biological stabilizing sands techniques

Sands enclosure to restore natural vegetation: to fence in vegetation destroyed land in arid and semi-arid areas so as to prevent human activities and animal use, and gradually restore natural vegetation.

fully enclosure, half- enclosure and alternate enclosure.
Fully enclosure: to forbid all the human activities destroying plants growth.

Alternate enclosure: implemented around the divided zones in turn. Sands enclosure is proved to be low cost and high efficiency.

Enclosure--fenced grassland

Biological barrier to stabilize sands

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Engineering stabilizing sands techniques

Sand barriers are made by **straw**, brushwood or branch, used to control direction and speed of wind sand so as to prevent strong wind sand. They are also the precondition andnecessary condition for biological stabilizing sands.

There are vertical and horizontal sand barriers. The **verticalsand barriers are 50-100 cm high** above sand surface,horizontal barriers are 20-50 cm. The sand barrier are verticalto dominant wind direction with shape of **check-board with1mX1m.**

44

Straw checkerboard barriers of shifting sand land in Hulunbeir grassland

- From biodiversity conservation and sustainable management on Hulunbeir grassland, ECBP
- The project researches integrated control model with engineering and biological models based on shifting and semi-fixed sandy land, in which the total area is 7500ha.

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Shelterbelt in sandy land areas

- Typical patterns for **combating desertification in oasis of arid areas**--- Shelterbelt system in oasis in Hetian, XinJiang Autonomous Regions
- Typical patterns for **combating desertification in farm---pastoral transition zone in semi-arid region**

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◆ The future joint research plan on DSS of China

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Evaluation on ecological effect of vegetation rehabilitation

1) Investigation and Analysis on Typical Vegetation in Mu us sandland and Kubuqi desert
2) Analysis of the problems and causes during Harnessing the DSS in the research areas.
3) Establishment of an evaluation indicator system and method for restoration effectiveness of vegetation.
4) Assessment on the technologies of vegetation restoration and the methods of management.

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Thank you

中国环境科学研究院
Chinese Research Academy Of Environmental Sciences

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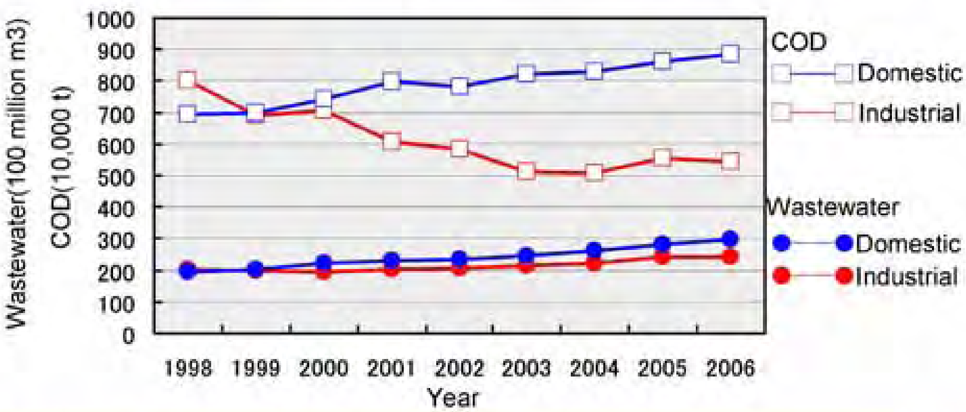
3-3 Fresh water pollution prevention : Decentralized domestic wastewater treatment in rural areas in China

- Senior researcher, Motoyuki MIZUOCHI, NIES, Japan

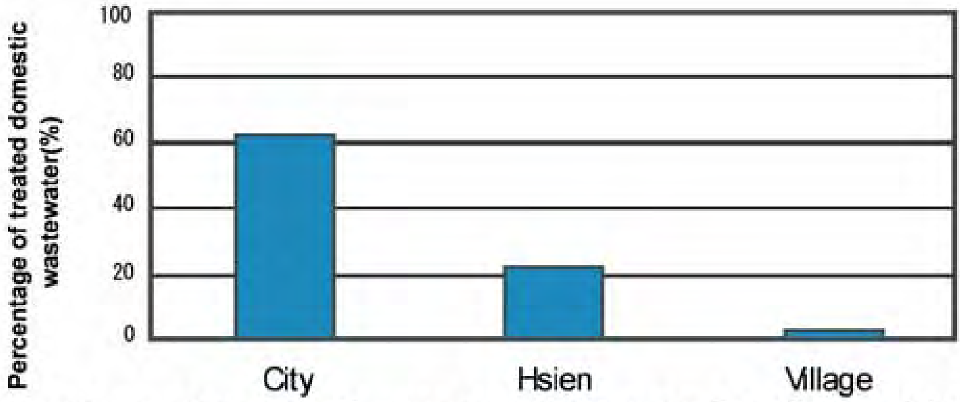
The big issue for the domestic wastewater in China



The amount of domestic wastewater has accounted for a larger percentage of the total amount of wastewater than that of industrial one since 1999.

The gap has been widening year by year.

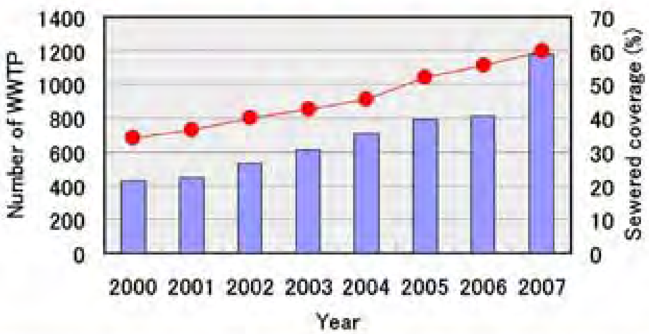
Promoting domestic wastewater measures has been a major issue.



Percentage of domestic wastewater treated in China (2007)

3

Progress of municipal sewer service in China

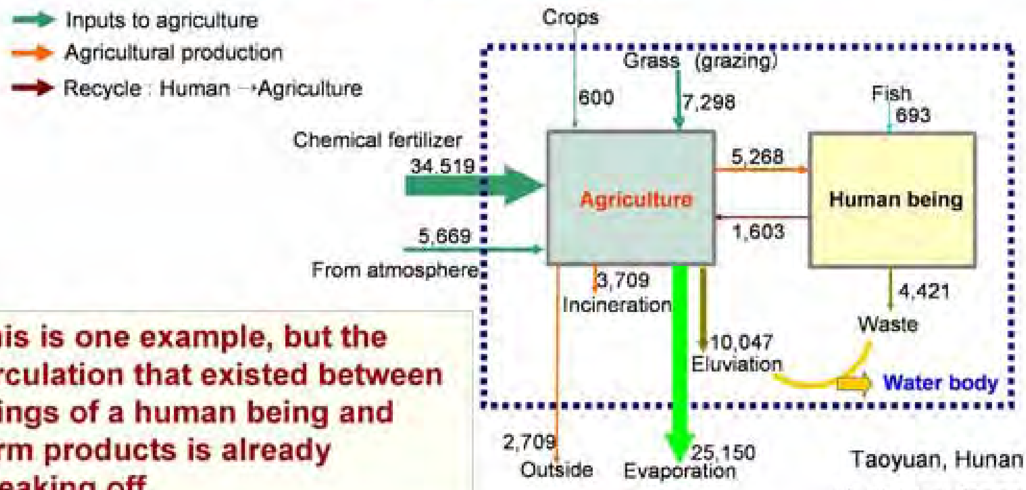


- Heavy investments have been made in the development of sewage systems in urban areas.
- 1,178 WWTP have been built and operated across the country by the end of 2007 and 472 plants were built between 2006 and 2007 .
- The sewage treatment rate to 60 percent.

The development of sewage systems in urban areas will further pick up speed in the future.

Importance of domestic wastewater treatment in the agricultural area in China in view of the nitrogen flow

Nitrogen flow combining crops production and consumption of Taoyuan, Hunan (2006)



This is one example, but the circulation that existed between things of a human being and farm products is already breaking off.

Domestic wastewater problem surfaced by the new farm village construction activity

Taizhou

Urmuchi

Qingdao

The use of the flush lavatory becomes common

The present conditions

Treatment is insufficient only in septic tank type facilities

Necessity of the secondary treatment such as the municipal sewage

Rural Area Decentralized Wastewater Treatment Model Project

(1) Study the reduction of water pollutants and what water environment management should be

(2) Introduce decentralized domestic wastewater treatment technologies

(3) Help those involved in the Chinese government with capacity building and enhance policy dialogue

(4) International seminar on theory and practice on total pollutant amount control in Japan and China

The signature of "the memorandum about the decentralized domestic wastewater treatment in rural areas in China" by the Minister of Environment of Japan and China

NIES take responsibility to the technical content of the project such as treatment process design

The cooperation between three countries in the field of decentralized domestic wastewater treatment in the past

JICA Technical Support Type Project
"Development of water quality renovation system in Korea"   South Korea 1993-1999

"Restoration of water environment at the Lake Taihu, China"   P. R. China 2001-2005

Ministry of the Environment Technology Transfer Project
"Water quality renovation for the Lake Baifu and Honfeng"   Guiyang, P. R. China 2000-2001

Collaborative investigation and development for the decentralized domestic wastewater treatment system with NIER

Small scale restaurant wastewater treatment system designed by Korean side using the project's results

Domestic wastewater treatment system designed by Korean side using the project's results

Start of Japan - Korea Cooperative Training Courses

1993 → 1999

Korea water quality improvement system development project[JICA]

National Institute for Environmental Studies (NIES)

↓

Korea National Environment Research Institute (NIER)

On the basis of six years of cooperation and achievements

2000 → 2003

Other Country Training: Water quality improvement Course

JICA KOICA
NIES NIER

Organic Cooperation

My memory of NIER, Korea and Bulkwang Dong

Technical transfer of the decentralized domestic wastewater treatment system in China

JICA Lake Taifu water quality restoration project

MOE Guizhou Province water environment protection cooperation project

Problems of factory production type Johkaso technology transfer in China

- ✓Grasp of the situation around Johkaso in China was insufficient.
- ✓Grasp of demonstration effect compared with social situation in China was insufficient.
- ✓Possibility of the adaptation of Johkasou in Japan was not examined.
- ✓Examination of the structure matched with the Chinese situation is short.
- ✓Feasibility of the maintenance was not examined enough.

Chinese Jhokaso

Rippled effect of technical transfer was insufficient

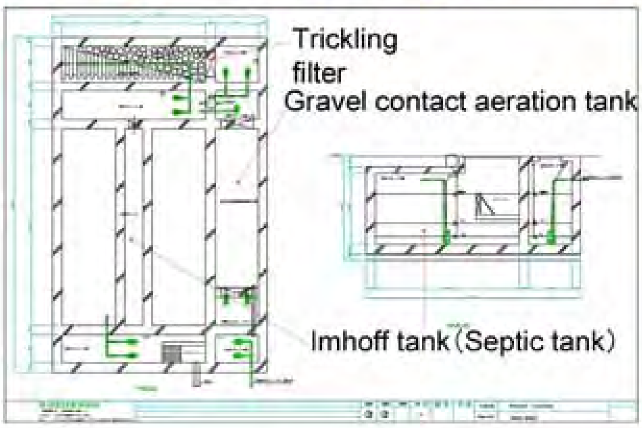
Ideal Way of Technological Transfer (1)

- **Wastewater treatment technology changes according to social conditions, and takes the most suitable form for a society that uses the technology, apart from its basic elements.**
- **Therefore, when the technology is transferred to another society, it is necessary to examine its adaptability from various aspects.**

Ideal Way of Technological Transfer (2)

- The difficulty in transferring Japanese technology to developing countries without modification is widely known.
- Therefore, in order to consider future technological transfer, it is necessary to not only consider current technology but also to **look into previously developed or adopted technology**, and to evaluate it from current technological or economic standpoints.

The facility installed 25 years ago: Effluent water quality is still satisfied



Septic tank → Trickling filter → Gravel contact aeration tank → Soil trench

Ideal Way of Technological Transfer (3)

- Because technology is not stationary, but constantly transforms according to the situation at the site where the technology is needed, it is possible to select technology more suited to the site, and develop new technology, as required, through additional examination of technological development cases as in the Chinese case outlined this report.
- Moreover, "locally suitable technology" is selected according to the current situation of a region where the technology is adopted, but a plan adaptable to changes afterwards must be considered.
- In any event, previous measures for wastewater treatment were taken to solve actual problems, however, future "locally suitable technology" must ensure future sustainability.

Necessary condition for "locally suitable technology"

●Construction cost is low

- Percentage for labor costs is higher.
- Materials are cheep and possible to recruit locally.
- There are few machine parts.

● Maintenance cost is low

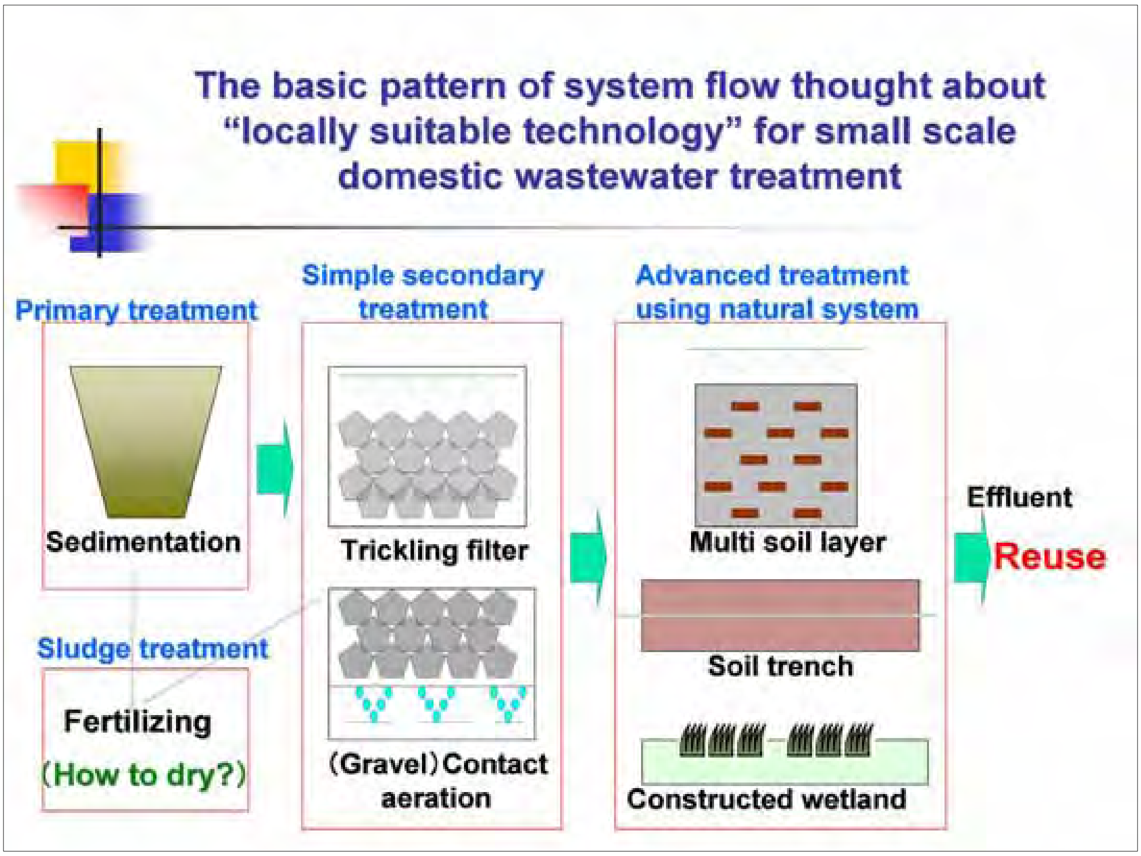
- Reduction of the electricity consumption.
- Reduction of the chemicals consumption.

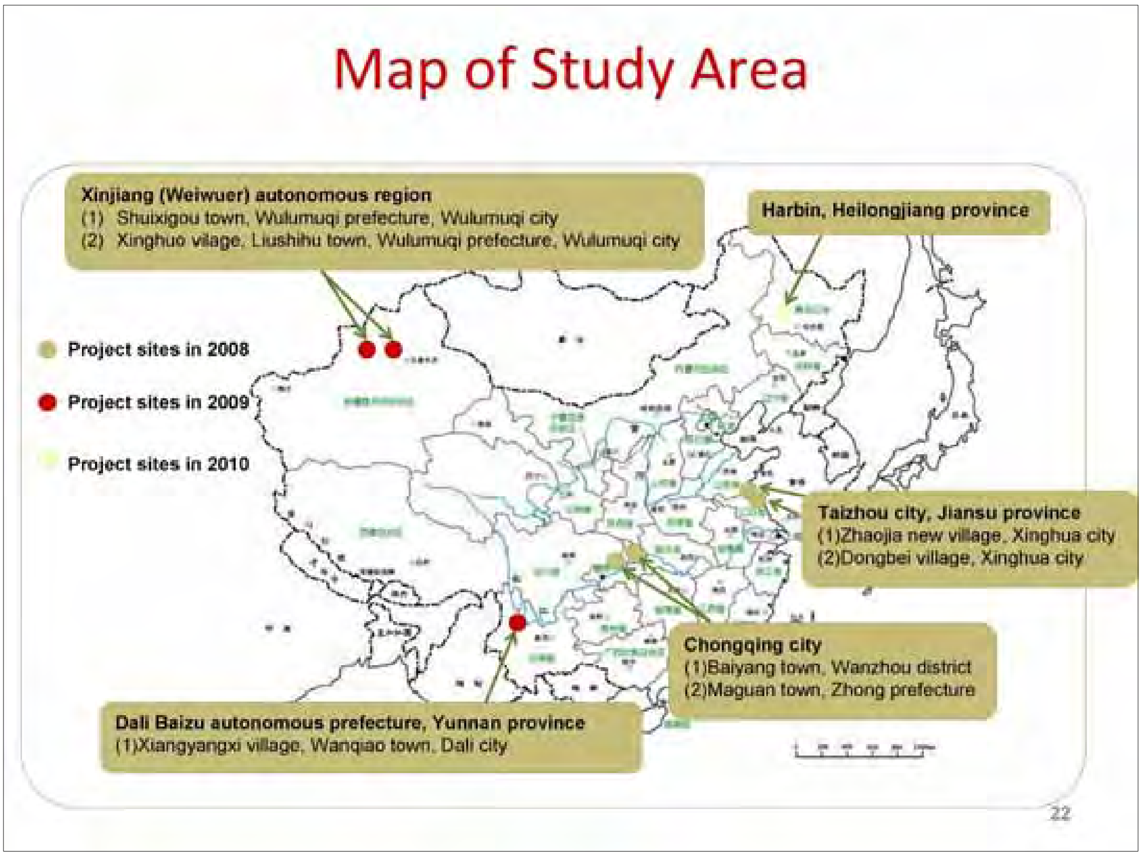
●Skills are not needed for maintenance

- System flow is simple.
- Control system can be operated manually.

●Contribute to local material circulation and a water cycle

- Reuse as fertilizer／Effluent reuse


The basic pattern of system flow thought about "locally suitable technology" for small scale domestic wastewater treatment
Primary treatment
Sedimentation
Simple secondary treatment
Trickling filter
(Gravel) Contact aeration
Advanced treatment using natural system
Multi soil layer
Soil trench
Constructed wetland
Effluent
Reuse
Sludge treatment
Fertilizing
(How to dry?)


Map of Study Area
Xinjiang (Weiwuer) autonomous region
(1) Shuixigou town, Wulumuqi prefecture, Wulumuqi city
(2) Xinghuo vilage, Liushihu town, Wulumuqi prefecture, Wulumuqi city
Harbin, Heilongjiang province
Project sites in 2008
Project sites in 2009
Project sites in 2010
Taizhou city, Jiansu province
(1)Zhaojia new village, Xinghua city
(2)Dongbei village, Xinghua city
Chongqing city
(1)Baiyang town, Wanzhou district
(2)Maguan town, Zhong prefecture
Dali Baizu autonomous prefecture, Yunnan province
(1)Xiangyangxi village, Wanqiao town, Dali city
22

Taizhou city, Jiangsu province

Taizhou city, Jiangsu province

Chongqing city

Situation of discharging of domestic wastewater

Outline of Applied Technology

No	Project Sites	Population	Influent	Capacity (m3/day)
1	Maguan town (Chongqing city)	6,000	Night soil Gray water	500
2	Baiyang town (Chongqing city)	6,000	Night soil Gray water	600
3	Zhaojia new village (Jiangsu province)	750	Night soil Gray water	150
4	Dongbei village (Jiangsu province)	200	Night soil Gray water	40
5	Shuixigou town (Xinjiang autonomous region)	4,200	Night soil Gray water Rain water	300
6	Xiangyuanxi village (Yunnan province)	2,600	Night soil Gray water	200

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Outline of Applied Technology

No	Project Sites	Operational Cost (CNY/m3)	Required Effluent Quality*
1	Maguan town (Chongqing city)	0.2	2
2	Baiyang town (Chongqing city)	0.25-0.3	
3	Zhaojia new village (Jiangsu province)	0.5-0.6	1B
4	Dongbei village (Jiangsu province)	0.5-0.6	
5	Shuixigou town (Xinjiang autonomous region)	0.5-0.6	2
6	Xiangyuanxi village (Yunnan province)	0.4	1A

*Discharge standard of pollutants for municipal wastewater treatment plant

BOD5, 1A:10mg/l, 1B:20mg/l, 2:30mg/l

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Outline of Applied Technology

No	Project Sites	Treatment Method	Carrier material	Aeration time (h)
1	Maguan town (Chongqing city)	Active sludge + Artificial Wetland	-	-
2	Baiyang town (Chongqing city)	Contact Aeration+ Artificial Wetland	Ball shaped plastic carrier	4
3	Zhaojia new village (Jiangsu province)	Contact Aeration	Gravel	16-20
4	Dongbei village (Jiangsu province)	Contact Aeration	Gravel	16-21
5	Shuixigou town (Xinjiang autonomous region)	Contact Aeration	Ball shaped plastic carrier	8
6	Xiangyuanxi village (Yunnan province)	Contact Aeration+ Multi-soil layer	Ball shaped plastic carrier	4

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Installation of Model Decentralized Wastewater Treatment Facilities

Overview of Model Installation Areas

Taizhou, Jiangsu

- New agricultural village construction has promoted the readjustment of land for industrial use, agricultural land, and residential land, and residences, which had been scattered over agricultural land before, have now formed villages of hundred to several hundred families.
- These villages basically use flush toilets, but conventional treatment facilities, which were based on septic tanks installed in individual households, do not provide satisfactory treatment of wastewater.
- Economic growth has increased the convenience of the land to make it difficult to acquire a large land lot for a wastewater treatment plant, which makes it inevitable that wastewater plants will be installed near residences.

Selection of Treatment Systems: Taizhou

Effluent water quality standards for Taizhou

CODcr	BOD	SS	NH4-N	Fecal coli.
60 mg/L	20 mg/L	20 mg/L	15 mg/L	10^4 MPN/L

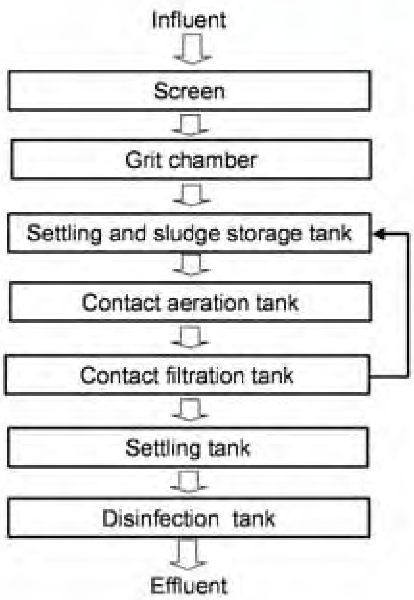
- The difficulty of acquiring large land lots, and the proximity of treatment plants to residences requires measures against odor to be taken.
- Construction, maintenance, and operation costs as well as the production of sludge must be kept low.

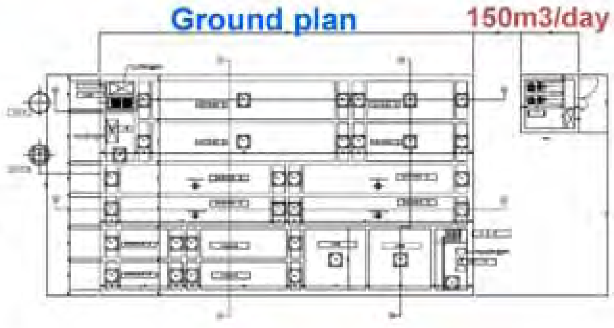
A gravel contact aeration system was selected.

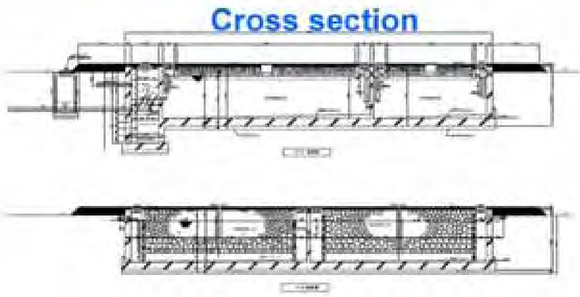
- Increasingly used as a decentralized treatment facility in Japan
- This system is topped with soil to produce fewer odors.
- Less sludge production than an activated sludge process

Overview and Features of Treatment Systems in Taizhou

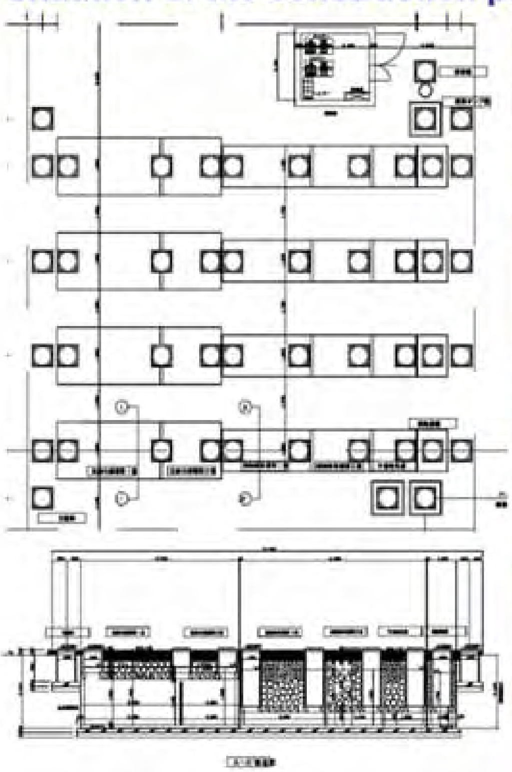
Gravel Contact Aeration System







The situation of the construction planned site of $40m^3$ and a plan



Condition for construction of same size (40m^3) facility in Japan

The situation of the construction: Taizhou, Jiangsu (150m3/day)

Installation of Model Decentralized Wastewater Treatment Facilities

Overview of Model Installation Areas

Zhong and Wanzhou, Chongqing

- Comprised of purely agricultural, mountain villages with large, terraced paddy fields.
- Located in the upper reach of the Three Gorges Dam, villages of several thousand people are scattered, and wastewater treatment must be provided for each of these villages.
- Since the incomes of those in the purely agricultural villages are not so high, construction, maintenance, and operation cost requirements for wastewater treatment plants in these areas are severe.
- Relatively large land lot can be secured for a wastewater treatment plant, though it is difficult to secure a flat land lot in the hilly areas.

Selection of Treatment Systems: Chongging

Effluent water quality standards for Chongqing

CODcr	BOD	SS	NH4-N
100 mg/L	30 mg/L	30 mg/L	25 mg/L

- To keep treatment plant construction, maintenance, and operation costs low. Relatively large land lot can be secured for a wastewater treatment plant.

Preliminary Contact Aeration—Constructed Wetland System was selected.

- Because Japan has no experience in domestic wastewater treatment using a constructed wetland, a constructed wetland designed by China with a good track record was combined with this wetland.

Overview and Features of Treatment Systems

Preliminary Contact Aeration—Constructed Wetland System

Influent

⇩

Screen

⇩

Settling and sludge storage tank

⇩

Contact aeration tank

⇩

Settling tank

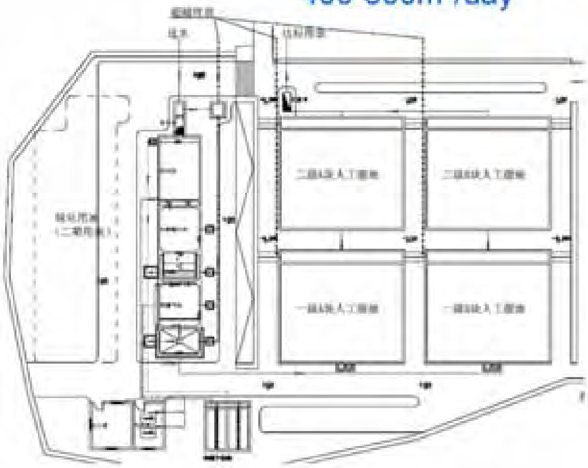
⇩

Constructed wetland

⇩

Effluent

Treatment capacity : 400-600m^3/day

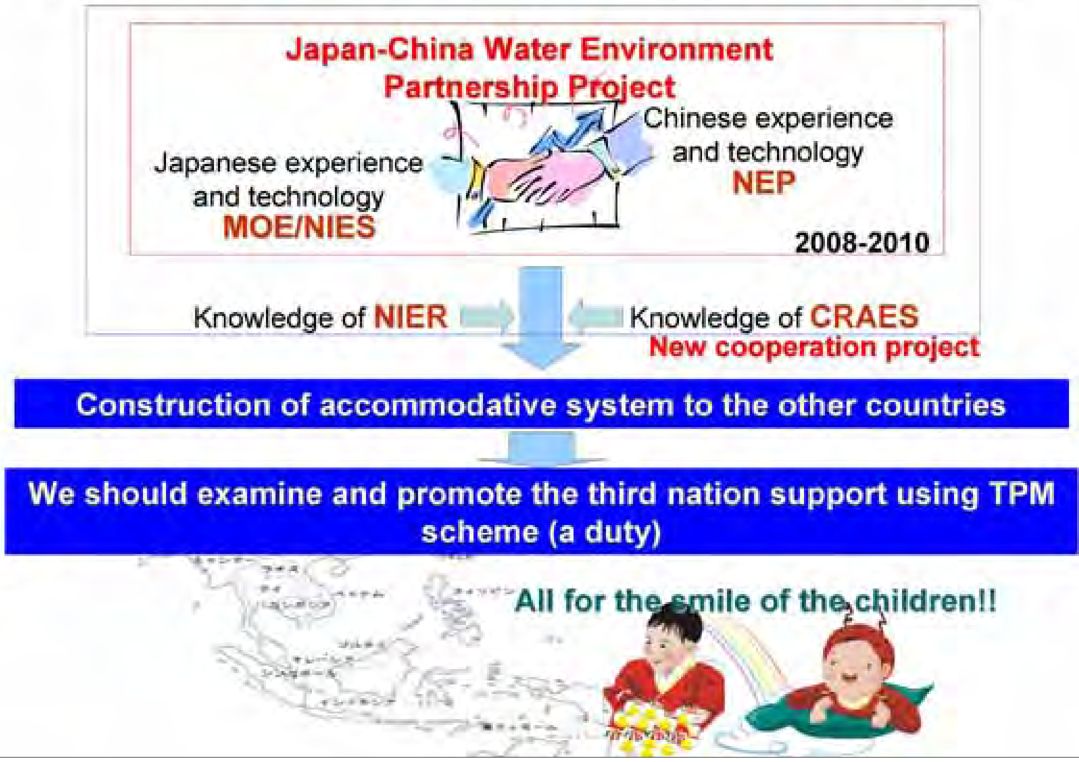


The situation of the construction: Zhong, Chongqing (600m3/day)

Future Prospects and Issues

- Treatment or disposal of sludge must be further studied with an eye toward the future.
- Basically, produced sludge should be recycled as fertilizer for use in these rural areas, and how it should be recycled must be studied also from the perspective of farmers.
- Especially, whether to recycle sludge as liquid fertilizer or dry fertilizer, which decides whether to add a sludge drying process or influences the design of a treatment system in other ways, must be clarified in view of the form of agriculture in that region.
- Since these decentralized domestic wastewater treatment systems are also important in other countries, further efforts must be made to develop the Japan-China water environment partnership project into foreign aid based on cooperation between the both countries.

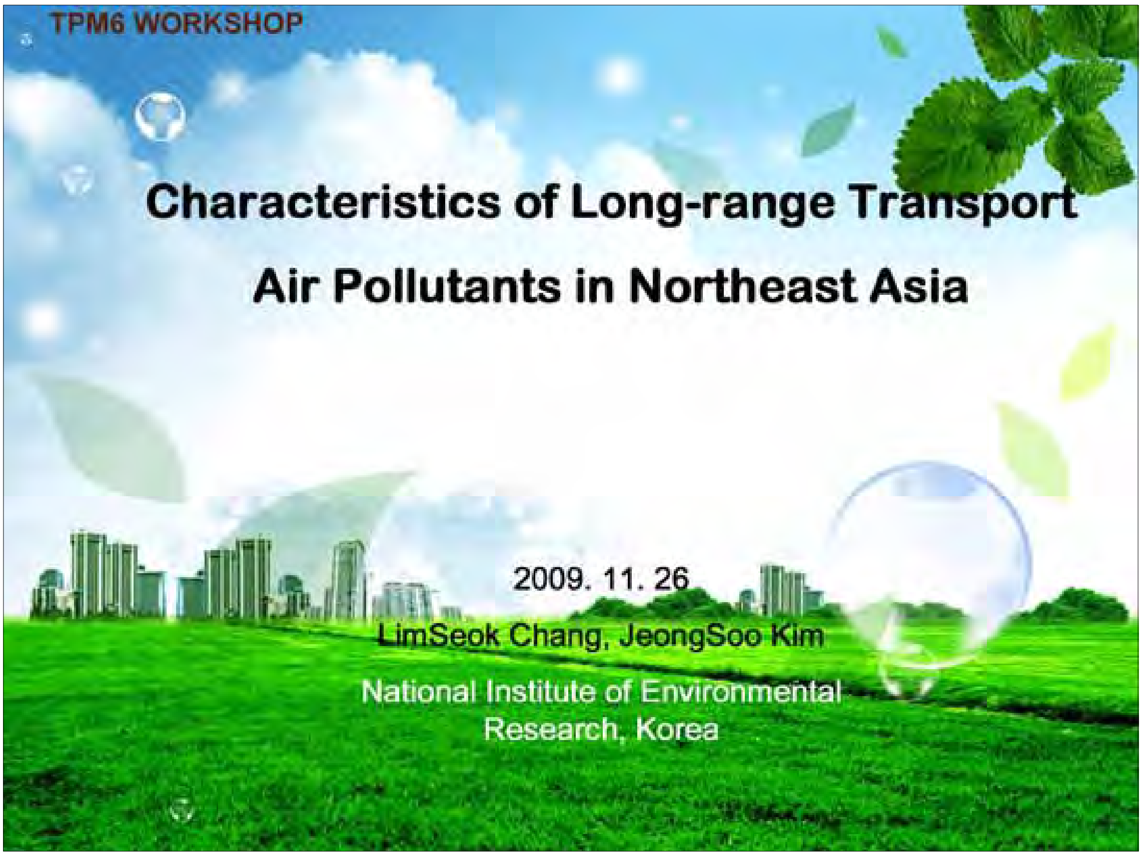
A future dream (Collaboration with Korea, China and Japan)




Thank you for your attention
mizuochi@nies.go.jp

3-4 Transbounday air pollution

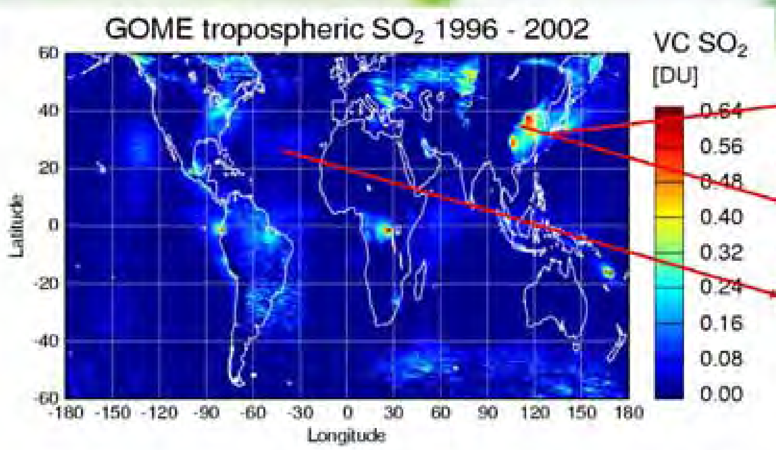
- Senior researcher, Im-Seok CHANG, NIER, Korea


TPM6 WORKSHOP
Characteristics of Long-range Transport
Air Pollutants in Northeast Asia
2009. 11. 26
LimSeok Chang, JeongSoo Kim
National Institute of Environmental
Research, Korea


Contents
Ⅰ Necessity of LTP Research
Ⅱ Tripartite LTP project
Ⅲ Research results
Ⅳ Future plan

I Necessity of LTP Research

Tropospheric SO2: Global perspective



SO_2 sources:

- Volcano activities
- Coal-fired power plant
- Coal mine fires
- DMS (trace)

➢ Northeast Asia is the largest SO2 emitter in the world

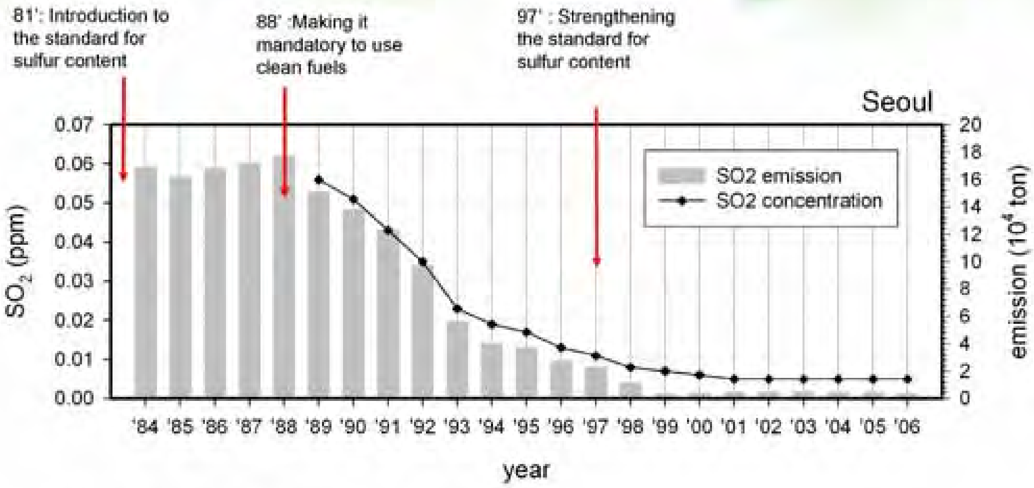
LTP impact is increasing?

$$F_L = \frac{C_{LTP}}{C_{LTP} + C_{LOCAL}}$$

If C_{LTP} increases, F_L increases
If C_{LOCAL} decreases, F_L increases

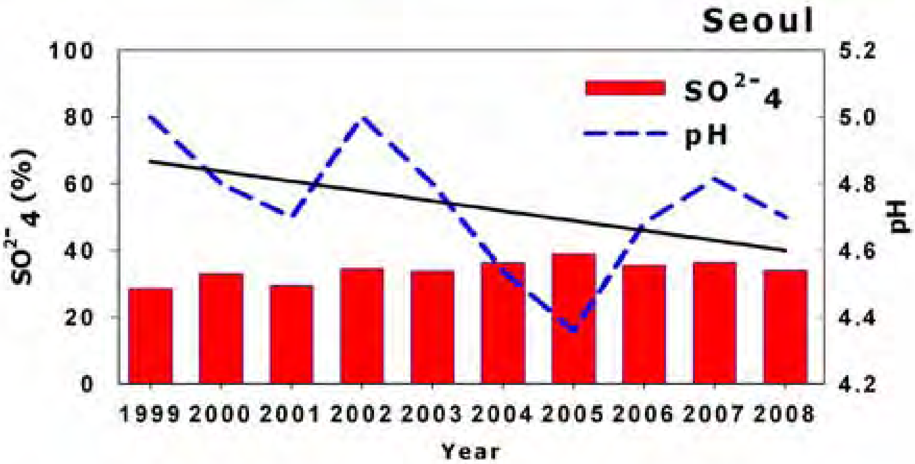
- More than 20 years, Korea has experienced a dramatic air quality improvement by emission control policies
- LTP becomes one of key issues for Korean air quality

Long-term trend of Korean air quality



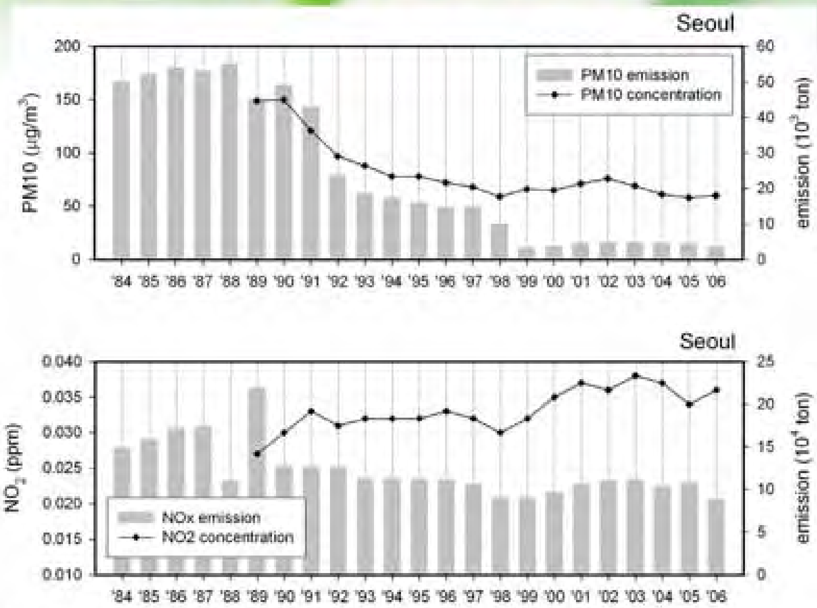
- [SO2] has decreased dramatically

Long-term trend of Korean air quality

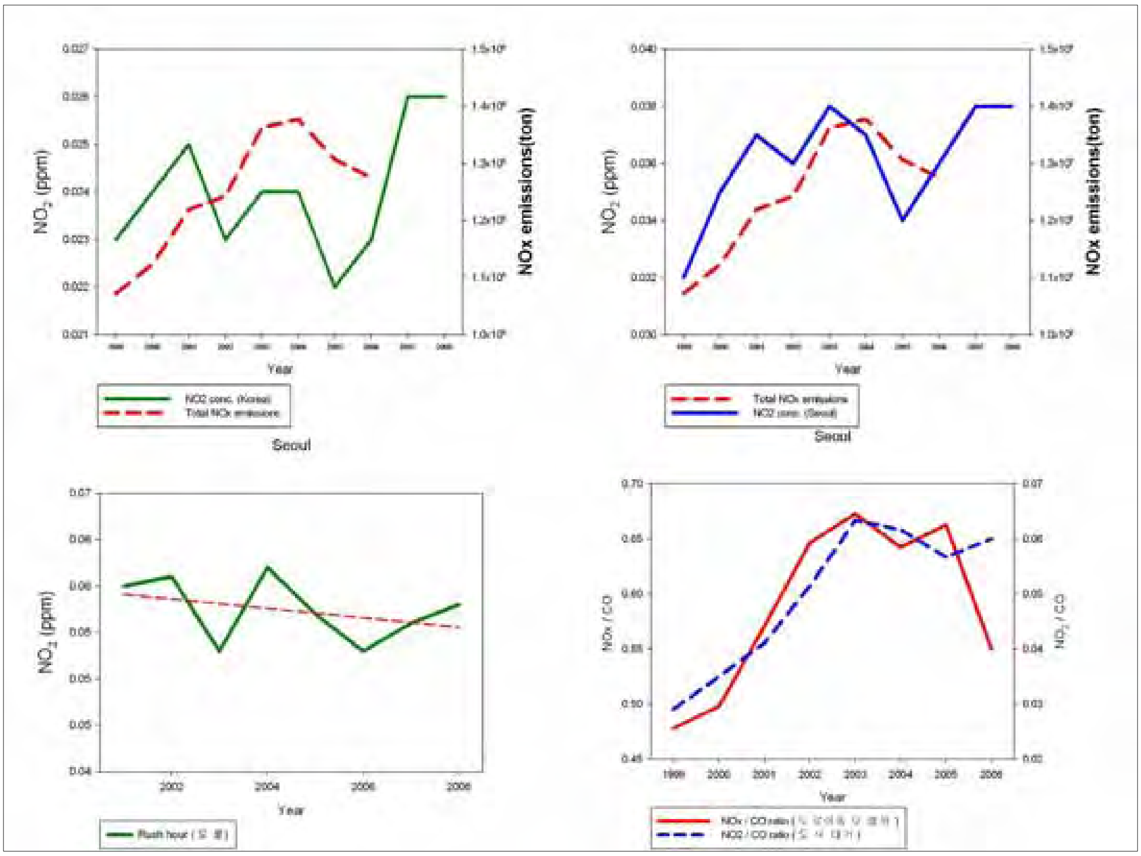


➢The acid rain problem still remains

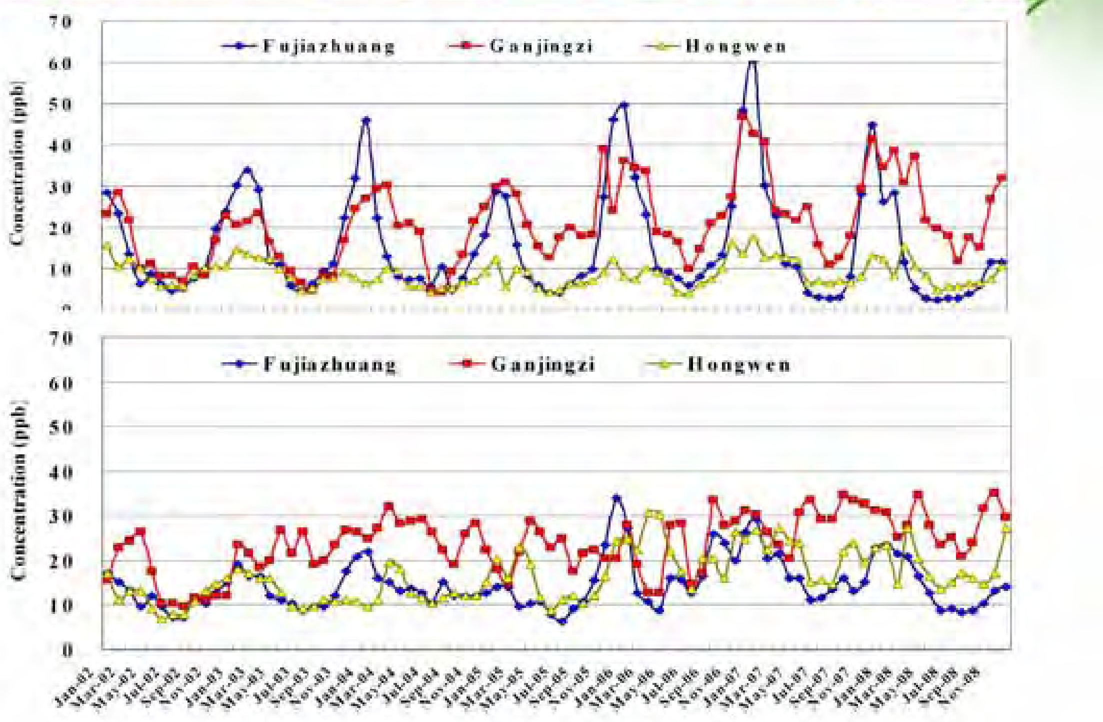
Long-term trend of Korean air quality



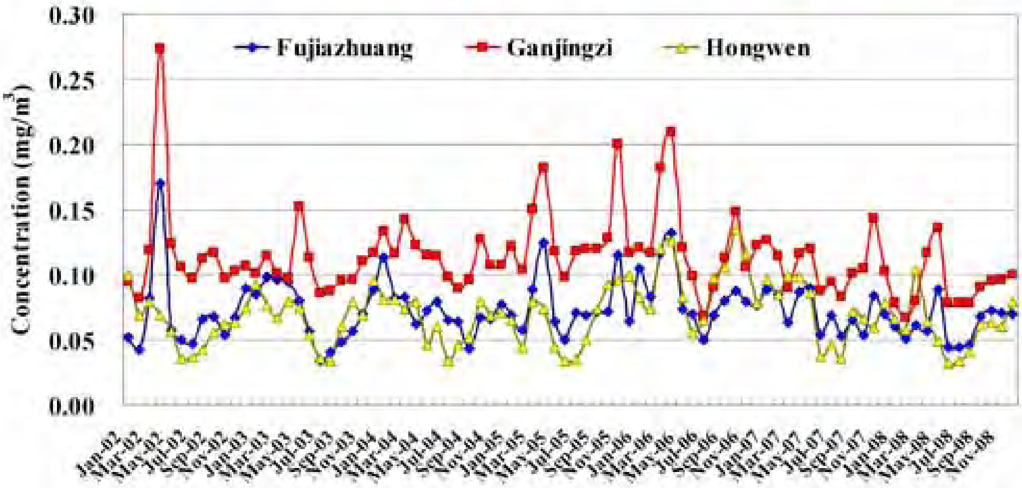
➢ PM10 conc. has plateaued out while [NO2] has been increasing



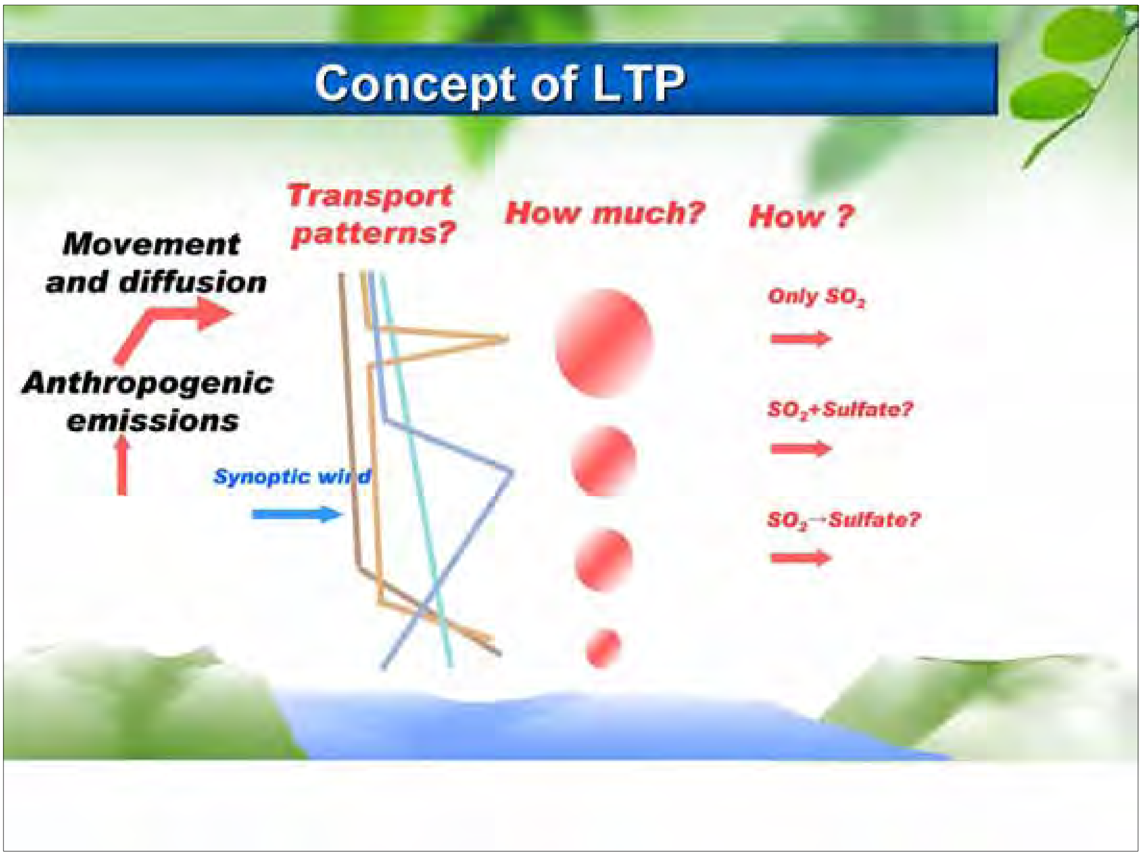
Long-term trend of Chinese air quality

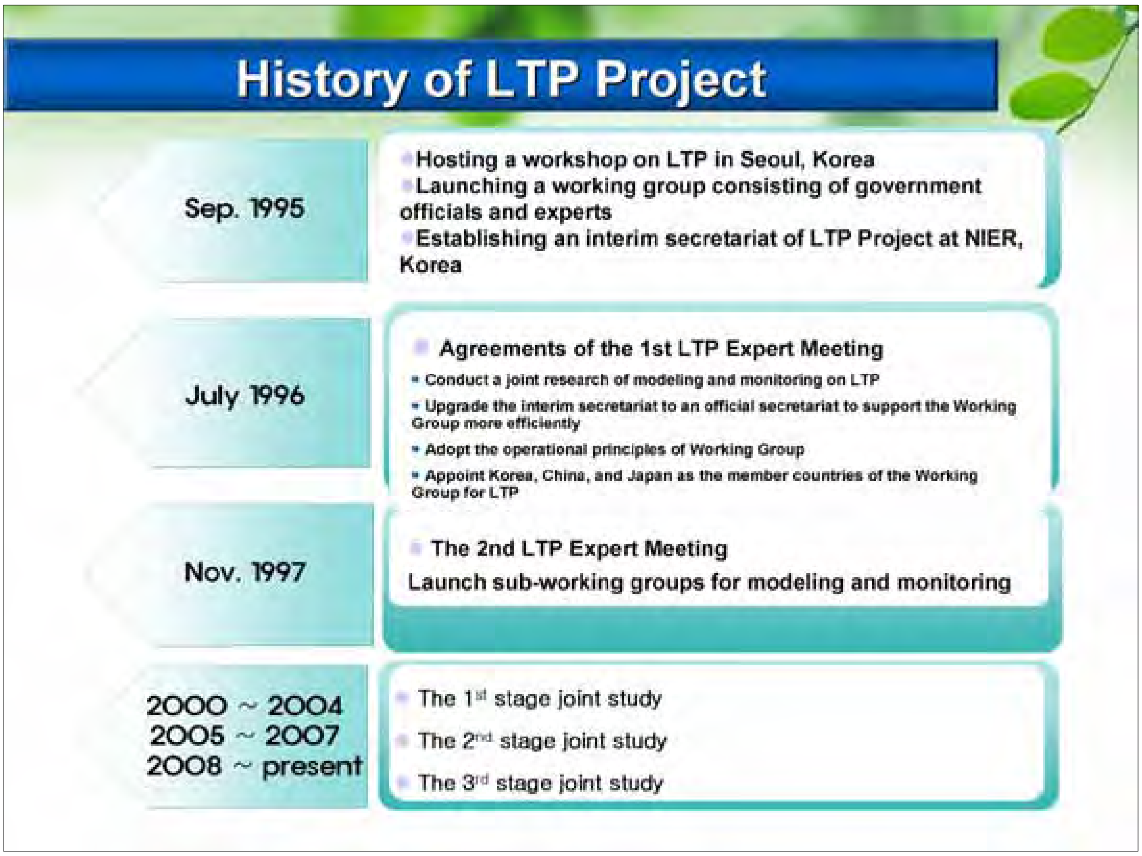


Long-term trend of Chinese air quality



Ⅱ Tripartite LTP project


Concept of LTP
Transport patterns?
How much?
How ?
Movement and diffusion
Anthropogenic emissions
Synoptic wind
Only SO_2
SO_2+Sulfate?
SO_2→Sulfate?


History of LTP Project
Sep. 1995
Hosting a workshop on LTP in Seoul, Korea
Launching a working group consisting of government officials and experts
Establishing an interim secretariat of LTP Project at NIER, Korea
July 1996
Agreements of the 1st LTP Expert Meeting
Conduct a joint research of modeling and monitoring on LTP
Upgrade the interim secretariat to an official secretariat to support the Working Group more efficiently
Adopt the operational principles of Working Group
Appoint Korea, China, and Japan as the member countries of the Working Group for LTP
Nov. 1997
The 2nd LTP Expert Meeting
Launch sub-working groups for modeling and monitoring
2000 ~ 2004
2005 ~ 2007
2008 ~ present
The 1st stage joint study
The 2nd stage joint study
The 3rd stage joint study

LTP Organization

➢ LTP has made many achievements in the fields of monitoring, modeling and emission inventory up until now. However, it still needs some systematic enhancement, for example, by restructuring the organization into Working Group and Task Force Team.

Outline of LTP Project

International cooperation for improving air quality in Northeast Asia

1st stage ('00~'04)	Establish a foundation for joint research; Establish database on the concentration and emissions of air pollutants; Establish a modeling system
2nd stage ('05~'07)	Estimate emissions among three countries; Research on monitoring and modeling; Produce S-R relationships quantitatively among countries
3rd stage ('08~'12)	Research on the impacts of NOx, O3, and PM

Expected effects

- Predict the impacts of long-range air pollutants on the air quality of Korea
- Predict the cross impacts of LTP
- Construct air pollutant monitoring system in Northeast Asia

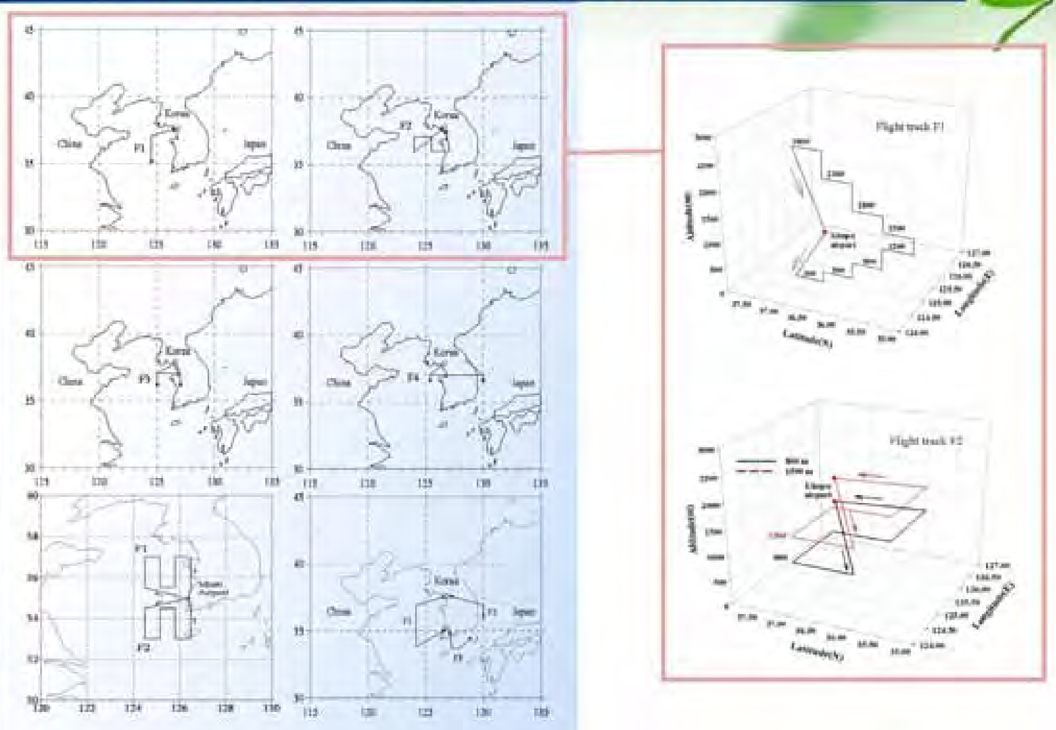
Make an emission reduction scenario in Northeast Asia

LTP Monitoring

- 2 background monitoring sites per each country
- Intensive and long-term monitoring from 2000 up to now

item	size	Interval (hr)	sampler
Mass	PM_{10}, $PM_{2.5}$	12	URG sampler
	0.056~18 m, 8 channel	48	MOUDI sampler
Ionic species	PM_{10}, $PM_{2.5}$	12	URG sampler
	0.056~18 m, 8 channel	48	MOUDI sampler
gas (NH_3, HNO_3)		12	URG sampler
Metal	PM_{10}, $PM_{2.5}$	12	URG sampler
OC, EC	$PM_{2.5}$	12	URG sampler
Number conc.	0.25~32 m	5	OPC
VOCs (TO-14A)		24	Mini sampler
Gas(SO2, O3, NOx, CO)		1	TEI analyzer

Aerial measurement by Korea

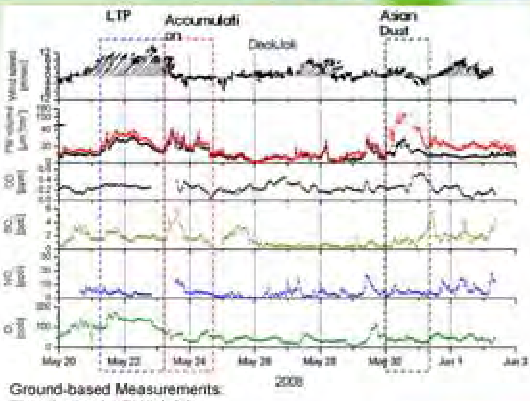


LTP Modeling

	China	Japan	Korea
Model system	Models-3 / CMAQ σ coordinate 14 layers, 70×66 grids, 60km resolution (Byun and Ching, 1999)	RAQM (Regional Air quality Model) terrain following coordinate 12 layers, 110×80 grids, 60km resolution (An et al., 2002)	CADM (Comprehensive Acid Deposition Model) terrain following coordinates 12 layers, 110×80 grids, 60km resolution (Lee et al., 1998)
Domain	20~50N, 100~150E	20~50N, 100~150E	20~50N, 100~150E
Meteorological Model	MM5 34 layers with FDDA using NCEP reanalysis	MM5 125×95 (45km), 23 layers, FDDA using NCEP FNL reanalysis	CSU-RAMS 110×80, 29 vertical layer FDDA using NCEP FNL reanalysis
Chemical Mechanism	RADM Chemistry	CBM-IV mechanism	RADM Chemistry
Cloud Model Physical option	Diagnostic cloud model in RADM Simple explicit moisture scheme Grell cumulus schemes, MRF	Cloud model in MM5 Betts-Miller cumulus scheme, MRF RRTM	Cloud model in CSU-RAMS Anthes-Kuo cumulus scheme, MRF
Emission	SO_2, NOx, VOC, NH_3, CO, PM_{10}, biogenic VOC provided by LTP for the base year of 1998 (1°×1° resolution)	Same as China	Same as China
Dry deposition	Wesely's parameterization (Wesely, 1989)	Modified Wesely's parameterization (Walmsley & Wesely, 1996)	Dry deposition module in RADM (Lee et al, 1998)
Wet deposition	RADM Module (Chang et al, 1987)	RADM Module (Chang et al, 1987)	RADM Module (Chang et al, 1987)
Land use type	EPA/NOAA global ecosystem (11 categories)	DeFries & Townshend (1994)	EPA/NOAA global ecosystem (11 categories)

Ⅲ Research Results

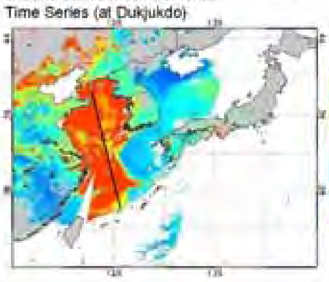
2008 LTP Case



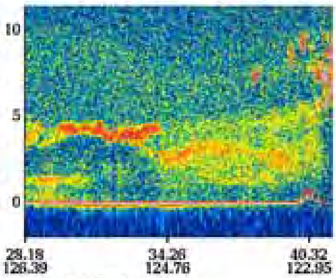
Ground-based Measurements: Time Series (at Dukjukdo)

- High concentration events occurred at Dukjukdo during May 2008 caused by LTP, air stagnation, and Asian dust.

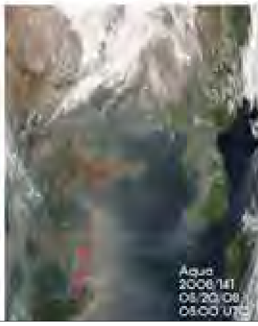
MODIS RGB Image



MODIS AOD

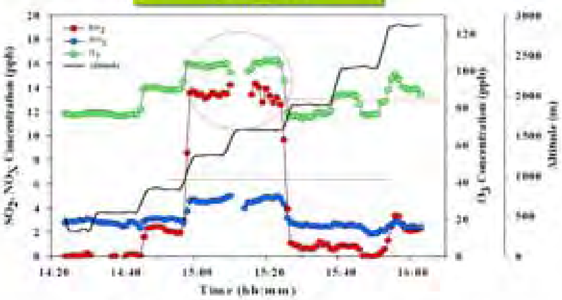


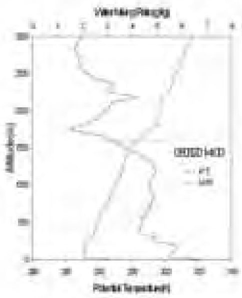
CALIPSO LIDAR



2008 LTP Case (Aerial Measurement)

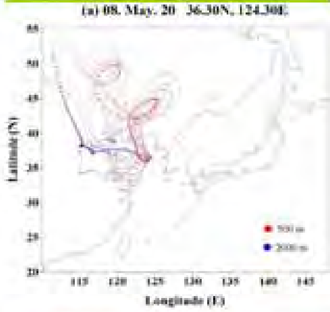
Aerial measurement by altitude

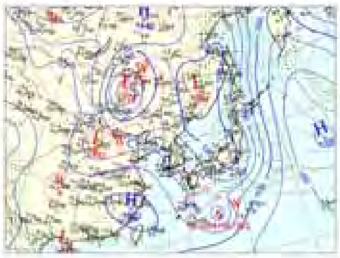




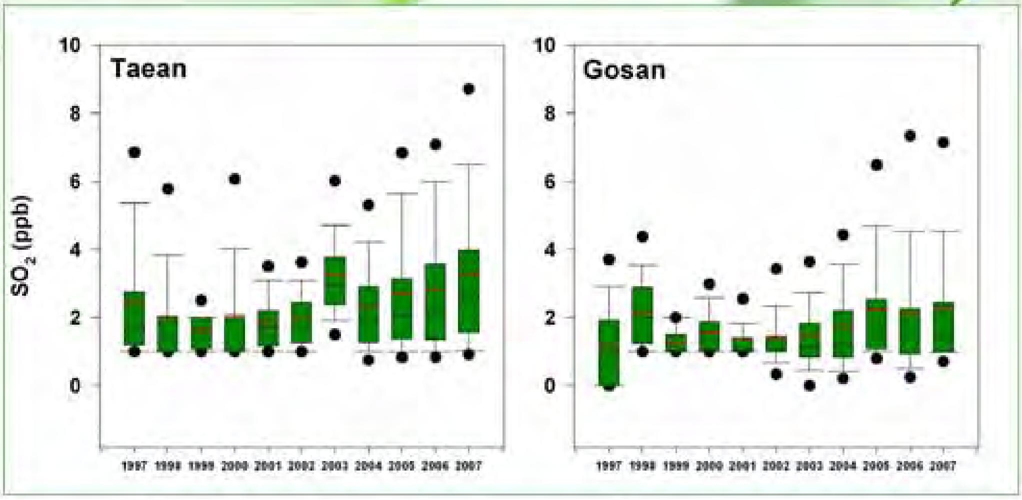
Emission sources: North Central China

(a) 08. May. 20 36.30N, 124.30E



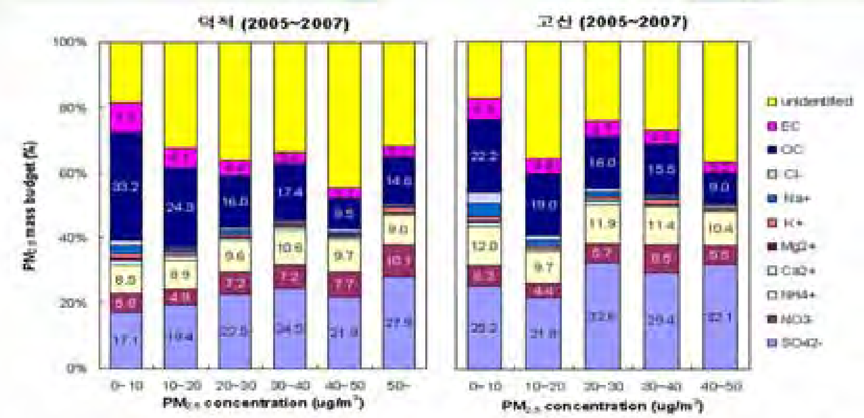


Long-term characteristics of gaseous LTP in Korean background regions



➢The annual variations of SO2 measured at LTP background regions during the last decade show that the mean temperature of SO2 remained almost same, while the high concentration events increased more.

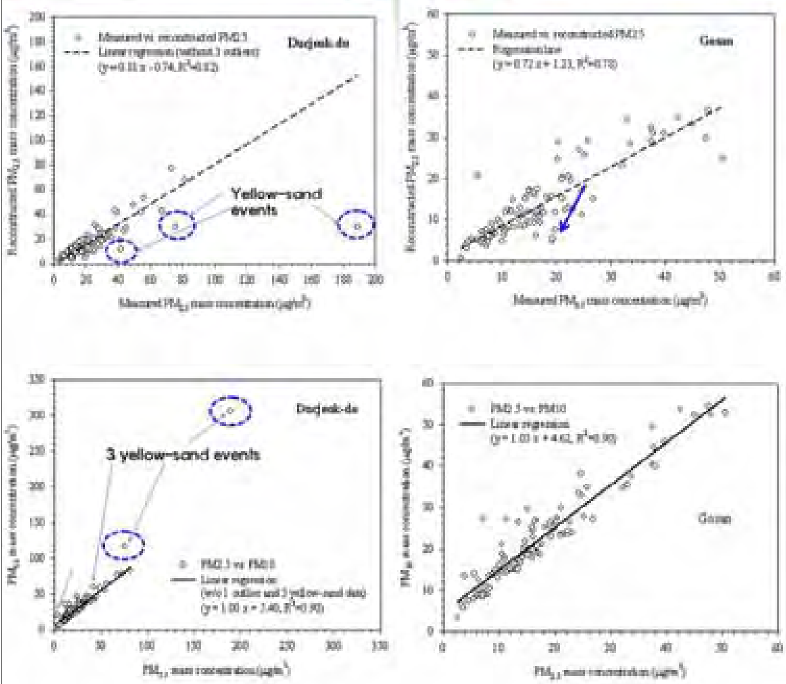
Characteristics of PM2.5 Mass in national background regions(2005-2007)



[SO_4^{2-}] increased greatly when affected by long-range transport

- In lower concentration, in Dukjeokdo, OC was the highest (~33.2%), while in Gosan, OC (~22.2%) and sulfate (~25.2%) showed the highest.
- In high concentration, in both Dukjeokdo and Gosan, sulfate showed the highest fractions (at ~27.9% in Dukjeokdo and ~32.1% in Gosan).

Characteristics of PM2.5 Mass in national background regions(2005-2007)



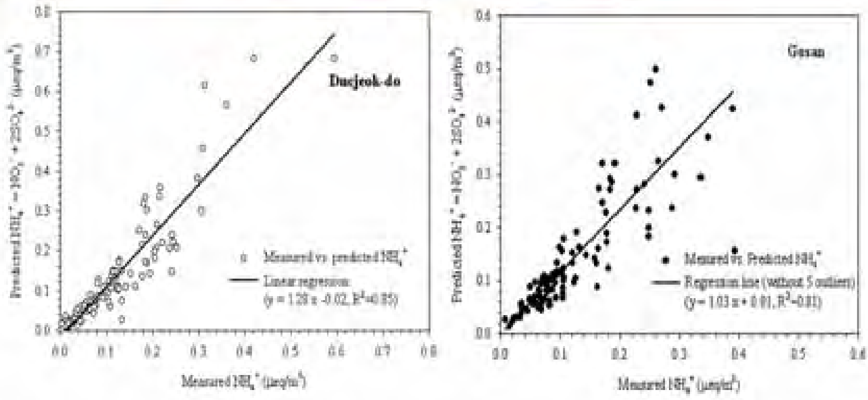
- **Reconstructed PM2.5 =**

EC + 1.6OC + SO42- + NO3- + NH4+ + other ions(Na+, Cl-, etc)

- Soil elements should be considered.

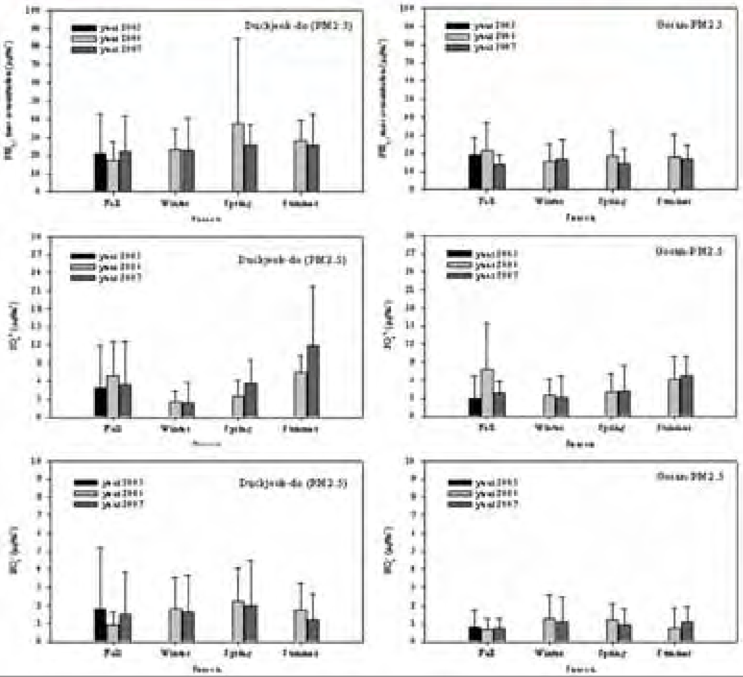
- PM10 and PM2.5 conc. were very similar but the initial background concentration.

Characteristics of Ion equivalent in national background regions (2005-2007)



- As a result of comparing the ion equivalents of PM2.5, assuming the state of being neutralized,
  - In Dukjeokdo, it exists in an acidic state due to insufficient concentration of NH3 to neutralize sulfate completely in high concentration,
  - In Gosan, the equivalent concentrations of total cation and anion are similar, with sulfate mostly existing in a state of being neutralized.

Characteristics of LTP in national background regions



➢The concentration of sulfate is relatively high in summer and autumn, while low in winter and spring.
-The acidification of SO2 induced by photochemical reaction in the summer season produces great particular sulfate.

➢The concentration of nitrate is relatively low in summer and autumn, while high in winter and spring.
- Existing in a gaseous state of nitrogen due to the high temperature in the summer season

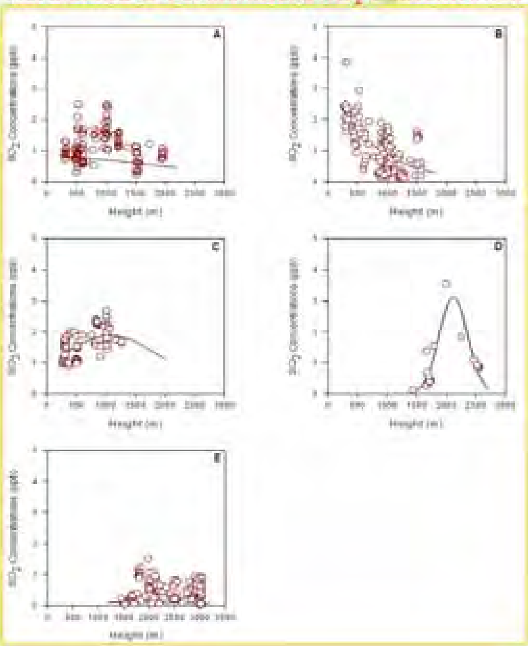
History of aerial measurement

measurement

Year	Measurements period	History	flight number
1995~6	95.12/3~5, 96.3/2~4, 11/17~19	❖ Demonstration flight and initial observation were conducted for aerial measurement	8
1997	1/14~16, 10/3~5, 12/17~19	❖ The tracks over the southern sea and eastern sea were added in measurement, and crank and cross-section were measured by altitude in spring and autumn.	15
1998	4/26~27, 11/7~10		9
1999	4/9~11, 6/19~22		8
2000	6/9~17, 11/15~19	❖ Measurement was conducted over the western sea, eastern sea, southern sea, and inland. ❖ Ground-based measurement was conducted jointly with the Institutes of Health and Environment in six cities and provinces in Korea.	13
2001	4/13~17, 11/7~10		9
2002	3/7~11, 4/17~21, 12/14~19		11
2003	4/5~7, 5/28~6/4, 11/13~18		11
2004	3/17~19, 6/15~16, 10/13~21		14
2005	4/15~25, 10/15~25	❖ Measurement was conducted over the western, eastern, southern seas and inland 12 times a year.	12
2006	4/1~15, 6/6~16, 10/16~26		12
2007	4/16~26, 10/15~25		12
2008	5/20~5/29, 8/18~24, 10/9~18	❖ Measurement was conducted over the western sea in spring and autumn, with inclusion of the ion components of particular matter.	12
2009	4/13~22, 5/20~30		7
Total			155

Patterns of Long-range transport

Normalized & Formularized SO_2 Concentration



-Linear Decay Formula

$$f(C_{SO_2}) = z_1 + a_1 \times Z$$

- Exponential Decay Formula

$$f(C_{SO_2}) = a_2 \times Exp^{(-b_2 \times Z)}$$

- Gaussian Distribution Formula

$$f(C_{SO_2}) = a_3 \times Exp^{[-0.5 \times ((Z-z_3)/b_3)^2]}$$

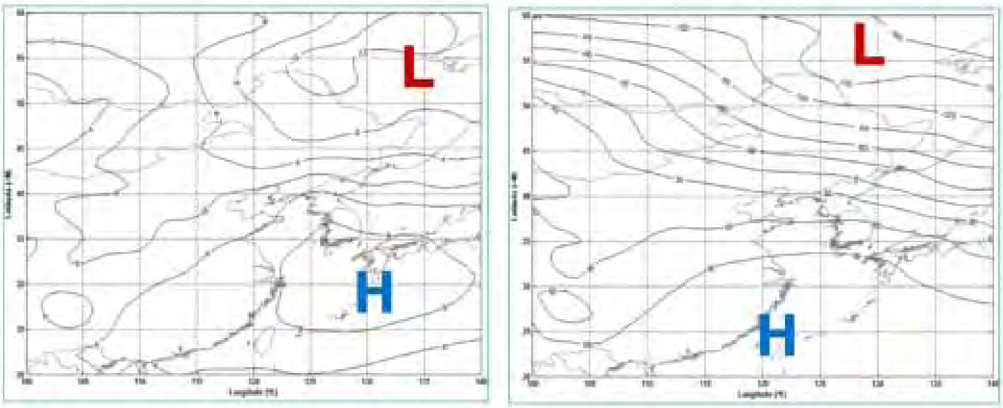
Statistical results SO2 measurements

Period / Altitude Statistics		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
<1000m	95%	2.2	0.3	1.5	5.6	1.6	3.4	8.8	0.6	2.5	2.2	5.6	1.0	3.4	10.7	5.7	0.7	1.3	1.6	
	75%	2.0	0.3	1.2	4.7	0.5	1.6	4.0	0.7	1.5	1.6	4.7	0.7	1.6	3.7	4.2	0.6	1.1	1.4	
	mean	1.7	0.3	0.9	3.2	0.8	1.4	3.2	0.5	1.4	1.1	3.2	0.8	1.4	4.3	2.0	0.5	0.8	1.0	1.5
	median	1.7	0.3	0.8	3.2	0.6	1.2	2.3	0.5	1.3	0.9	3.2	0.6	1.2	1.9	1.3	0.5	0.4	0.8	1.1
	25%	1.3	0.3	0.6	2.0	0.4	0.9	2.0	0.2	1.0	0.6	2.0	0.4	0.9	0.0	0.0	0.5	0.3	0.6	
	5%	1.0	0.3	0.5	0.8	0.2	0.6	0.8	0.1	0.7	0.1	0.5	0.2	0.0	0.4	0.0	0.4	0.2	0.2	
1000-2000m	95%	6.0	0.3	1.7	2.4	0.8	0.6	4.6	0.2	0.6	1.3	2.9	1.5	1.4	8.4	0.0	5.4	5.0	0.6	
	75%	3.2	0.3	1.4	1.3	0.8	0.3	2.8	0.2	0.3	0.3	2.4	1.1	0.4	1.9	0.0	3.5	3.3	0.5	
	mean	2.3	0.3	0.9	1.1	0.5	0.4	1.7	0.1	0.3	0.4	1.8	0.8	0.7	1.7	0.0	2.6	2.0	0.4	1.0
	median	1.2	0.3	0.7	1.1	0.5	0.4	1.1	0.1	0.2	0.3	1.0	1.0	0.4	0.8	0.0	3.7	1.8	0.5	0.8
	25%	1.0	0.3	0.5	0.5	0.4	0.3	0.0	0.1	0.1	0.3	0.2	0.4	0.3	0.5	0.0	0.4	0.7	0.2	
	5%	0.8	0.3	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.2	0.1	0.0	0.1	0.2	0.0	0.2	0.3	0.1	
>2000m	95%	0.9	0.3	NaN	6.6	0.4	0.6	2.2	0.3	0.8	0.3	4.6	0.4	5.5	1.7	0.0	NaN	NaN	0.8	
	75%	0.4	0.3	NaN	3.7	0.3	0.4	0.8	0.2	0.6	0.3	3.7	0.4	1.3	1.3	0.0	NaN	NaN	0.5	
	mean	0.3	0.3	NaN	2.9	0.3	0.3	0.6	0.1	0.4	0.3	2.9	0.3	1.0	0.8	0.0	NaN	NaN	0.4	0.7
	median	0.1	0.3	NaN	1.8	0.2	0.3	0.5	0.1	0.4	0.2	1.8	0.2	0.2	0.7	0.0	NaN	NaN	0.4	0.5
	25%	0.1	0.3	NaN	1.4	0.2	0.2	0.0	0.1	0.2	0.3	1.4	0.2	0.2	0.1	0.0	NaN	NaN	0.3	
	5%	0.1	0.3	NaN	1.2	0.1	0.2	0.0	0.1	0.1	0.3	1.2	0.1	0.1	0.0	0.0	NaN	NaN	0.2	

Synoptic patterns of long-range transport

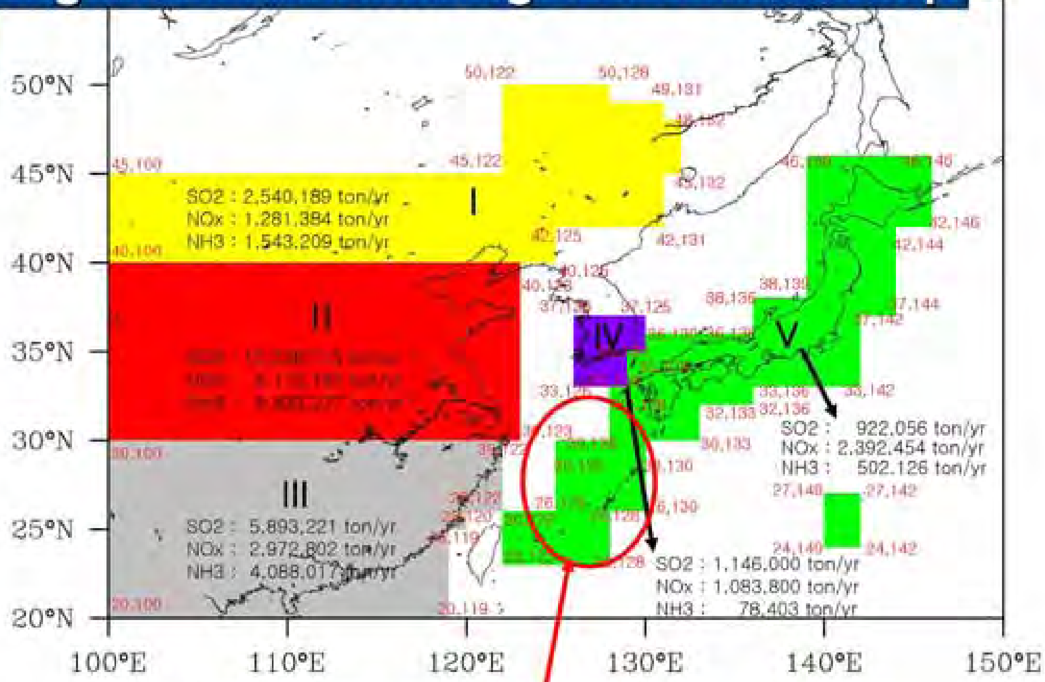
SFC
; 2001/04/15, 2002/03/08, 2002/03/09

850hPa
; 2001/04/15, 2002/03/08, 2002/03/09



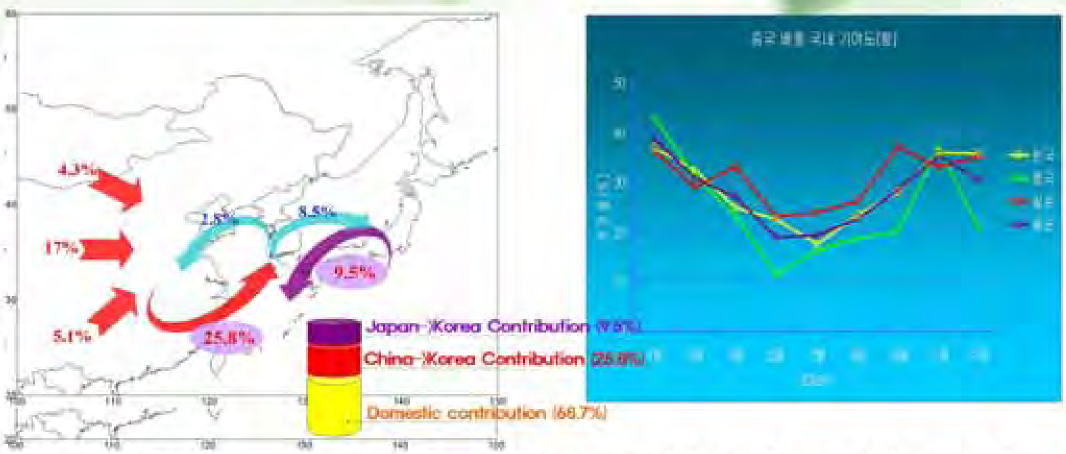
- The cluster analysis, conducted by selecting high concentration cases from the aerial measurement data during 1998~2006, shows that long-range transport occurred frequently in south high and north low patterns.

Regions for estimating S-R Relationship



China requests excluding ocean sector in Region V.

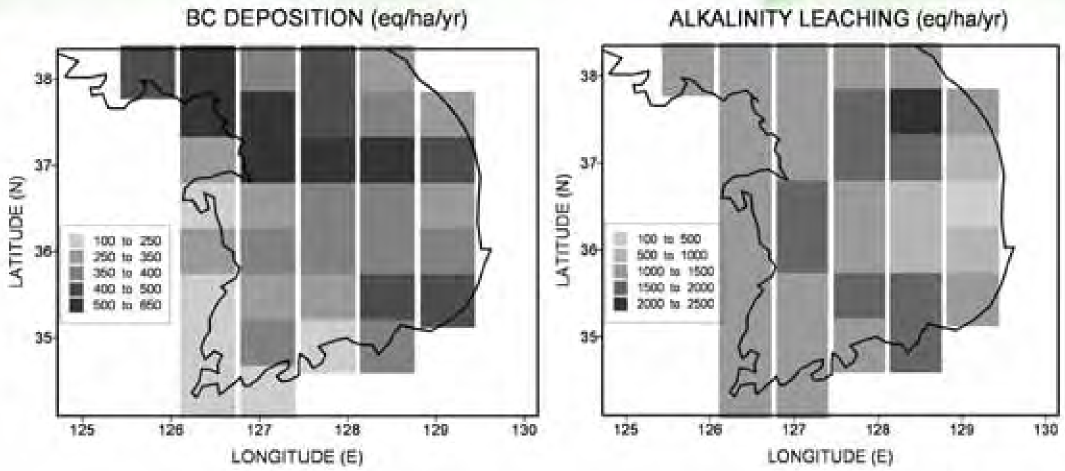
Result of estimating S-R Relationship for Sulfur among three countries



30% of the domestic sulfur depositions are originated from China and Japan

- As a result of joint research among three countries for the year 2002, 20~40% of sulfur depositions in Korea originated from China, and the concentration was the highest in the winter season.

Impacts of LTP on Forest Ecosystem



- Alkalinity of soil in Korea slows down its acidification

Thank you

for your attention.

3-5 Hazardous materials contamination, such as EDCs and POPs

- Director, Kyung hee-CHOI, NIER, Korea

www.nier.go.kr

국립환경과학원

The 6th Tripartite President meeting among NIER, CRAES and NIES
25th - 29th November 2009, Seoul, Republic of Korea

Strategic Approaches & Perspectives on Chemicals Management

Kyunghee CHOI
nierchoi@korea.kr

National Institute of Environmental Research
Ministry of Environment

www.me.go.kr

C . O . N . T . E . N . T . S

- Overview
- Status on Chemicals Management in Korea
- Policies for Toxic Chemicals & Environmental Health

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C . h . a . p . t . e . r 1

Overview

- Current Status of Chemicals in Korea
- Toxic Chemicals Circulation
- History of Chemicals Management in Korea
- Laws regarding Chemicals Management
- Relevant Laws for Chemicals Management

1-1 Current status of Chemicals in Korea

- The 6th largest of the world chemicals industry
- Account for 13.4% of the domestic manufacturing industry

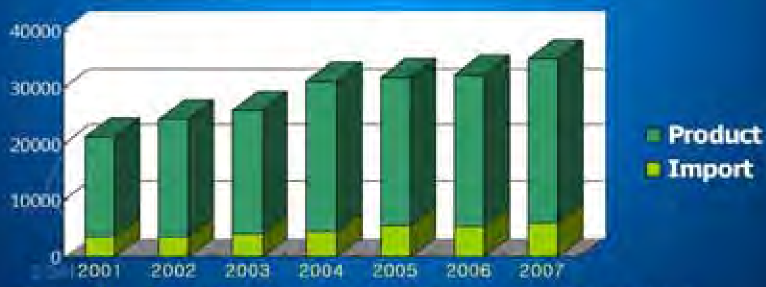
- Amount of place on the market of each country

✓ Source : International Council of Chemical Association (2007)

1-2 Toxic Chemicals Circulation

- **Designated Chemicals by Toxic Chemicals Control Act (Feb. 2009)**
  - Toxic Chemicals 597
  - Observational Chemicals 50
  - Restricted Chemicals 12, Banned Chemicals 60
  - Accident Precaution Chemicals 56

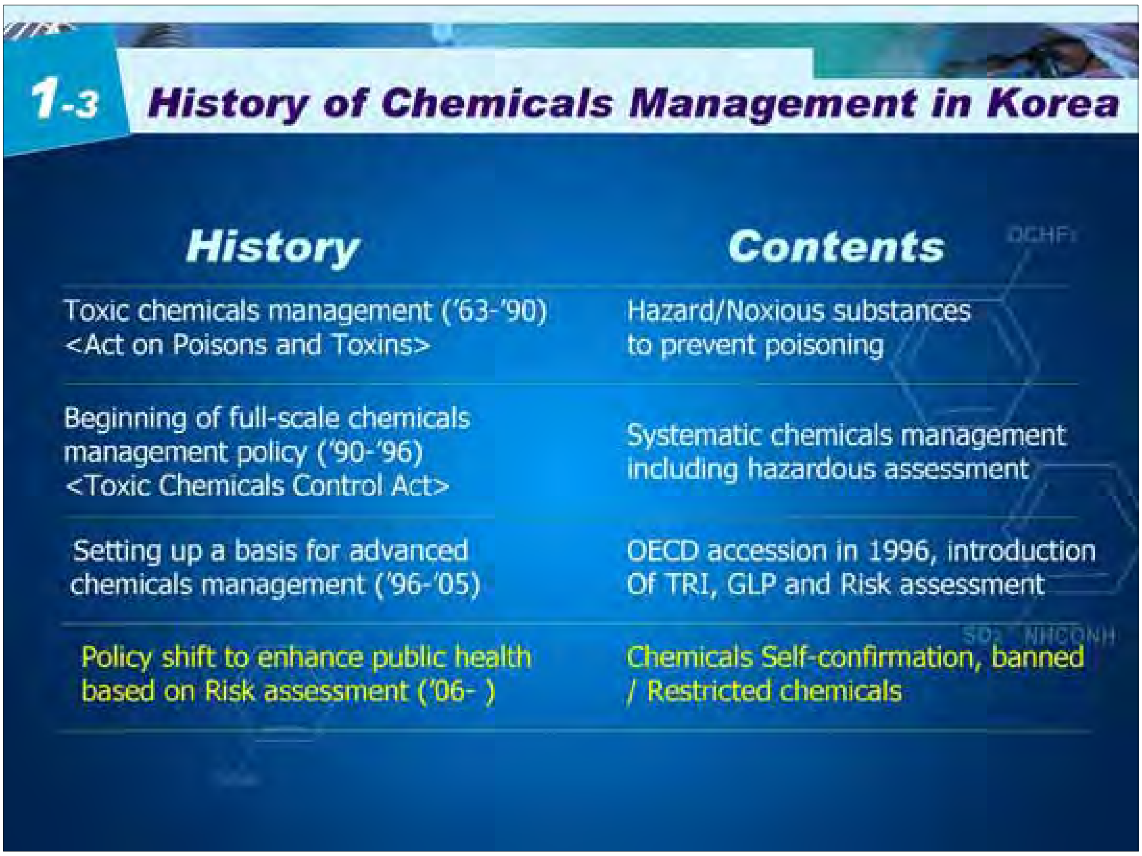
Toxic Chemicals Control Act (Enacted '90, Rev. '08)



Trends of Toxic Chemicals Circulation in Korea

Definition

- ***Toxic chemicals***
  - Harmful to human health or the environment
- ***Observational chemicals***
  - Being likely to be harmful to human health or the environment
- ***Restricted or banned chemicals***
  - Restricted chemicals mean chemicals which cause severely harmful to human health or the environment when they are used for specific
  - Banned chemicals mean chemicals so harmful that are prevented from manufacturing, import, keeping, transport and use.
- ***Accident precaution chemicals***
  - They have high acute toxicity, explosive hazard, etc. and cause severely harmful effect if an accident occurs


1-3 History of Chemicals Management in Korea
History
Contents
Toxic chemicals management ('63-'90) <Act on Poisons and Toxins>
Hazard/Noxious substances to prevent poisoning
Beginning of full-scale chemicals management policy ('90-'96) <Toxic Chemicals Control Act>
Systematic chemicals management including hazardous assessment
Setting up a basis for advanced chemicals management ('96-'05)
OECD accession in 1996, introduction Of TRI, GLP and Risk assessment
Policy shift to enhance public health based on Risk assessment ('06-)
Chemicals Self-confirmation, banned / Restricted chemicals


1-4 Laws regarding Chemicals Management
Toxic Chemicals Control Act (enacted '90; rev '04, '08)
有害化學物質管理法
Basic law regarding chemicals management in Korea
"To prevent risk caused by chemicals to human health or the environment" and "to control hazardous chemicals so that everyone can live in a healthy environment"
Five Chapters
Framework Plan for Hazardous Chemicals Control, TRI, etc.
New Chemical Notification, Risk Assessment, etc.
Safe Control of Toxic Chemicals & Banned or Restricted Chemicals, Responses to Chemical Accidents, etc.
Supplementary Provisions
Penalty Provisions

1-5 Relevant Laws for Chemicals Management in Korea

- **13 laws are managed by 7 ministries** (including Ministry of Env.)

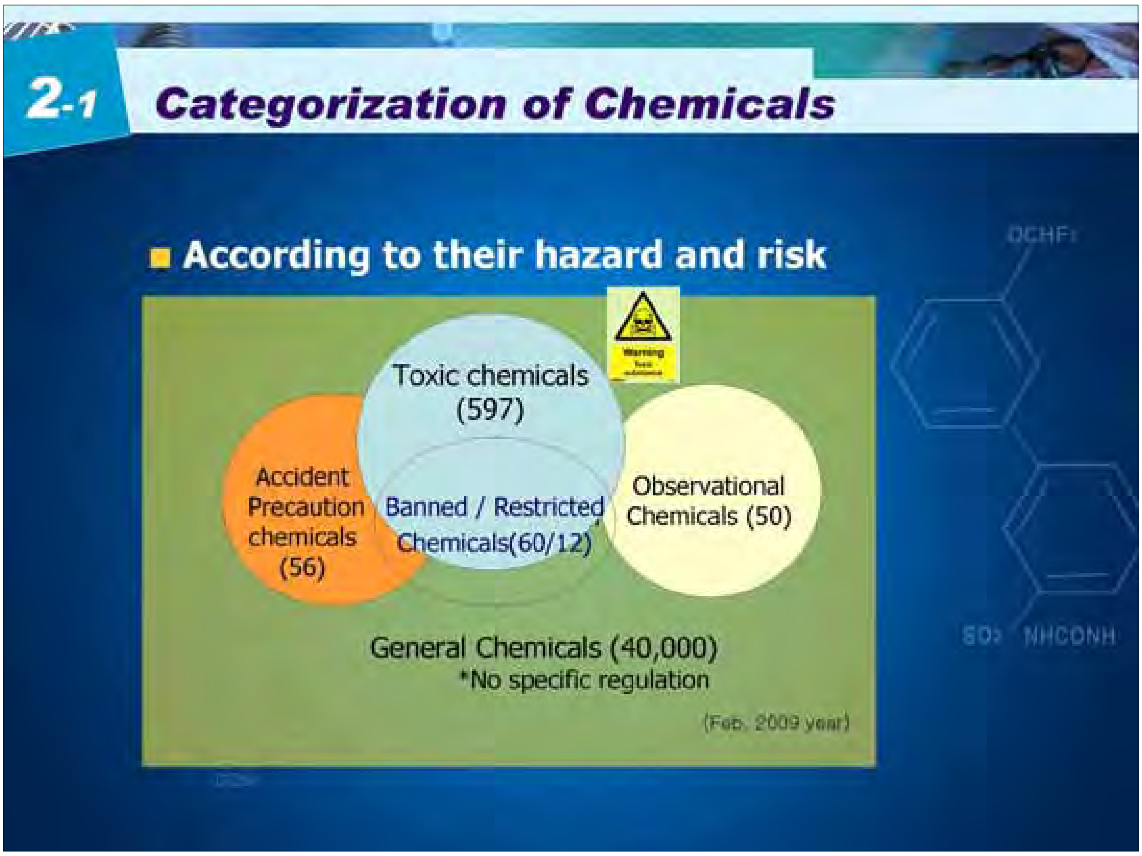
Target	Ministries	Laws
Toxic & Explosive Chemicals in working places	Ministry of Labor	Industrial Safety and Health Act
Agricultural Chemicals, Fertilizers	Ministry for Food, Agriculture, Forestry & Fisheries	Agricultural Chemicals Control Act Fertilizers Control Act
Medical Supplies Narcotics Cosmetics Food additives	Ministry for Health, Welfare & Family Affairs	Pharmaceutical Affairs Act Narcotics control Act Cosmetic Act Food Sanitation Act
Explosives	Ministry of Public Administration & Security	Explosives Safety Control Act Gun, Sword and Gunpowder Control Act
High Pressure Gas, Industrial Products	Ministry of Knowledge & Economy	High Pressure Gas Safety Control Act Quality Management and Industrial Products Safety Control Act
Explosives	Ministry of Land, Transport & Maritime Affairs	Ship Safety Act

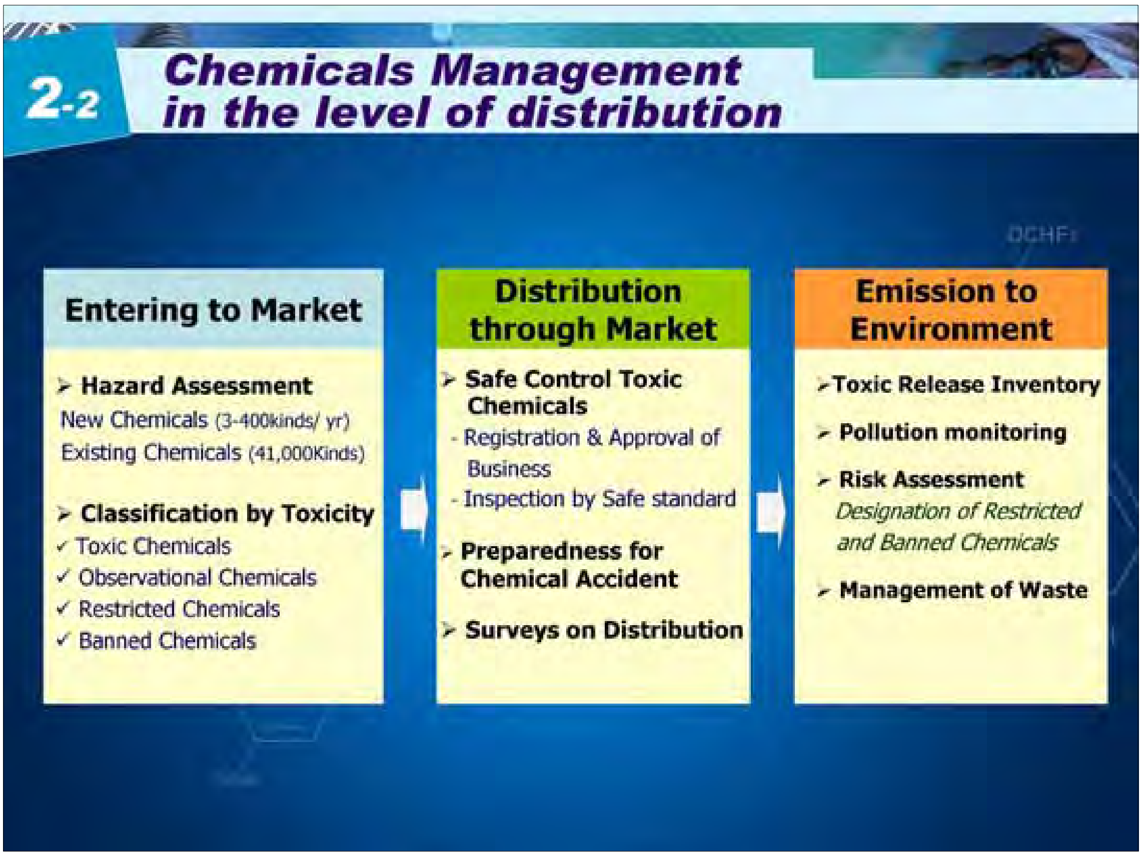
www.me.go.kr

C.h.a.p.t.e.r 2

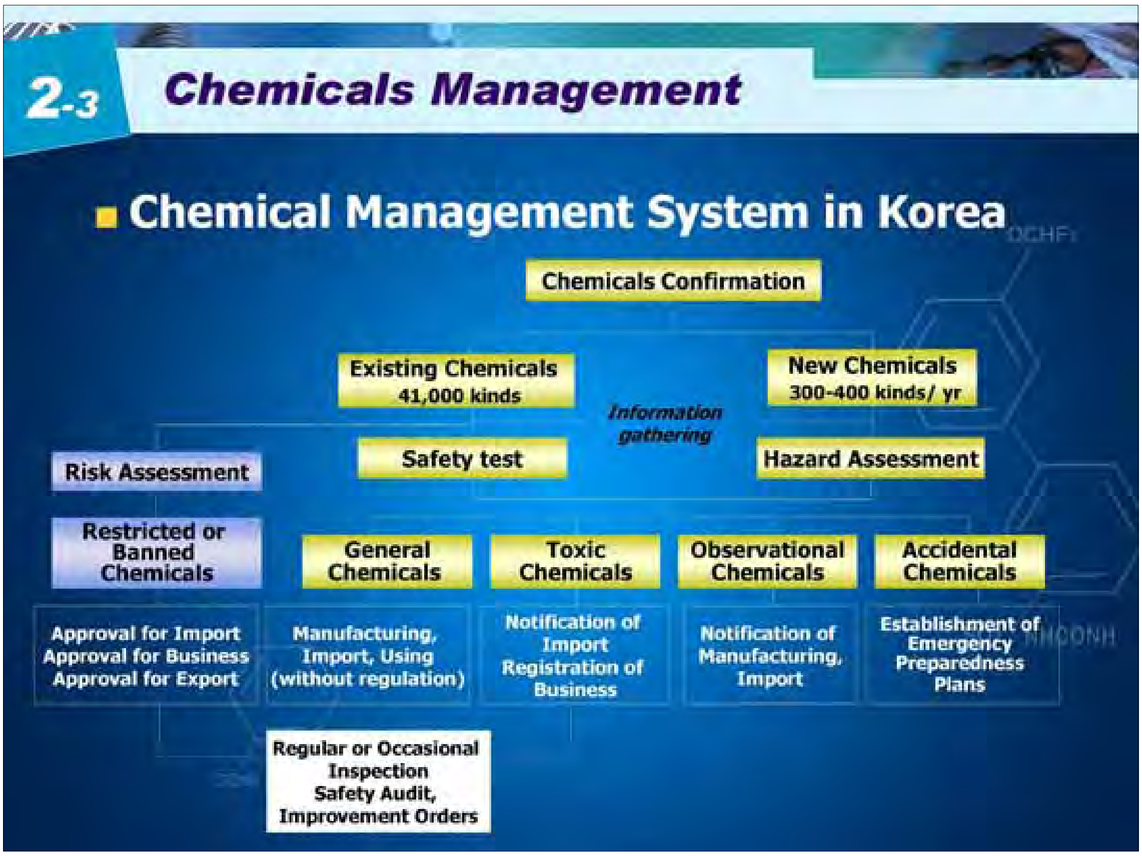
Toxic Chemicals Management in Korea

- **Categorization of Chemicals**
- **Chemical Management in the level of Distribution**
- **Chemicals Management**
  - *Assessment of New/Existing Chemicals*
  - *Chemicals Self-Confirmation*
  - *Regulation of Toxic Chemicals/Restricted Chemicals*
  - *Accident Precaution Chemicals Management*
  - *Toxic Release Inventory (TRI)*
  - *Issuing Substances Management : Pops, EDCs, Mercury, Asbestos*
  - *Capacity Building*
- **Environmental Risk Assessment**
- **Chemical Information**


2-1
Categorization of Chemicals
According to their hazard and risk
Toxic chemicals
(597)
Accident
Precaution
chemicals
(56)
Banned / Restricted
Chemicals(60/12)
Observational
Chemicals (50)
General Chemicals (40,000)
*No specific regulation
(Feb. 2009 year)


2-2
Chemicals Management
in the level of distribution
Entering to Market
Hazard Assessment
New Chemicals (3-400kinds/ yr)
Existing Chemicals (41,000Kinds)
Classification by Toxicity
Toxic Chemicals
Observational Chemicals
Restricted Chemicals
Banned Chemicals
Distribution
through Market
Safe Control Toxic
Chemicals
- Registration & Approval of
Business
- Inspection by Safe standard
Preparedness for
Chemical Accident
Surveys on Distribution
Emission to
Environment
Toxic Release Inventory
Pollution monitoring
Risk Assessment
Designation of Restricted
and Banned Chemicals
Management of Waste


2-3
Chemicals Management
Institutional Framework
Ministry of Environment
- Environmental Health Policy Division
- Chemicals Management Division
National Institute of Environmental Research
- Environmental Health Risk Research Dept.
Related Ministry :
Ministry of Labor,
Ministry of Knowledge· Economy
Korea Food and Drug Administration
Rural Development Administration
National Emergency Management Agency


2-3
Chemicals Management
Chemical Management System in Korea
Chemicals Confirmation
Existing Chemicals 41,000 kinds
New Chemicals 300-400 kinds/ yr
Information gathering
Risk Assessment
Safety test
Hazard Assessment
Restricted or Banned Chemicals
General Chemicals
Toxic Chemicals
Observational Chemicals
Accidental Chemicals
Approval for Import Approval for Business Approval for Export
Manufacturing, Import, Using (without regulation)
Notification of Import Registration of Business
Notification of Manufacturing, Import
Establishment of Emergency Preparedness Plans
Regular or Occasional Inspection Safety Audit, Improvement Orders

2-3 Chemicals Management

2.3.1. Assessment of New / Existing Chemicals

New Chemicals

Chemicals produced/introduced in Korea for the first time (approx. 400 kinds/yr)

- Completion of 5,801 chemicals evaluation from 1991 to 2008
- Designated 144 chemicals as toxic chemicals and 32 chemicals as observational chemicals

→ **Assess nine items for toxicity** (since July '09)

- Acute oral toxicity, Genetic toxicity, Biodegradability, Fish acute toxicity, Daphnia toxicity, Algae toxicity, *Skin irritation, Skin sensitization, Eye irritation*

13 items recommended by the OECD

Acute dermal toxicity, Acute inhalation toxicity, Repeated dose toxicity, Bioaccumulation

2-3 Chemicals Management

2.3.1. Assessment of New / Existing Chemicals

Existing Chemicals

- Completion of 1,017 chemicals evaluation by 2008
- Designate 440 chemicals as toxic chemicals and 9 chemicals as observational chemicals

Safety test : approx. 15 kinds/year according to priorities of Chemicals circulation

Risk Assessment

- Annual Risk assessment by stage
- Chemicals management plans based on survey of toxicity, distribution, emission of chemicals
- OECD SIDS participation : Initial Assessment → OECD SIAM ('01-'08(Apr) : Acetanilide etc. 19 HPV chemicals ; >1000ton)

2-3 Chemicals Management

2.3.2. Chemicals Self-Confirmation

- **Manufacturer or importer of chemicals shall submit chemicals self-confirmation sheet to MOE prior to manufacturing or import**

→ Confirmation of New Chemicals, Toxic Chemicals, Observational Chemicals, Restricted Chemicals

- **Submit only once for the same product**

→ Exporters in overseas need to offer chemicals information to their importers in Korea

2-3 Chemicals Management

2.3.3. Regulation of Toxic / Restricted Chemicals

- **Required to Register**

→ People who want to produce, market, store, transport, or use toxic chemicals : 597 toxic chemicals (2009)

- **Regulation on the import of toxic chemicals**

→ People who intend to import a toxic chemicals for the first time shall give notice of its type, application, etc, to Ministry of Environment

→ Reagent for tests, research, and inspection are examined

- **Regular/irregular facility inspection**

→ Applications for regular inspection (every year) & safety inspection (if necessary)

- **Post management for toxic chemicals handlers**

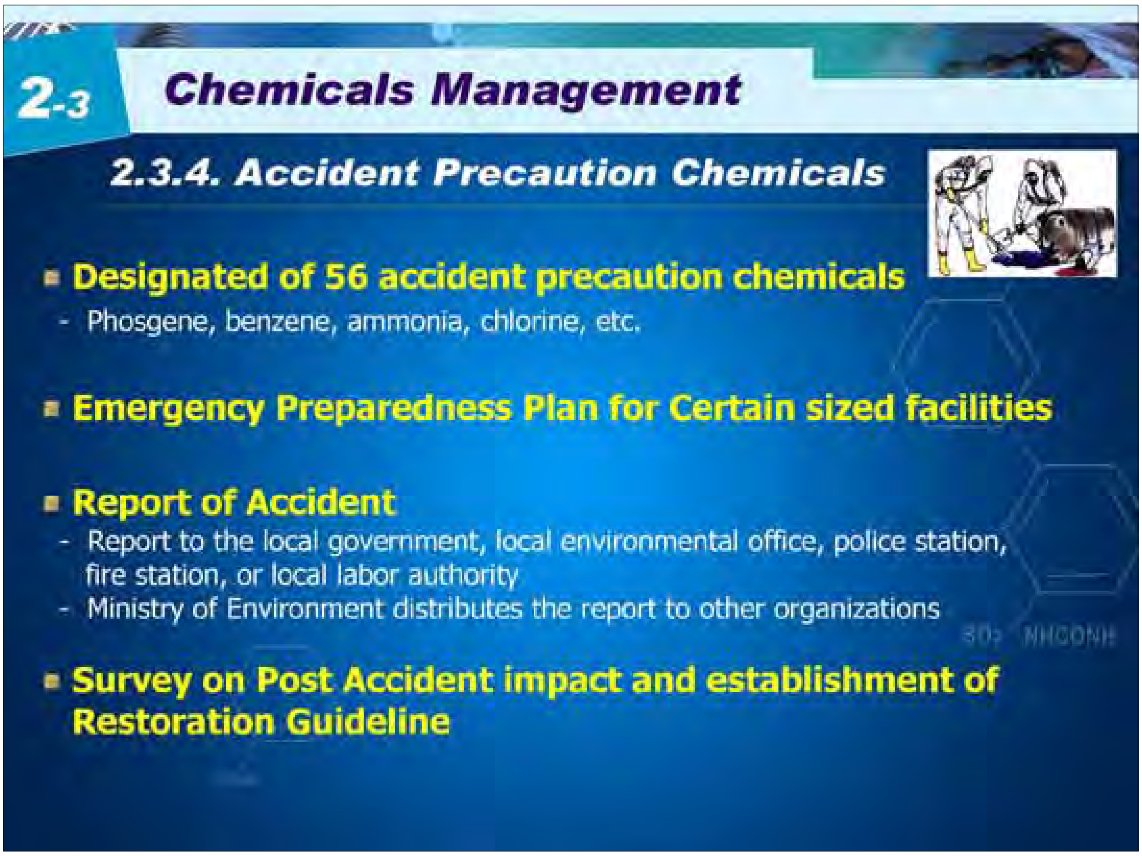
→ Reporting annual results of manufacturing, sales, storage, transportation

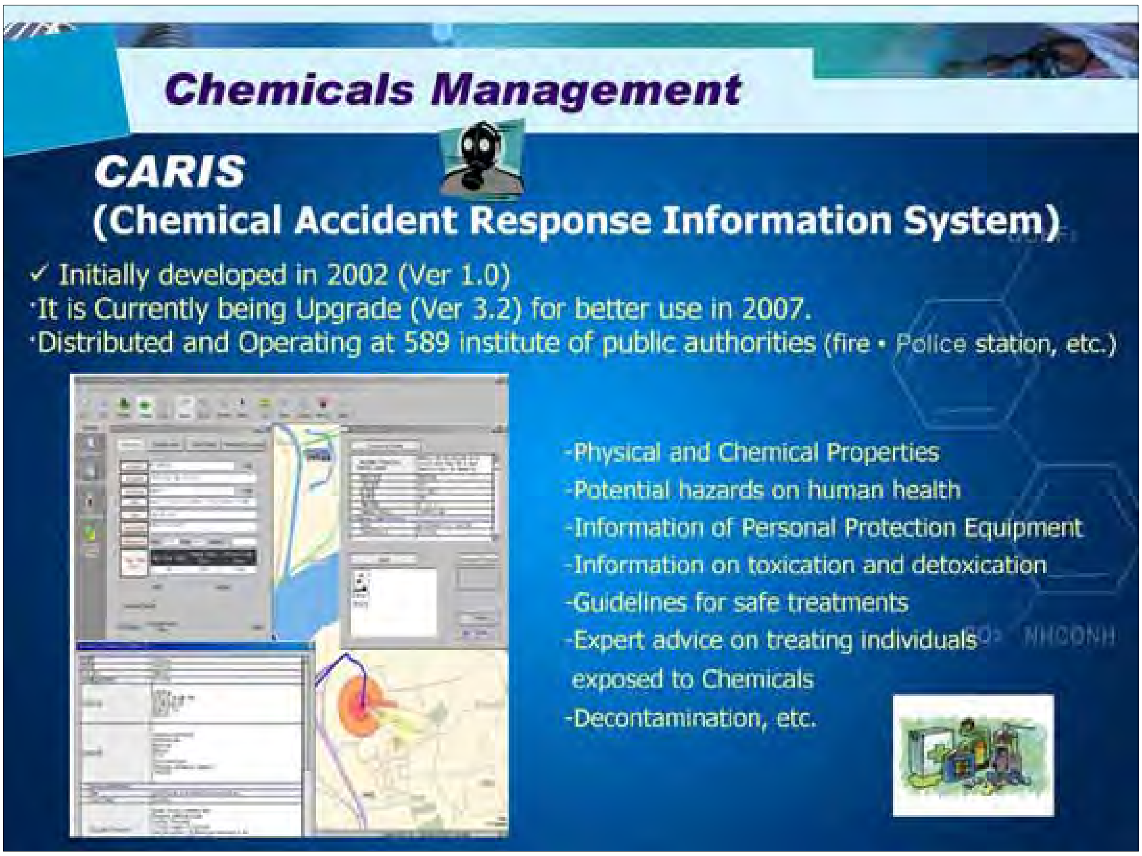
- **Required to obtain business permission**

→ Restricted chemicals, banned chemicals (PCBs, Aldrin, Endrine, etc.)

- **Needs prior authorization for the import restricted chemicals**

→ Reagents for tests, research, and inspection are exampted


2-3
Chemicals Management
2.3.4. Accident Precaution Chemicals
Designated of 56 accident precaution chemicals
- Phosgene, benzene, ammonia, chlorine, etc.
Emergency Preparedness Plan for Certain sized facilities
Report of Accident
- Report to the local government, local environmental office, police station, fire station, or local labor authority
- Ministry of Environment distributes the report to other organizations
Survey on Post Accident impact and establishment of Restoration Guideline


Chemicals Management
CARIS
(Chemical Accident Response Information System)
✓ Initially developed in 2002 (Ver 1.0)
·It is Currently being Upgrade (Ver 3.2) for better use in 2007.
·Distributed and Operating at 589 institute of public authorities (fire • Police station, etc.)
-Physical and Chemical Properties
-Potential hazards on human health
-Information of Personal Protection Equipment
-Information on toxication and detoxication
-Guidelines for safe treatments
-Expert advice on treating individuals exposed to Chemicals
-Decontamination, etc.

2-3 Chemicals Management

2.3.5. Toxics Release Inventory

- **To report the amount of chemicals released to the environment in the process of production or use, as well as the amount transferred to the other places → Release Reduction**
  - 388 chemicals from companies with > 30 employees : Annual ('00 -)

2-3 Chemicals Management

2.3.6. Issued Substances Management

- **POPs (Persistent Organic Pollutants)**

The Stockholm Convention (http://chm.pops.int/) initially specified 12 classes of POPs as chemicals subject to regulation → ***Organochlorine Pesticides, PCBs, Dioxins & Furans, HCB***

- **Mercury**

Mercury management plan was created by MOE in 2006 and the project in progress.

* *MOE = Ministry of Environment*

- **Nanomaterials**

Nano material is a material of nano size (~10^{-9}m) that is created using nano technology, and displays different physical chemical characteristics from normal chemicals

→ *MOE has been exerting efforts to verify and secure the nano-materials since 2007*

- **Pharmaceuticals and Personal Care Products (PPCP)**

PPCP Survey and monitoring studies have been performed in Environmental matrix ('08. 27 compounds (Sulfathiazole, Naproxen etc.) survey)

- **Endocrine Disrupting Chemicals (EDCs)**

EDCs research and monitoring have been performing since 1999 (inter-ministerial work)

- **Asbestos**

Asbestos collectively refers to 6 different types of fibrous minerals, the main three types being chrysotile, crocidolite, and amosite

POPs (Persistent Organic Pollutants)

National POPs Monitoring Station

- Started from 2008
- Sampling:
  - Water : spring, fall
  - Soil : spring
  - Sediment : fall
  - Air : spring, summer, fall, winter
- Survey Sites:

Year	Air	Water	Soil	Sediment	Total
2008	37	36	57	30	160

POPs (Persistent Organic Pollutants)

New POPs Management

Chlordecone, Lindane, Alpha HCH, Beta HCH, Tetrabromodiphenyl ether & pentabromodiphenyl ether
Pentachlorobenzene, Hexabromodiphenyl ether & Heptabromodiphenyl ether, Pentachlorobenzene
PFOS, its salts & PFOSF,

- Update NIP
- Strengthen the survey of the chemicals circulation
  - 4 year term → 2 year term
  - Special survey for BDEs and PFOS
- Program for stakeholders participation
  - Industries, NGOs, Government

POPs (Persistent Organic Pollutants)

Future Works and Challenges

POPs Control Act
- Amend for inclusion of New 9 POPs
- Revise a Basic Strategy for POPs management

Implementation of Convention
- Update the National Implementation Plan for POPs
  - Include additional information related to New 9 Chemicals
- Strengthen the Activity for Data Warehouse in East Asia
- Participate the Activity of Effectiveness Evaluation, Technical Assistance in region

Research and Cooperation
- Continuous researches in accordance with the research plan
- Strengthening Local, Regional & International Cooperation
- Risk Reduction Measure for Hazardous Chemicals

POPs (Persistent Organic Pollutants)

Data Warehouse Homepage

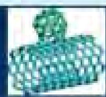
http://pops-asia.org

Mercury

Mercury management plan was prepared by MOE in 2006 and the projects are in progress

- **Management of Products and Wastes containing mercury**
- **Management of Emission and Discharge Sources**
- **Monitoring and Risk Assessment**
  - Hg conc. in blood, Hg accumulation in fish

Nanomaterials



Participation in OECD WPMN (Working party on manufactured nanomaterials)

→ **Korea has been involved in this working party and NIER** (National Institute of Environmental Research) **has taken the role of focal point**

→ **Working for Steering Group as a participant**
SG1 *(OECD database on EHS Research),* ***SG3****(Safety testing of representative set of manufactured nanomaterials),* ***SG4****(Manufactured nanomaterials and test guidelines) and* ***SG8*** *(Exposures measurement and exposure mitigation)*

The working party on WPMN was established in 2006 by the OECD's chemicals committee to understand their impacts on human health and the environment

OECD WPMN has organized eight steering groups (SGs) in order to foster capacity for risk management of nanomaterials

Work Plan for Safety Management of Nanomaterials

→ **Establishing Infrastructure for toxicity test, risk assessment, etc.**

2-3 Chemicals Management

2.3.7. Capacity Building

Periodic mandatory education for field managers dealing with toxic chemicals and restricted/banned chemicals (every 3 years)

- TCCA regulation, toxic chemicals property, general chemistry

Education for officeholders in charge of chemicals management

- Ministry of Environment and local government : TCCA regulation, GHS, Risk assessment, Chemicals accident precaution
- Emergency response agencies (fire station, police) : chemicals accident precaution, CARIS, emergency preparedness plan

2-4 Environmental Risk Assessment

- **High-risk priority chemicals substances were selected based on their potential hazard and distribution amount ('02-'03)**
- **Initial risk assessment about 17 chemicals among the priority chemicals ('03-'06)**
  - Screening test for selecting chemicals and concerned area
  - Based on chemicals toxicity, monitoring, exposure assessment, etc.
- **Risk assessment of chemicals of concerns ('07-)**
  - Lead, Cadmium, Mercury, Arsenic, Chrome, Nickel, Benzene ('07-'08)
  - PAHs(16) , Phthalates(4) : Initial Risk Assessment ('08)
- **Study on the Risk Assessment :** Multi-media exposure **('09 -)**
  - Multi-pathway and Multi-Receptor Exposure

2-5 Chemicals Information

Information Sharing

NCIS

" National Chemicals Information System" Construction ('05-'09)

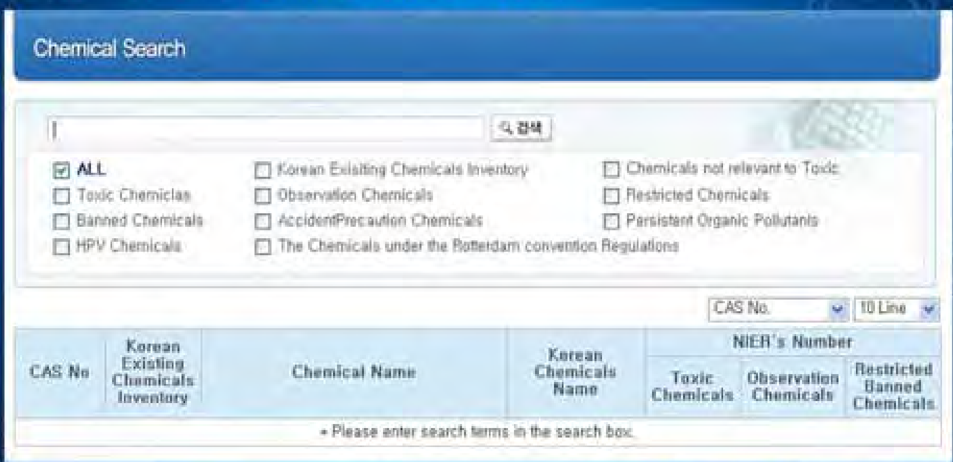
- Providing domestic chemicals database, information on toxic substances and regulations

http://ncis.nier.go.kr

2-5 Chemical Information

NCIS (National Chemicals Information System)

- English version under construction



http://ncis.nier.go.kr

2-5 Chemical Information

TRI Information System

- **Government is opening TRI results to the public**
  - Statistics by regions, industries, etc.
  - Statistics of each enterprise were available from 2008

http://tri.nier.go.kr

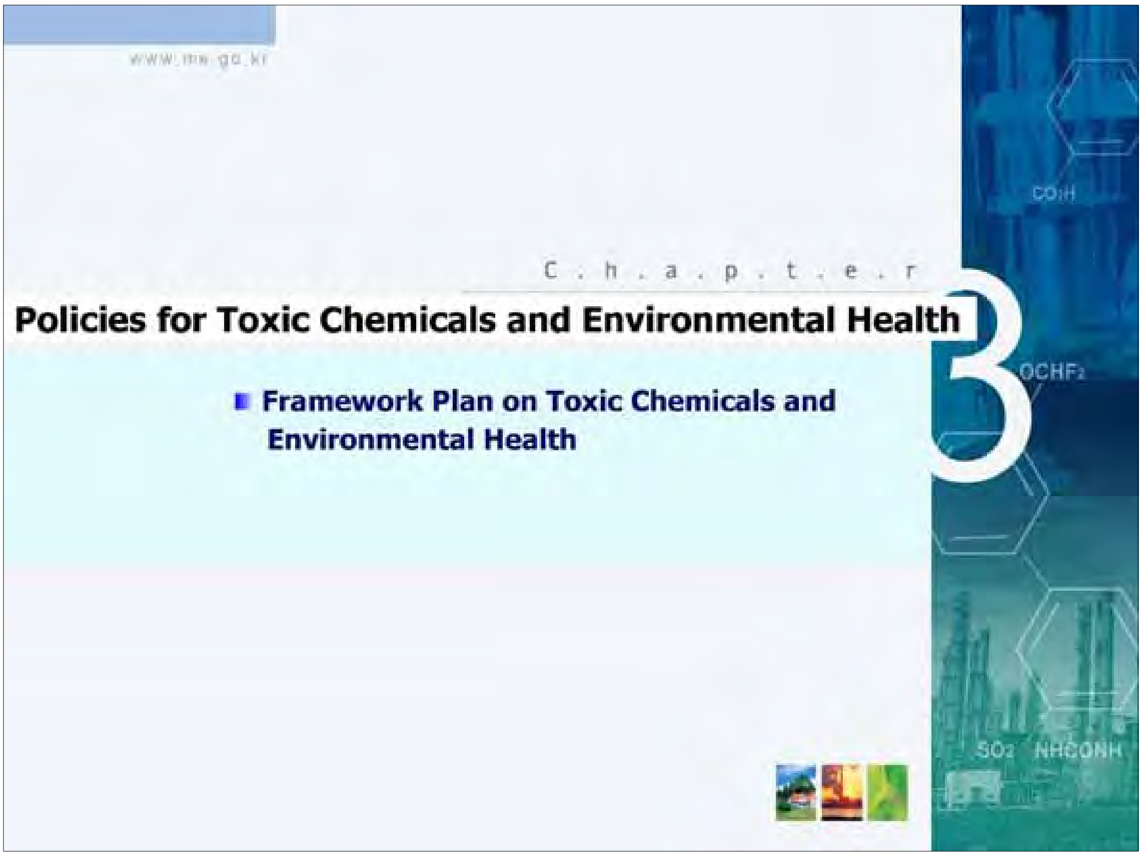
2-5 Chemical Information

CCSM (Center for Chemical Safety Management)

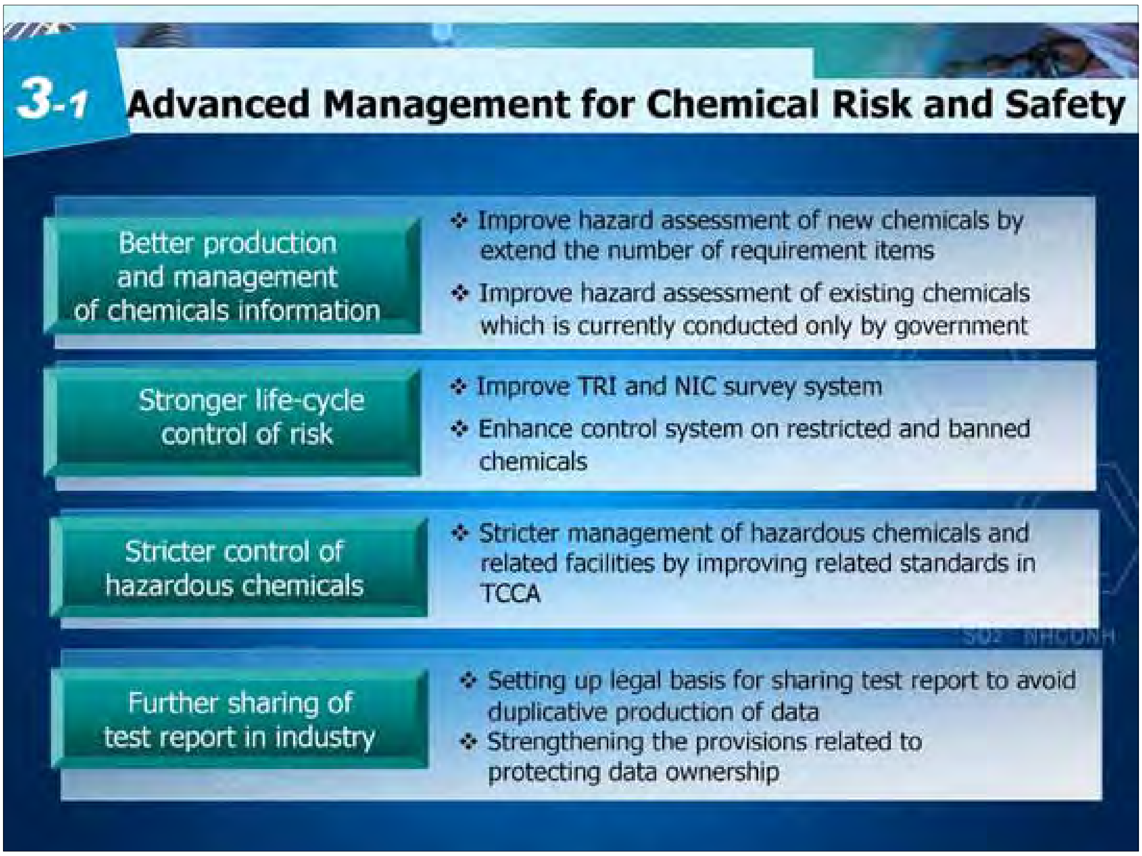
After the 9.11 terror, CCSM(Center for Chemical Safety Management) was established for counter-terrorism and chemical safety management.
Ministry of Environment has taken a leading role in building programs to respond and Prevent chemical accidents.
Ministry of Environment's activities in these areas come together in its CCSM in National Institute of Environmental Research (NIER), organized in Dec 2001.

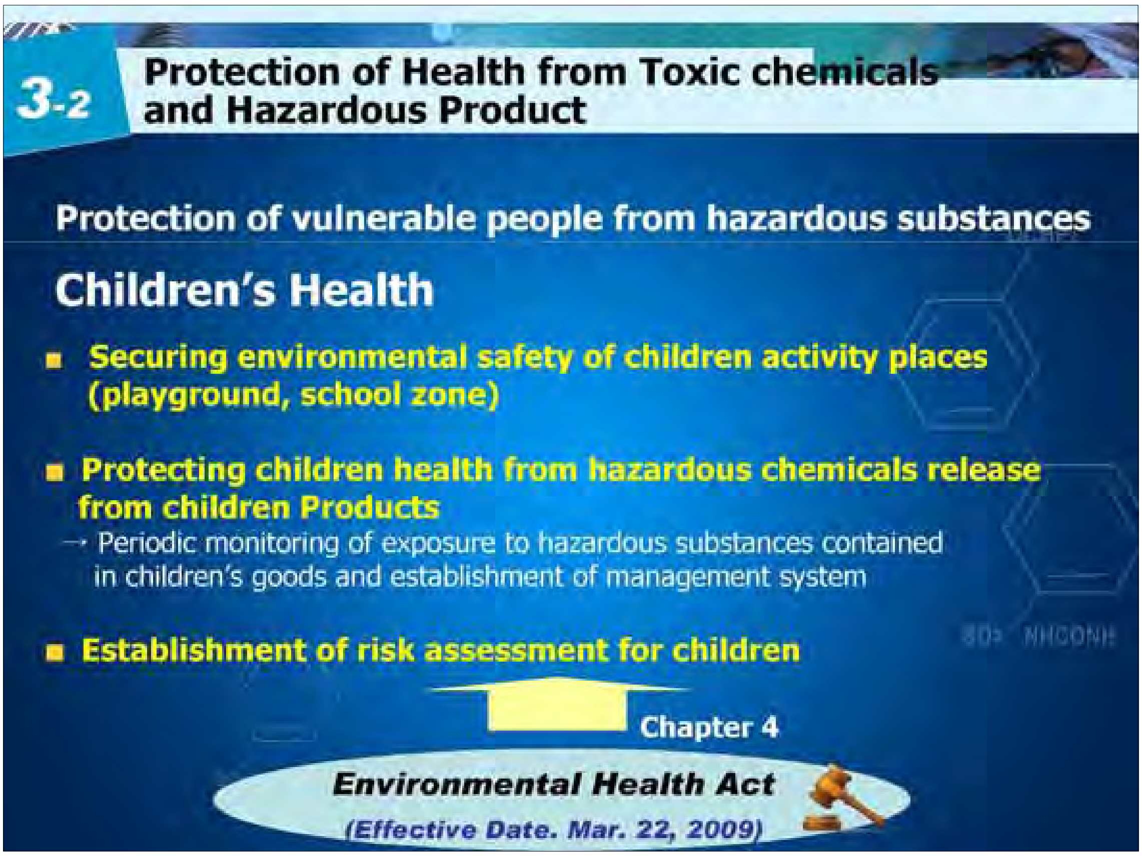
CCSM provides leadership, builds partnerships and offers technical assistance to prevent and prepare for chemical emergencies; respond to environmental crises; inform the public about chemical hazards in their community; and share lessons learned about chemical accidents.

http://ccsms.nier.go.kr/


www.me.go.kr
C . h . a . p . t . e . r
3
Policies for Toxic Chemicals and Environmental Health
Framework Plan on Toxic Chemicals and Environmental Health


3
Framework Plan on Toxic Chemicals and Environmental Health ('10-'13)
<key Objectives>
Protect human health and environment from Risks caused by Hazardous Chemicals
Strategies
Expanding management coverage : Hazard → Risk
Utilization of diverse policy tools
Enhancing cooperation mechanism
Specific Goals
Advanced Management for Chemical Risk and Safety
Protection of Health from Toxic Chemicals in Environment and Hazardous Products
Establish a "Risk Communication System" and a "Cooperation system" among Interested Parties
Advanced Information Management of Chemicals
Improvement of Adaptability and Competitiveness of Chemical Industry


3-1
Advanced Management for Chemical Risk and Safety
Better production and management of chemicals information
❖ Improve hazard assessment of new chemicals by extend the number of requirement items
❖ Improve hazard assessment of existing chemicals which is currently conducted only by government
Stronger life-cycle control of risk
❖ Improve TRI and NIC survey system
❖ Enhance control system on restricted and banned chemicals
Stricter control of hazardous chemicals
❖ Stricter management of hazardous chemicals and related facilities by improving related standards in TCCA
Further sharing of test report in industry
❖ Setting up legal basis for sharing test report to avoid duplicative production of data
❖ Strengthening the provisions related to protecting data ownership


3-2
Protection of Health from Toxic chemicals and Hazardous Product
Protection of vulnerable people from hazardous substances
Children's Health
Securing environmental safety of children activity places (playground, school zone)
Protecting children health from hazardous chemicals release from children Products
→ Periodic monitoring of exposure to hazardous substances contained in children's goods and establishment of management system
Establishment of risk assessment for children
Chapter 4
Environmental Health Act
(Effective Date. Mar. 22, 2009)

3-3 Improvement of Adaptability and Competitiveness of Chemical Industry

Policy for supporting responses to REACH

- **Monitoring tendencies related to REACH**
- **Education and consulting for Industry**
- **Development of system to support industry**

  - *Setting up REACH helpdesk (MOE, www.reach.me.go.kr), REACH business center (MKE, www.reach.or.kr) since 2006*

3-4

Environmental Health Act (enacted 2008, **Effective 2009**)
環境保健法

- **To evaluate the impact of environmental contamination on human health and ecosystem and to prevent and manage**
  - *Precautionary principle*
  - *Priority Protection for susceptible population*
  - *Receptor oriented approach*
  - *To guarantee community participation*

Six Chapters

1. **General : Objectives, Scope, etc. / National EH plan** (Next-10 year)
2. **Risk Assessment and management / Health Impact Assessment**
3. **Prevention and management of Environment related Health Effect**
   → **Epidemiological survey, Petition for HIA, EH indicator development, etc.**
4. **Children's Health**
   → **Exposure/Risk Assessment of Children's activity place and proucts**
5. **Supplementary Provisions**
6. **Penalty Provisions**

4 Strategies To Achieve Goals

- Expanding knowledge and strengthening techniques
- Utilizing diverse experimental tools
- Enhancing cooperation mechanism

4.1 Strategies To Achieve Goals

- Expanding knowledge and strengthening techniques
- Utilizing diverse experimental tools

Steps and Process for NIER's Environmental & Human health Research

Release of toxic chemicals and hazardous substances into the environment

⇩

Transport and fate into biota

⇩

Exposure to humans and ecological system

⇩

Understanding toxic responses and potential effects in living organism

⇩

Design risk assessment, minimization, and management plans to eliminate, prevent or predict environmental and human health threats


4-2 Strategies To Achieve Goals
Enhancing cooperation mechanism
Improve cooperation between related parties
Strengthen the international cooperation
→ Collaboration and support of Research with other national. regional and international agencies/institutes
Harmonization of national/regional/global activities


Working together
to support policy and actions
to protect & promote our
environment & human health
Thank You For Your Attention
국립환경과학원

3-6 Air pollution, a regional challenge for Northeast Asia

- Director, Fan MENG, CRAES, China

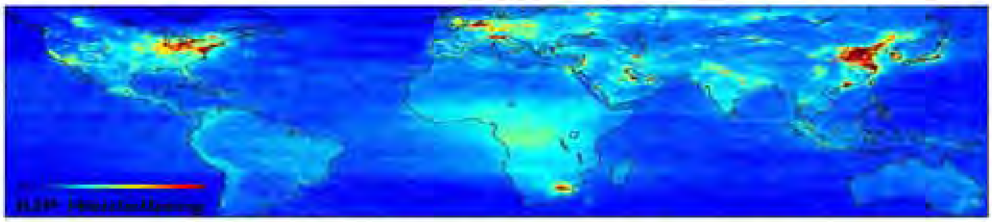
Air Pollution, a Regional Challenge for Northeast Asia

Fan Meng

Chinese Research Academy of Environmental Sciences

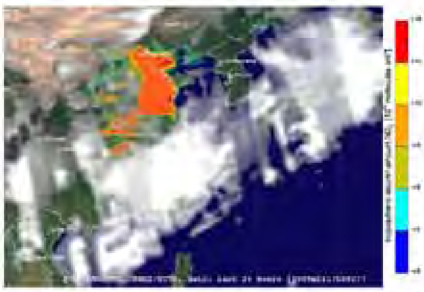
6th Tripartite Presents Meeting , Nov.26-27, 2009. Seoul, Korea

Regional Air Pollution in East Asia



- The image shows the global mean tropospheric nitrogen dioxide (NO2) vertical column density (VCD) between January 2003 and June 2004, as measured by the SCIAMACHY instrument on ESA's Envisat.
  The scale is in 1015 molecules/cm-2. Image produced by S. Beirle, U. Platt and T. Wagner of the University of Heidelberg's Institute for Environmental Physics.

November 6, 2009 Haze over China



Tropospheric NO2 (air pollution) over East Asia, Nov. 17, 2009 24 hours)

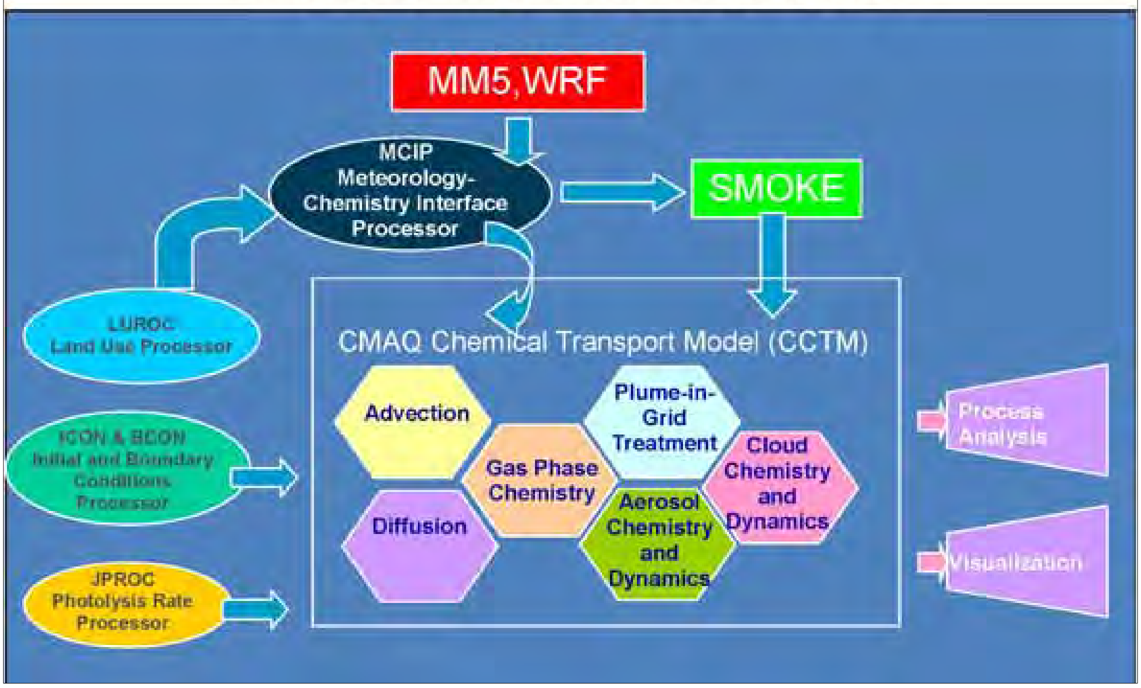
Regional Air Pollution Problem

- Evidence showing that regional air pollution exist. There still many uncertainties about it's extend, strength and trend.
- Air Pollution Impact on Health and Ecosystem
- Climate Effect

On Going Projects for Regional Air Pollution Northeast Asia

- LTP for Sulphate, Nitrate Deposition
- ABC Project for Climate Effects of Aerosol
- O3, Sand Storm, ……

CMAQ Chemical Transport Model & Interface Processors



Vertical Layers: sigma-pressure coordinate, top is 100 hpa.

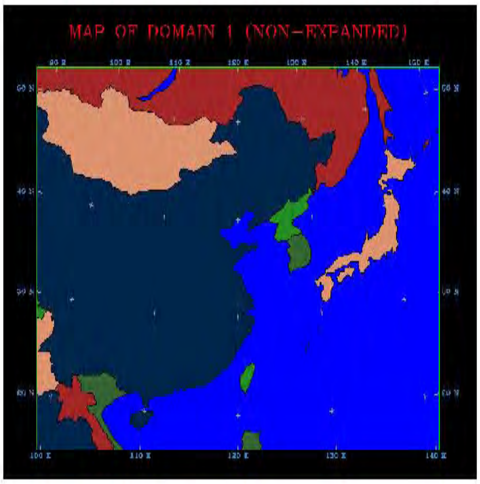
MM5: 32 sigma levels an 31 half sigma levels (layer) Layer The 31σ-layers,

1.0000,
0.9975,
0.9950,
0.9900,
0.9800,
0.9700,
0.9600,
0.9400,
0.9200,
0.9000,
0.8750,
0.8500,
0.8200,
0.7900,
0.7550,
0.7200,
0.6850,
0.6500,
0.6150,
0.5800,
0.5500,
0.5000,
0.4500,
0.4000,
0.3500,
0.3000,
0.2500,
0.2000,
0.1500,
0.1000,
0.0500,
0.0000

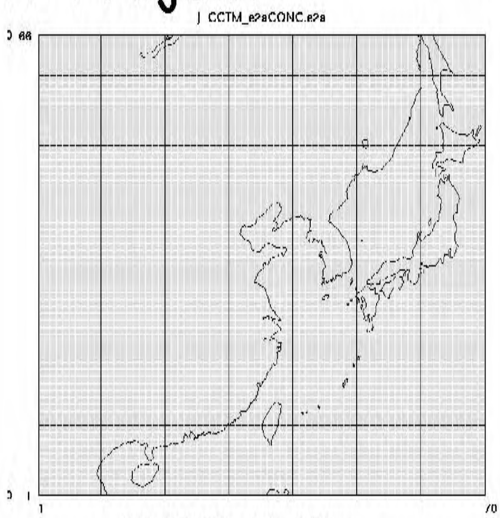
CMAQ:15 Levels (14 Layers)

1.0,
0.995,
0.99,
0.98,
0.96,
0.94,
0.91,
0.86,
0.80,
0.74,
0.65,
0.55,
0.4,
0.2,
0.0

Domain of LTP Project



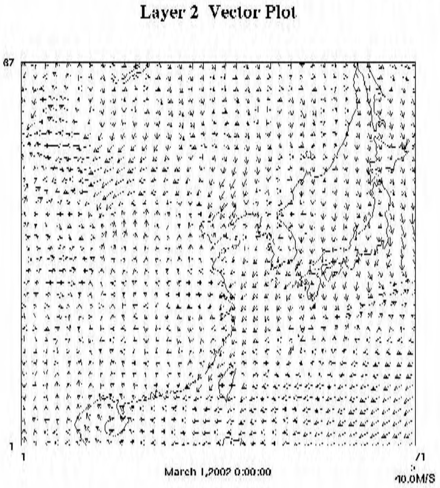
MM5 77x73, 60km

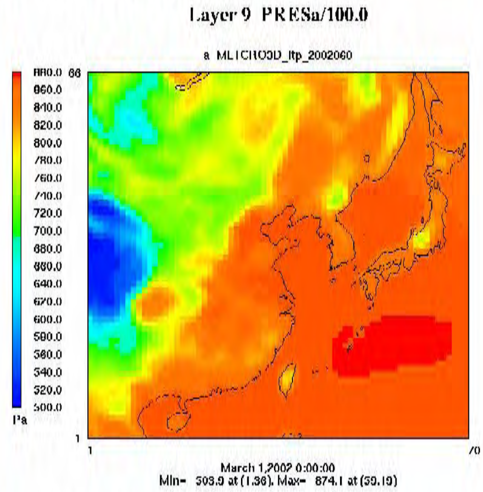


CMAQ 70x66, 60km

standard parallels are 25N and 47N.

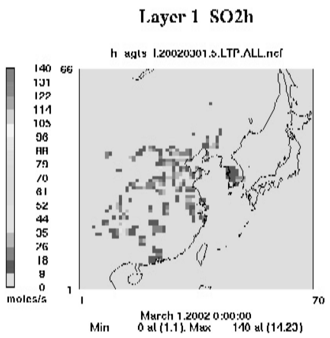
Meteorology

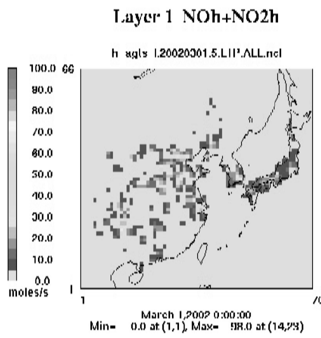


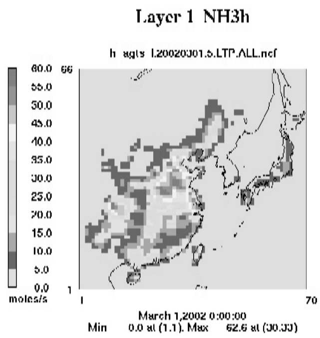


MM5 is used in simulation of 2002. (LTP-2008).

Gridded Emission

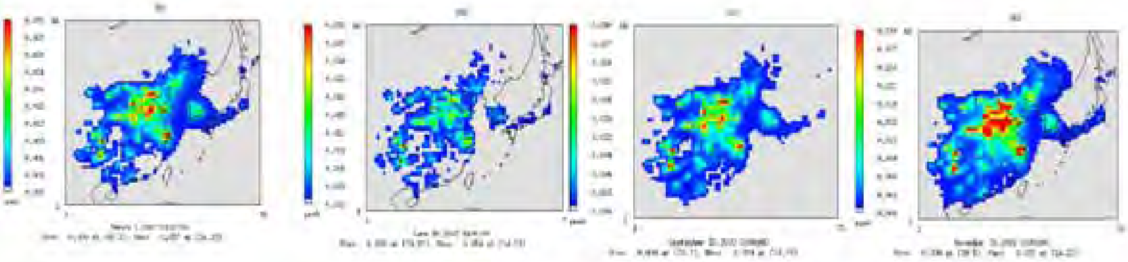


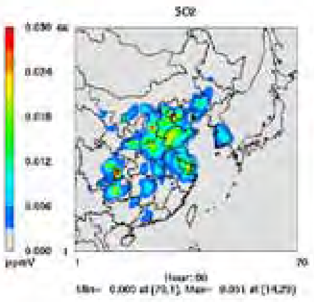




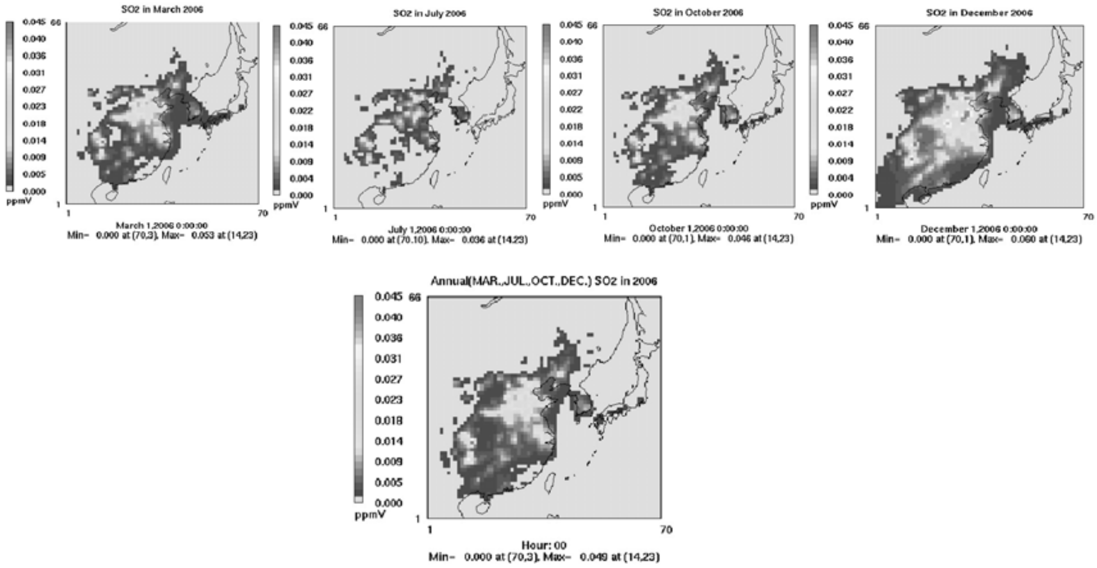
Modeling Results for Northeast Asia in March, June, Sep., Nov., of 2002 and March, July, Oct., Dec, of 2006

SO2 concentration of 2002

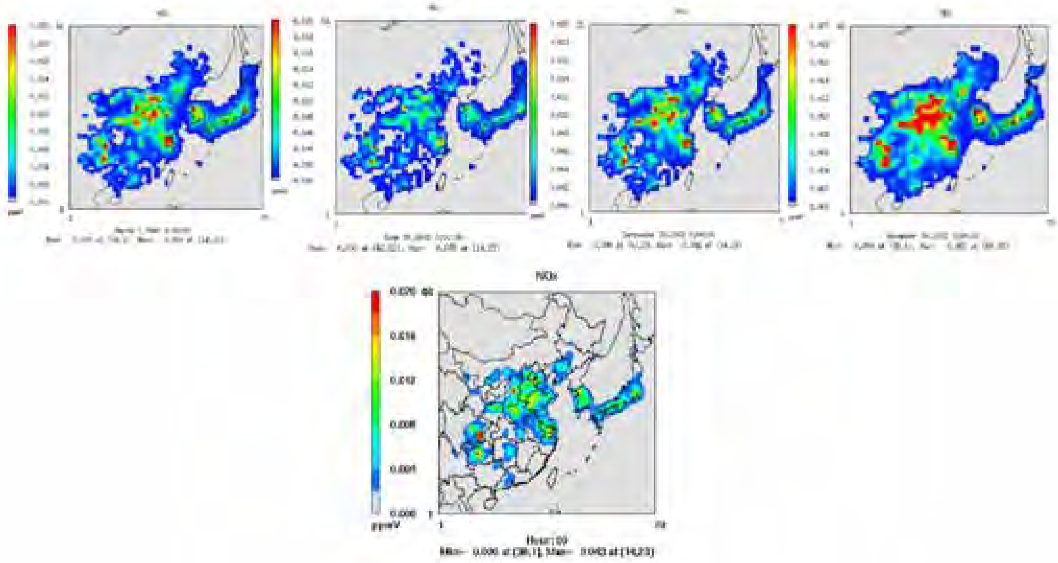




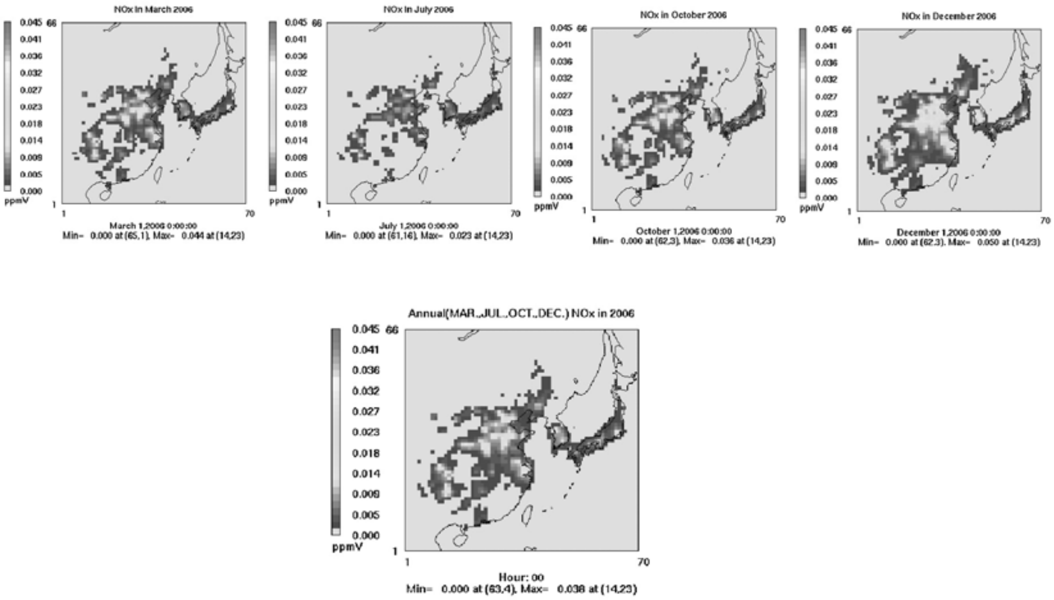
SO2 concentration of 2006

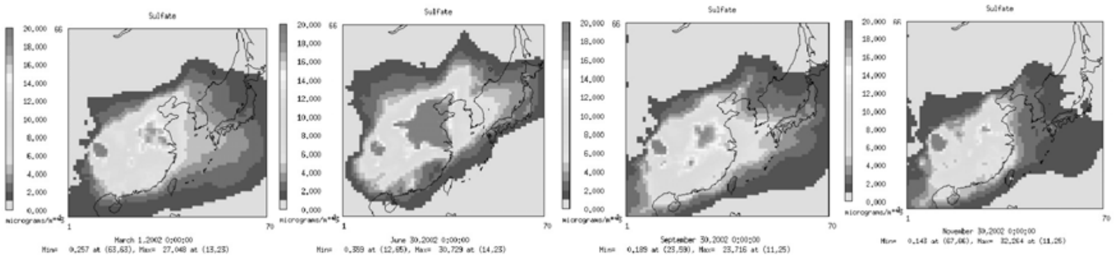


NOx concentration of 2002

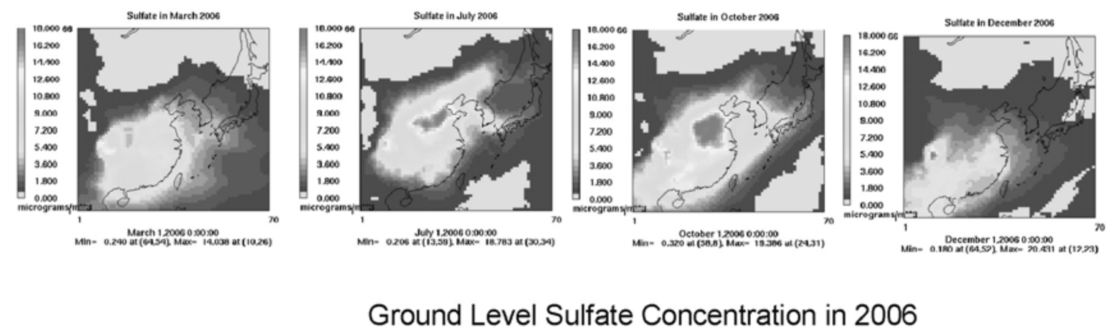


NOx concentration of 2006

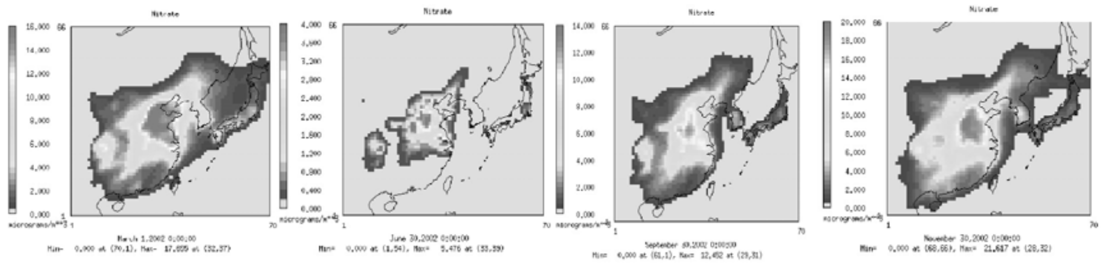




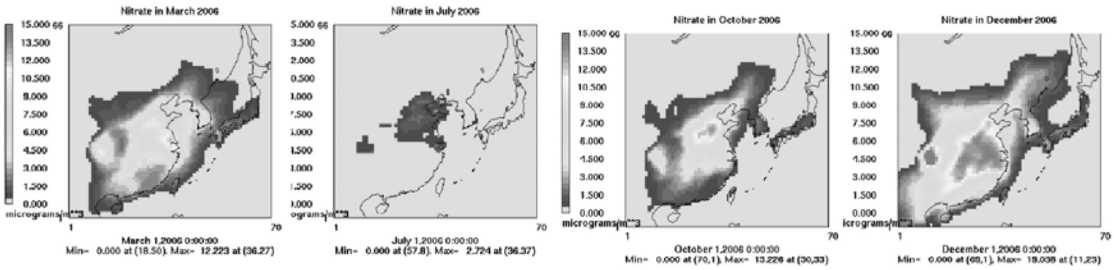
Ground Level Sulfate Concentration in 2002



Ground Level Sulfate Concentration in 2006

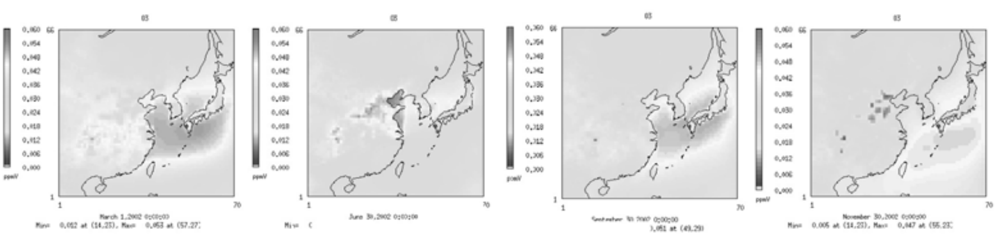


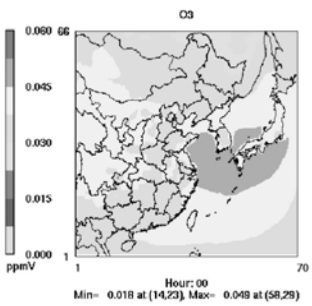
Nitrate Concentration in 2002



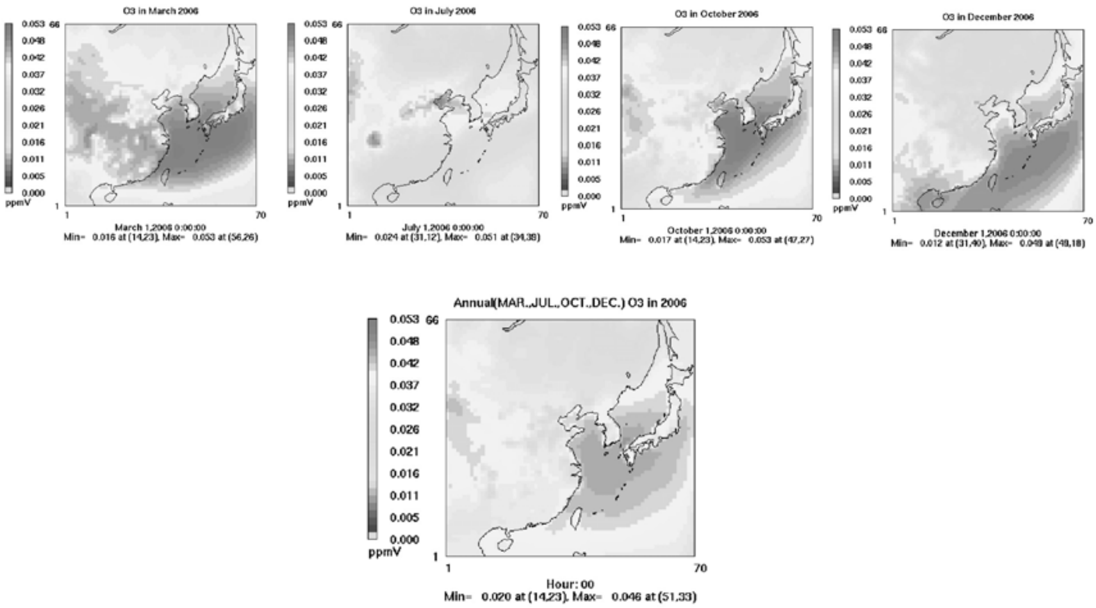
Nitrate Concentration in 2006

Ground Level O3 Concentration in 2002

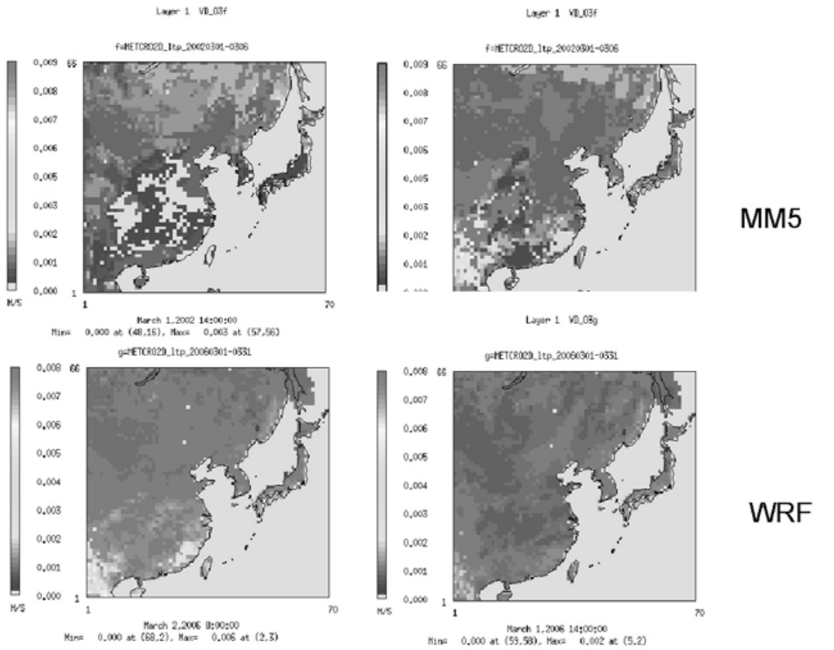


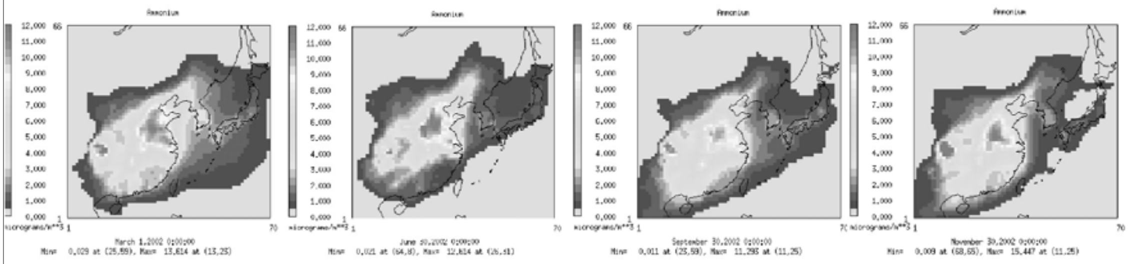


Ground Level O3 Concentration in 2006

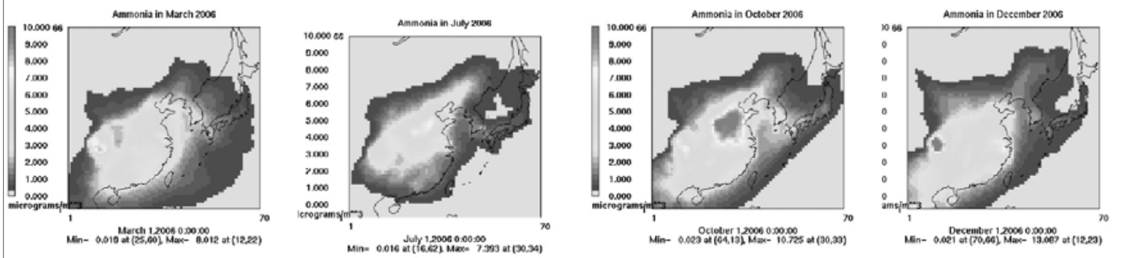


Dry Deposition for O3 by MM5 and WRF

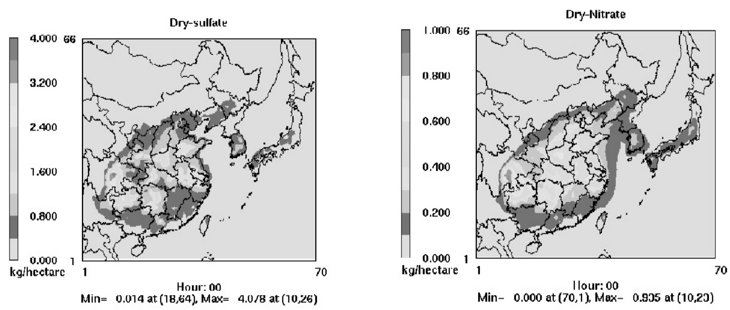




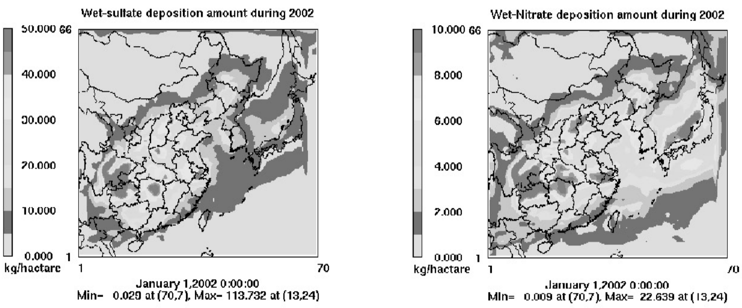
NH3 Concentration at Ground Level in 2002



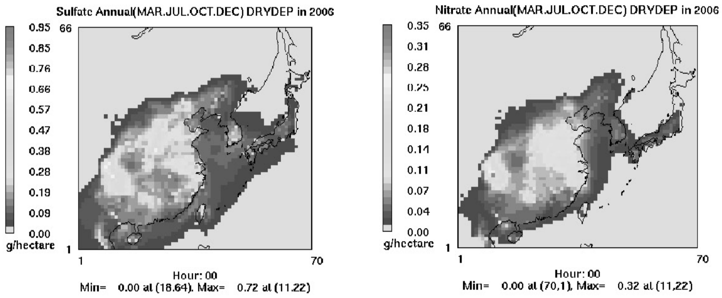
NH3 Concentration at Ground Level in 2006



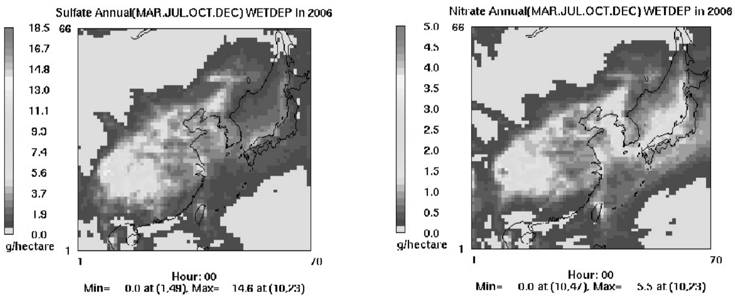
■ Total dry deposition of sulfate and nitrate aerosols in 2002



■ Total wet deposition of sulfate and nitrate aerosols in 2002

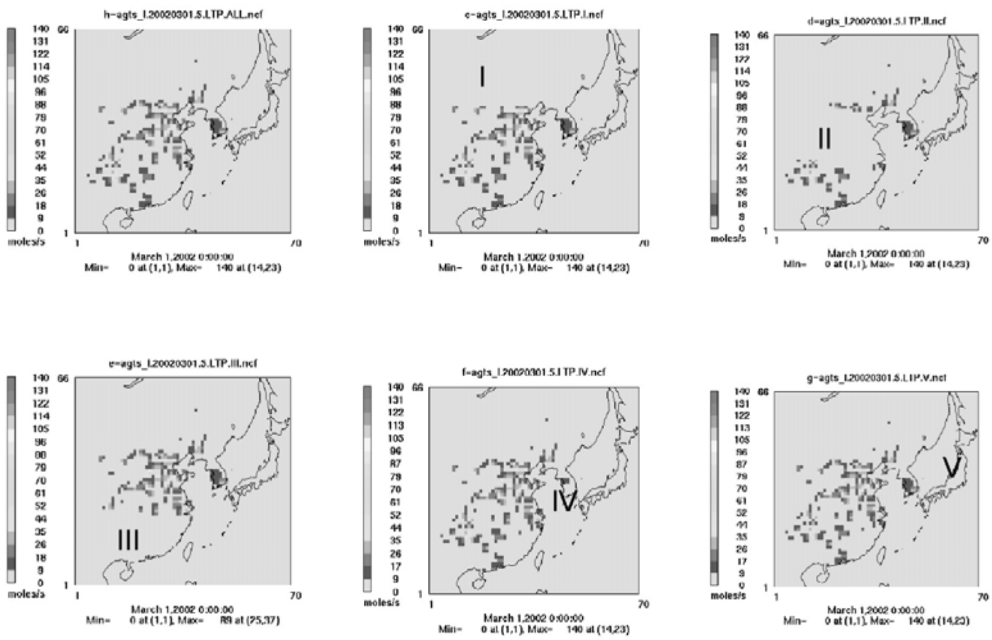


- Annual averaged dry deposition of sulfate and nitrate aerosols in 2006



- Annual averaged wet deposition of sulfate and nitrate aerosols in 2006

SO2 Emission Scenarios for LTP Project:

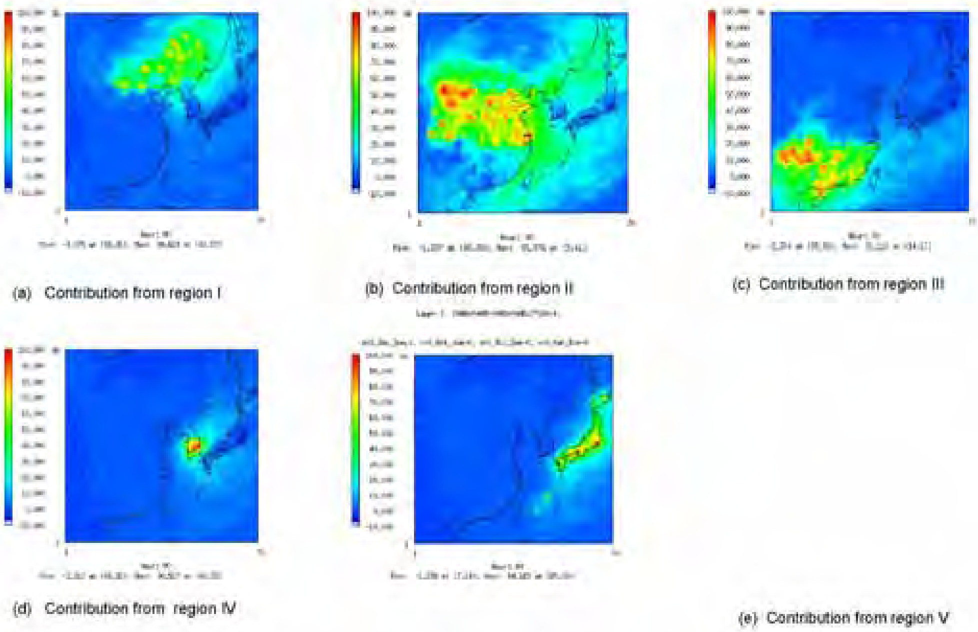


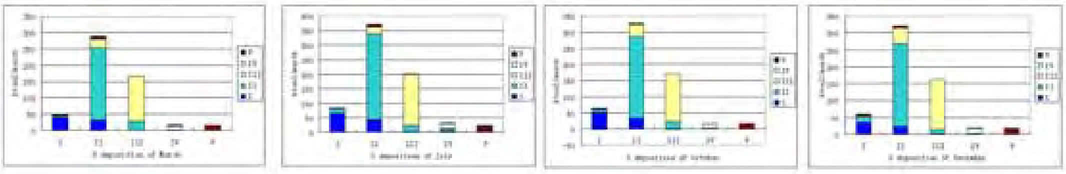
Calculation of Source-Receptor Relationship

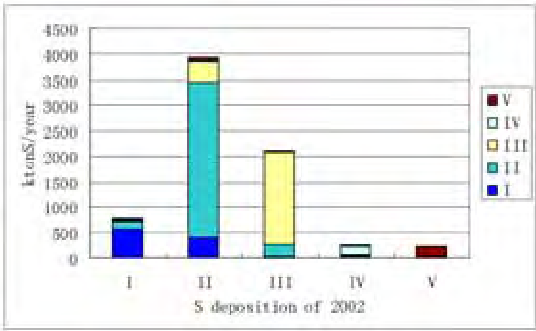
$$Rij = \frac{Hij}{\sum_{i}^{n} Hij} \times 100\ \%$$

- Where *Rij* is the contribution of i-th emission source to j-th receptor; *Hij* is the concentration or deposition amount at j-th receptor due to i-th source. In this study, receptors and emissions are the same 5 regions. *Hij* can be obtained by calculating the difference between the deposition of j region using the all emissions and the deposition using the emission from all regions except i region.

Fig 9. 2002年第i区SO2污染源对S沉降的年平均贡献 (Source-Receptor Relationship) (%).

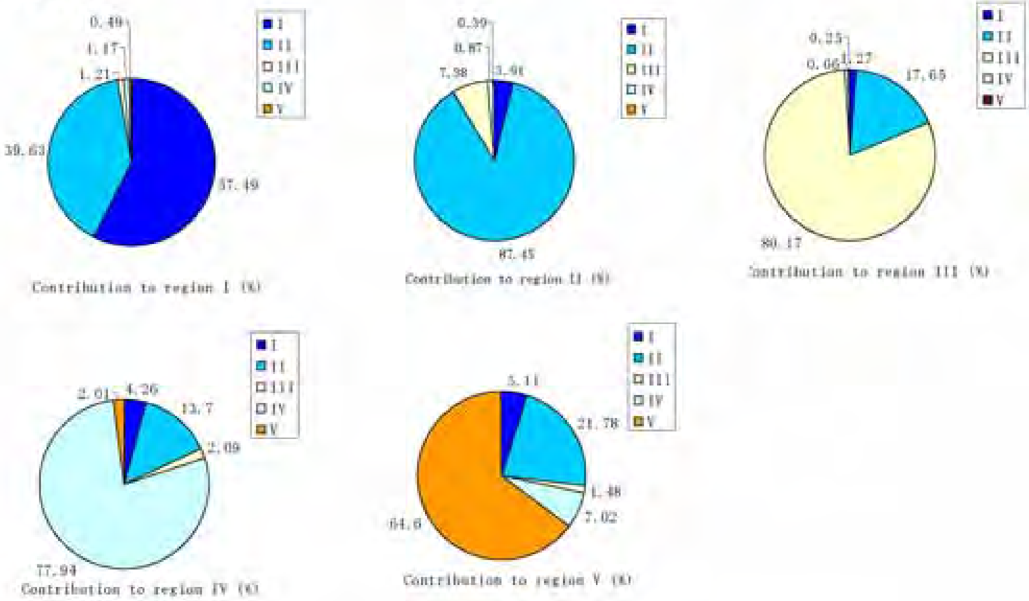




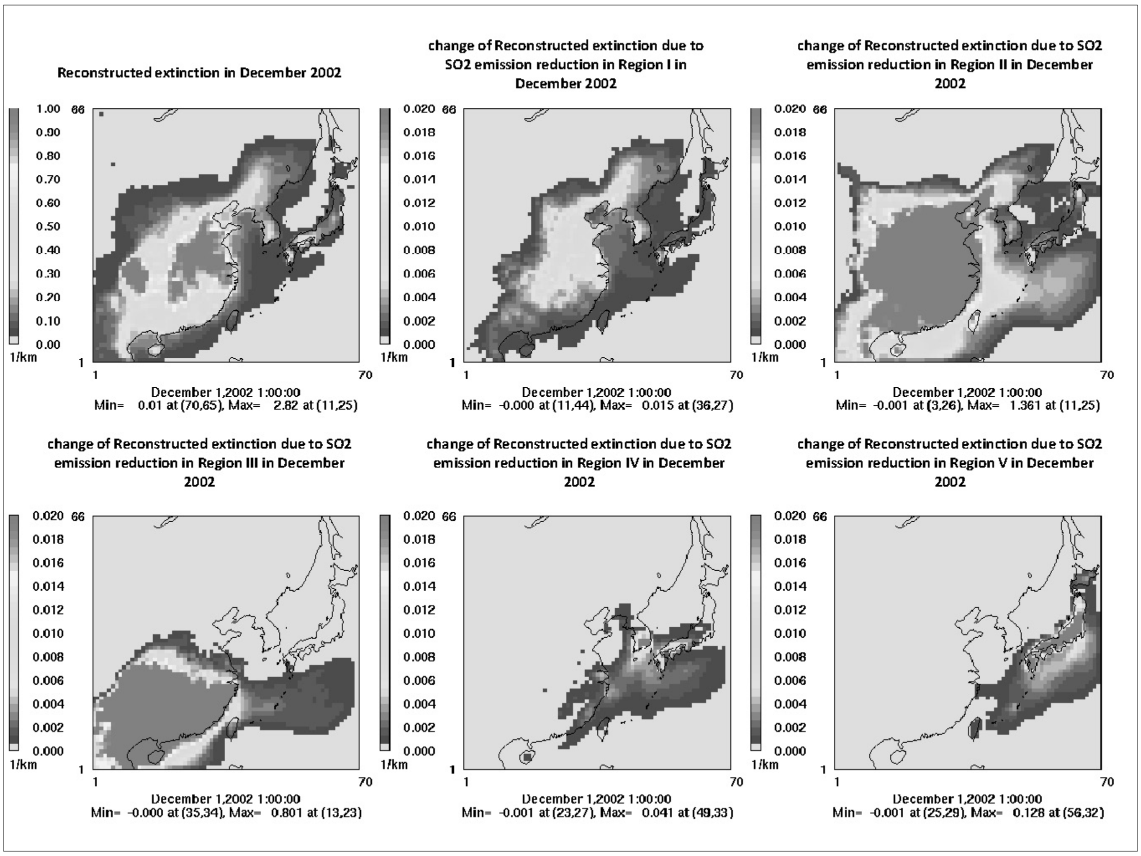


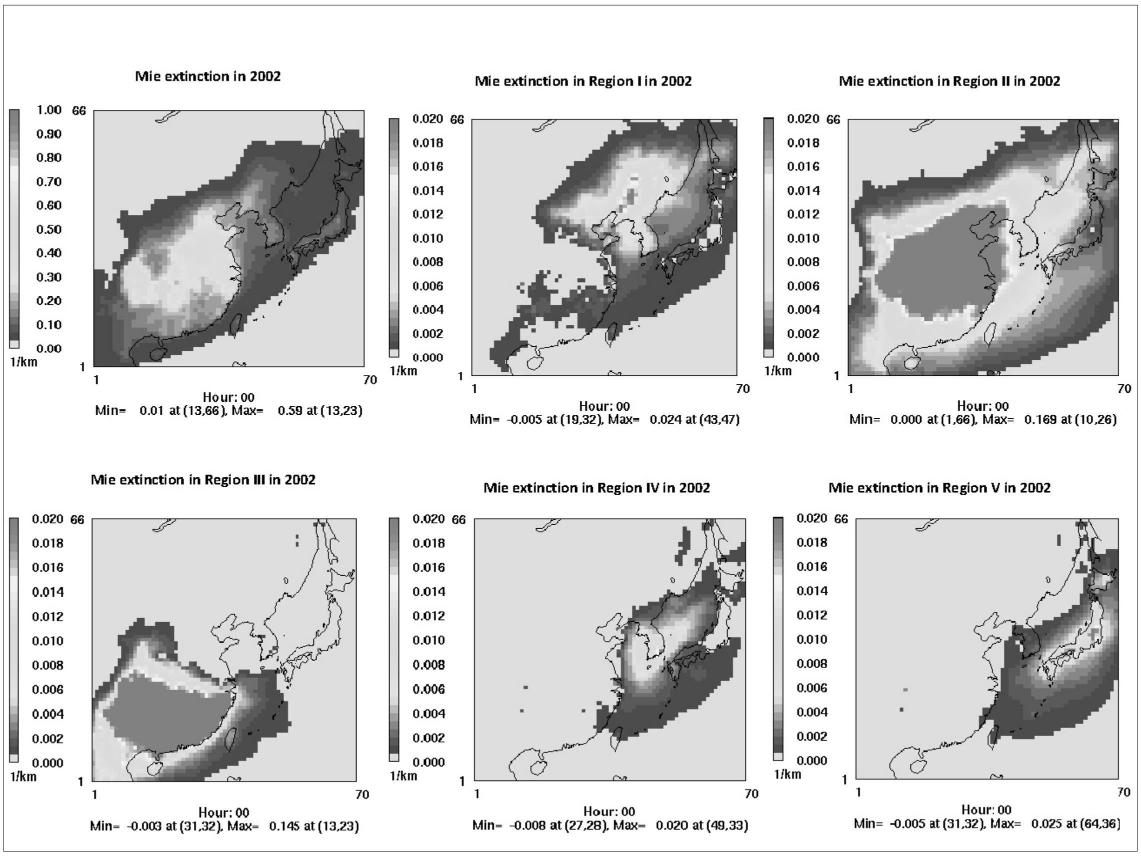
S deposition of 5 LTP regions

Contribution from sources to receptors of sulfur deposition in 2002



Note: SO2 emission from the volcanic island of Miyakejima, Japan not included. The total SO2 emission amounts to 18 Mt from mid of Aug. 2002 to at least December 2003.


Reconstructed extinction in December 2002
December 1,2002 1:00:00
Min= 0.01 at (70,65), Max= 2.82 at (11,25)
change of Reconstructed extinction due to SO2 emission reduction in Region I in December 2002
December 1,2002 1:00:00
Min= -0.000 at (11,44), Max= 0.015 at (36,27)
change of Reconstructed extinction due to SO2 emission reduction in Region II in December 2002
December 1,2002 1:00:00
Min= -0.001 at (3,26), Max= 1.361 at (11,25)
change of Reconstructed extinction due to SO2 emission reduction in Region III in December 2002
December 1,2002 1:00:00
Min= -0.000 at (35,34), Max= 0.801 at (13,23)
change of Reconstructed extinction due to SO2 emission reduction in Region IV in December 2002
December 1,2002 1:00:00
Min= -0.001 at (23,27), Max= 0.041 at (49,33)
change of Reconstructed extinction due to SO2 emission reduction in Region V in December 2002
December 1,2002 1:00:00
Min= -0.001 at (25,29), Max= 0.128 at (56,32)
1/km


Mie extinction in 2002
Hour: 00
Min= 0.01 at (13,66), Max= 0.59 at (13,23)
Mie extinction in Region I in 2002
Hour: 00
Min= -0.005 at (19,32), Max= 0.024 at (43,47)
Mie extinction in Region II in 2002
Hour: 00
Min= 0.000 at (1,66), Max= 0.169 at (10,26)
Mie extinction in Region III in 2002
Hour: 00
Min= -0.003 at (31,32), Max= 0.145 at (13,23)
Mie extinction in Region IV in 2002
Hour: 00
Min= -0.008 at (27,28), Max= 0.020 at (49,33)
Mie extinction in Region V in 2002
Hour: 00
Min= -0.005 at (31,32), Max= 0.025 at (64,36)
1/km

Concentration Difference between Current Case and Scenario II

Oct. 8 2002 0:00 -- Oct. 11 2002 24:00

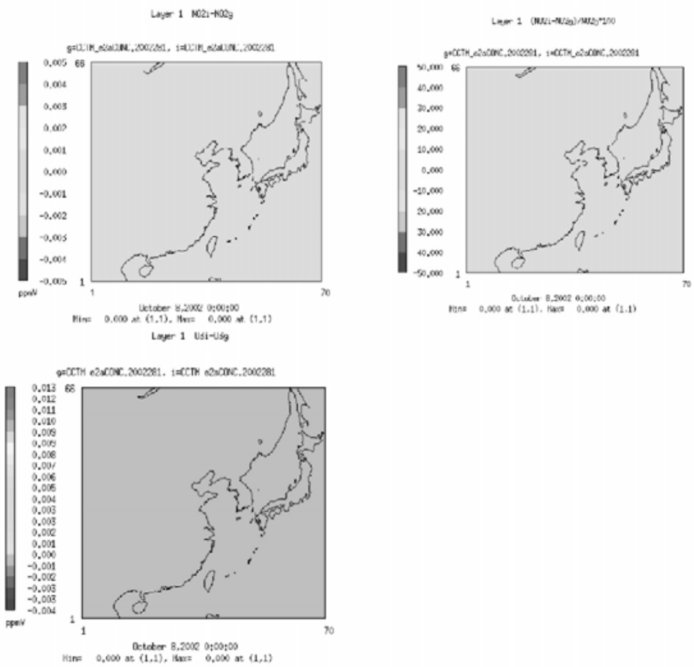
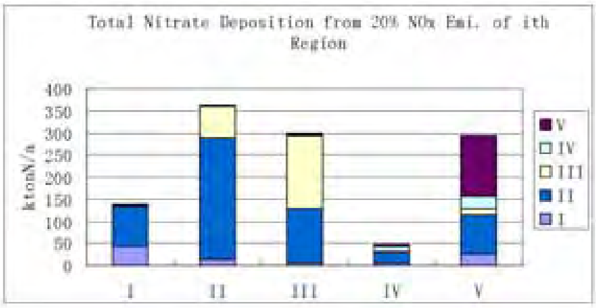
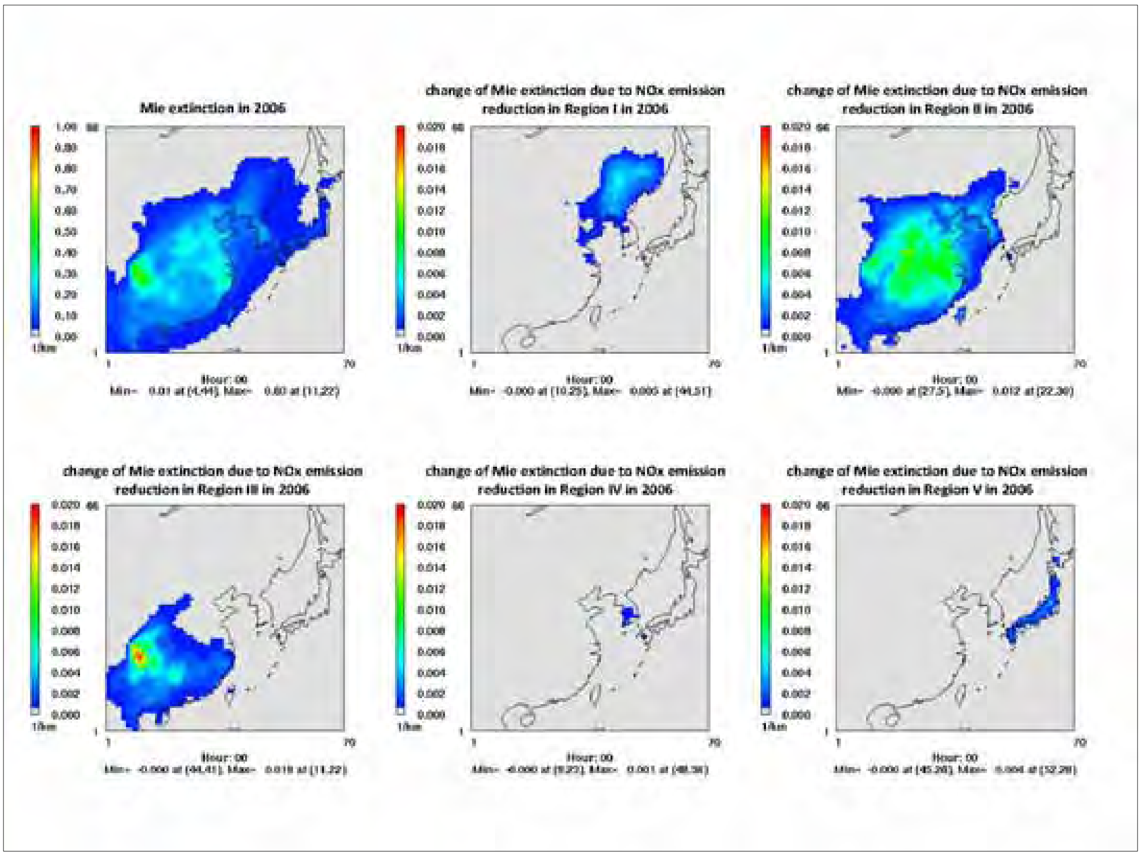
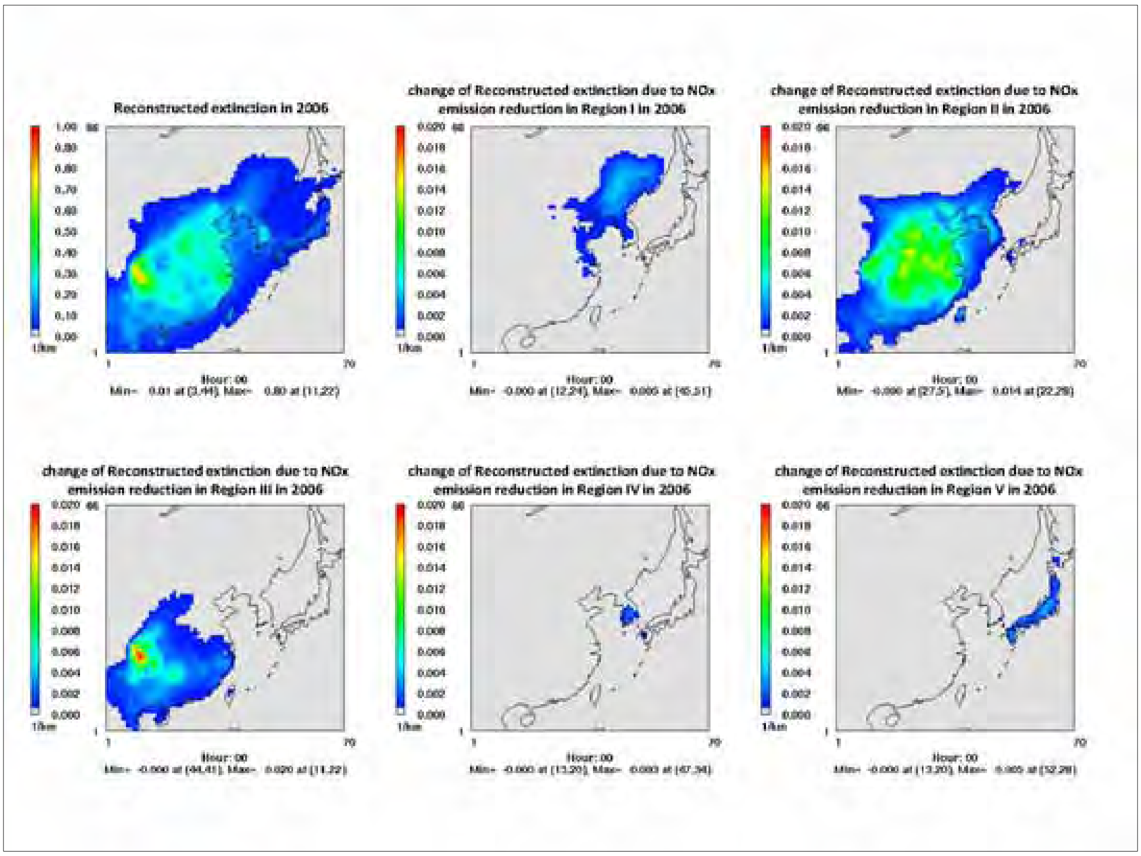


Table 5. Contributions of 20% NOx emission of sources regions to the total nitrate deposition of receptor regions in 2006

S/R	I		II		III		IV		V		Total Dep. from 20% NOx Emi. of ith Region	
	ton	%	ton	%	ton	%	ton	%	ton	%	ton	%
I	42210	6.41	14096	0.789	5352	0.342	4952	1.91	27207	1.78	93817	11.2
II	91574	13.9	274695	15.4	121505	7.76	24222	9.35	87465	5.72	599461	52.1
III	2676	0.406	70626	3.96	167030	10.7	2864	1.11	12610	0.82	255806	17.0
IV	2064	0.313	2308	0.129	2376	0.152	9911	3.82	31068	2.03	47727	6.44
V	567	0.086	1808	0.101	2109	0.135	6324	2.44	134122	8.77	144930	11.5
Total Dep. of ith Region	139091	21.1	363533	20.4	298372	19.1	48273	18.6	292472	19.1	1141741	98.3




Mie extinction in 2006
change of Mie extinction due to NOx emission reduction in Region I in 2006
change of Mie extinction due to NOx emission reduction in Region II in 2006
change of Mie extinction due to NOx emission reduction in Region III in 2006
change of Mie extinction due to NOx emission reduction in Region IV in 2006
change of Mie extinction due to NOx emission reduction in Region V in 2006
Hour: 00


Reconstructed extinction in 2006
change of Reconstructed extinction due to NOx emission reduction in Region I in 2006
change of Reconstructed extinction due to NOx emission reduction in Region II in 2006
change of Reconstructed extinction due to NOx emission reduction in Region III in 2006
change of Reconstructed extinction due to NOx emission reduction in Region IV in 2006
change of Reconstructed extinction due to NOx emission reduction in Region V in 2006
Hour: 00

Conclusions

- The research of LTP and ABC revealed that the regional air pollution exists. There are still many questions to be answered about the extend, strength, and trend of the this regional problem. Their impacts on health and the effect on climate are also unclear.
- The control of regional air pollution is a challenge to Northeast Asian countries. The problem can only be solved based on scientific understanding and joint efforts.
- Cooperation in science research can maximum the effort of each country. The ongoing research projects of Korea, Japan and China are good examples.
- The potential areas of further collaboration and cooperation for regional air pollution Northeast Asia include O3 and its precursor, aerosol, acid deposition, climate effects of aerosol or haze, toxic air pollutants etc. Emission Estimation and control for sand storm, biomass burning also need to be addressed.

Session Ⅳ	**Collaboration in the Future** (chaired by NIES President)

4-1 Proposal of New cooperative project

- Risk assessment and safety guideline on recycled products
  - Senior researcher, Dong-Jin LEE, NIER, Korea

4-1 Proposal of New cooperative project

- Risk assessment and safety guideline on recycled products

Risk Assessment and Safety Guideline on Recycled products

2009. 11. 26

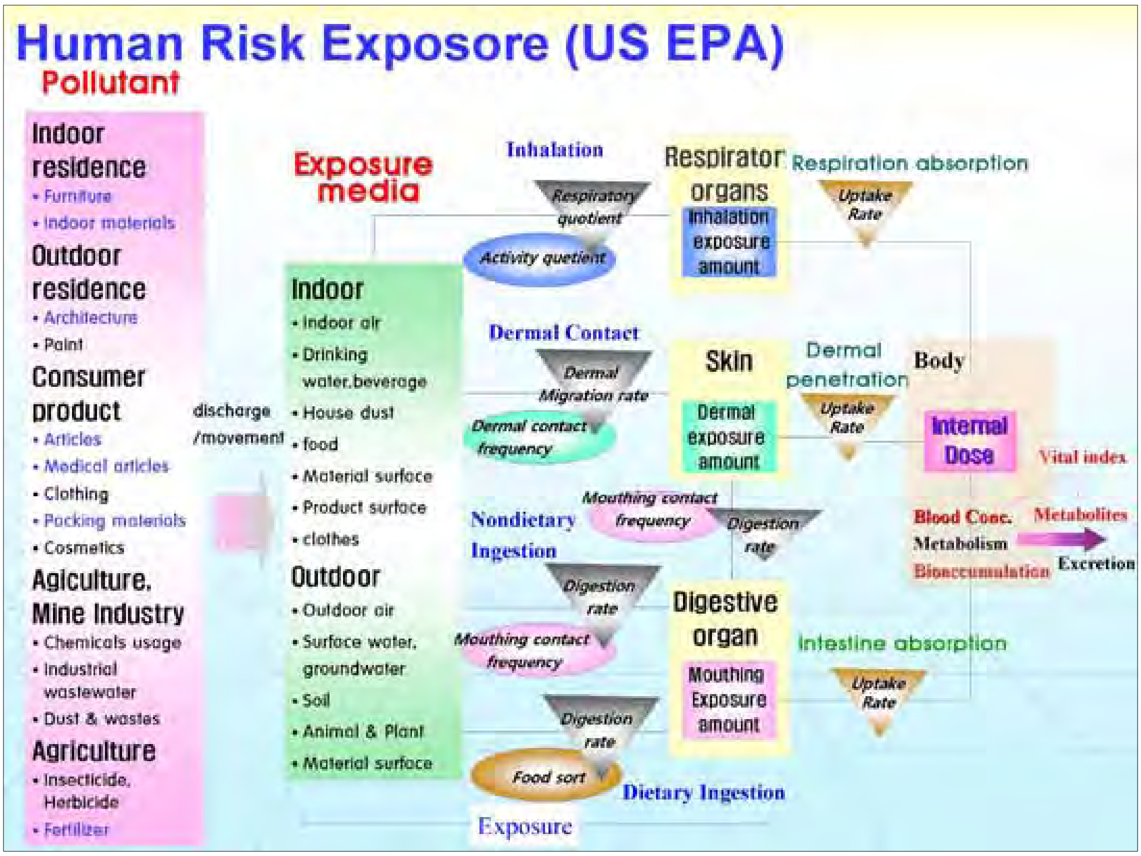
National Institute of Environmental Research (NIER)

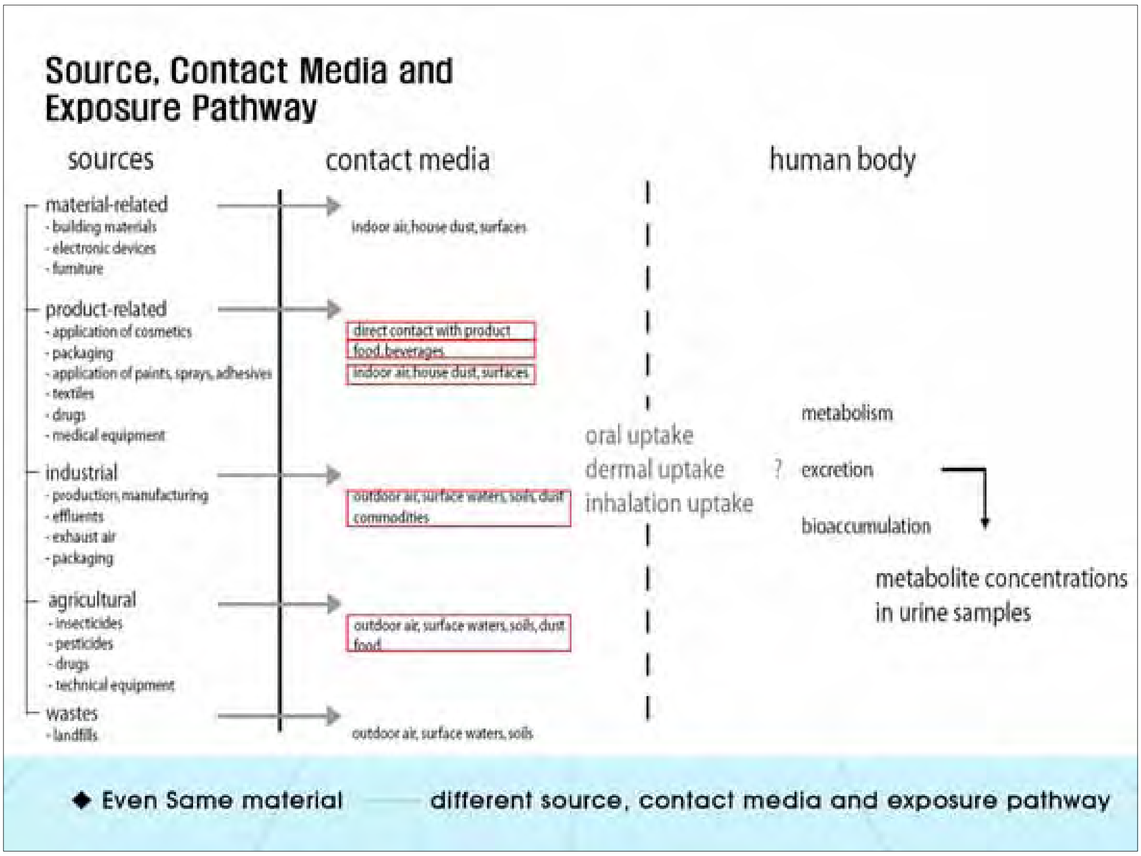
Lee, Dong-Jin

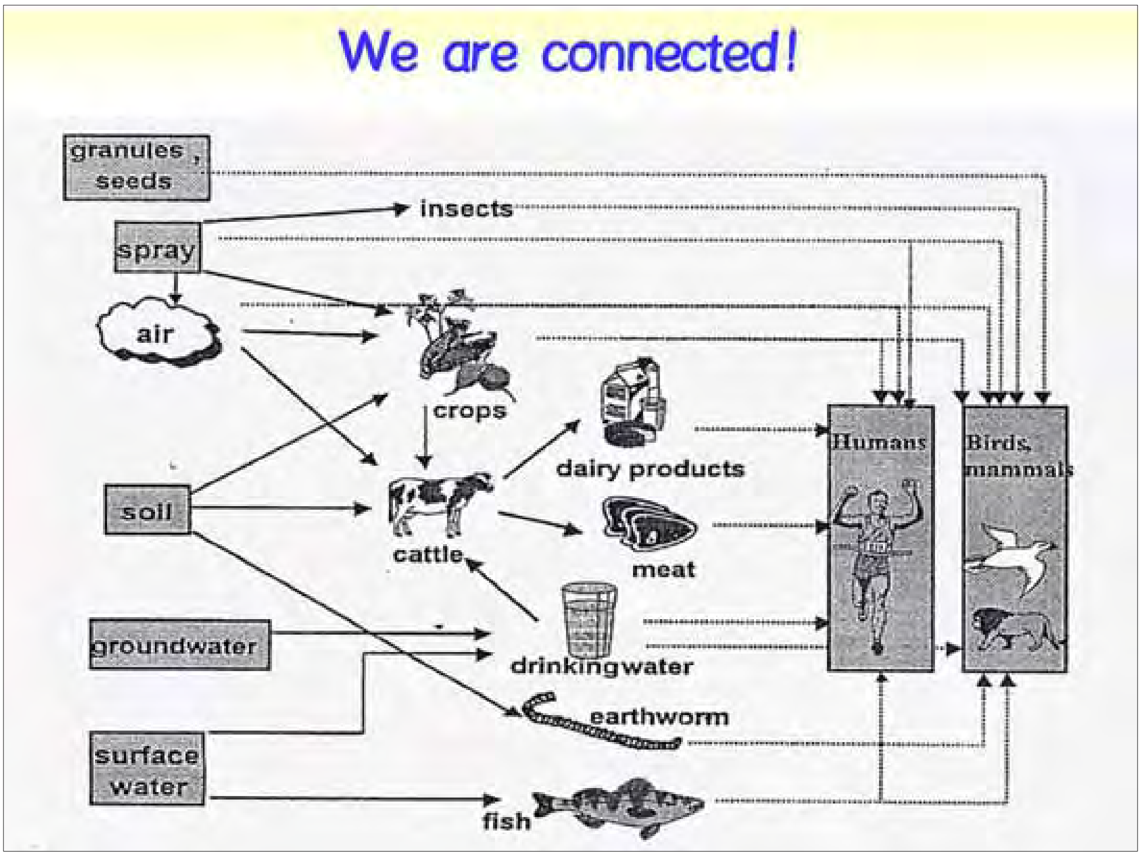
Outline

1. Introduction of Risk Assessment of products
2. Methodology of Risk Assessment of products
3. Introduction of Recycled products
4. Further Plan


1.
Introduction of Risk Assessment of products


Human Risk Exposore (US EPA)
Pollutant
Indoor residence
• Furniture
• Indoor materials
Outdoor residence
• Architecture
• Paint
Consumer product
• Articles
• Medical articles
• Clothing
• Packing materials
• Cosmetics
Agiculture, Mine Industry
• Chemicals usage
• Industrial wastewater
• Dust & wastes
Agriculture
• Insecticide, Herbicide
• Fertilizer
discharge /movement
Exposure media
Indoor
• Indoor air
• Drinking water,beverage
• House dust
• food
• Material surface
• Product surface
• clothes
Outdoor
• Outdoor air
• Surface water, groundwater
• Soil
• Animal & Plant
• Material surface
Inhalation
Respiratory quotient
Activity quetient
Dermal Contact
Dermal Migration rate
Dermal contact frequency
Mouthing contact frequency
Nondietary Ingestion
Digestion rate
Mouthing contact frequency
Digestion rate
Food sort
Dietary Ingestion
Exposure
Respiratory organs
Inhalation exposure amount
Skin
Dermal exposure amount
Digestion rate
Digestive organ
Mouthing Exposure amount
Respiration absorption
Uptake Rate
Dermal penetration
Uptake Rate
Intestine absorption
Uptake Rate
Body
Internal Dose
Vital index
Blood Conc.
Metabolism
Bioaccumulation
Metabolites
Excretion

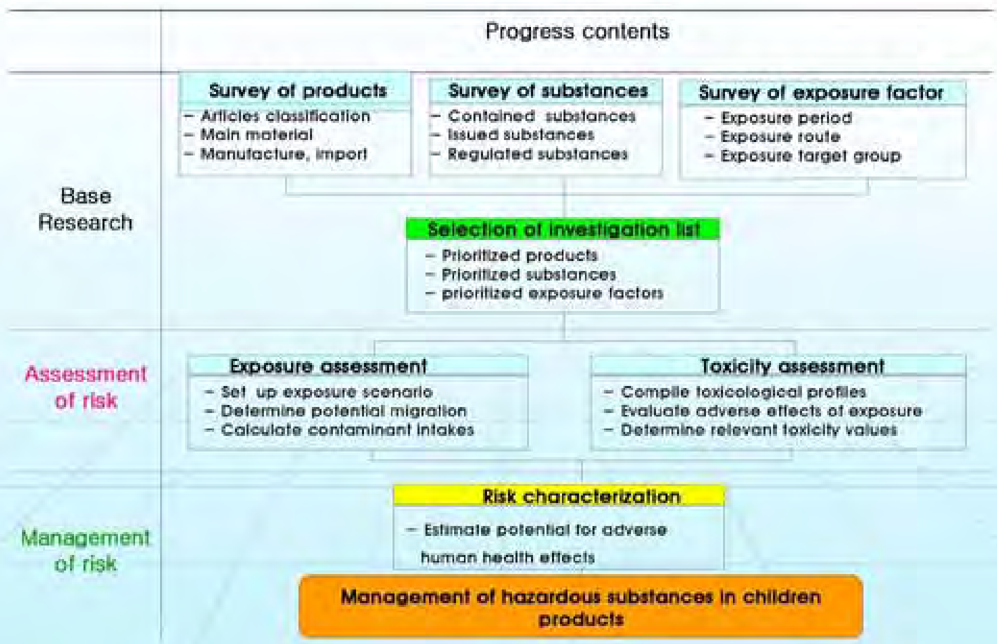

Source, Contact Media and
Exposure Pathway
sources
contact media
human body
material-related
- building materials
- electronic devices
- furniture
indoor air, house dust, surfaces
product-related
- application of cosmetics
- packaging
- application of paints, sprays, adhesives
- textiles
- drugs
- medical equipment
direct contact with product
food, beverages
indoor air, house dust, surfaces
industrial
- production, manufacturing
- effluents
- exhaust air
- packaging
outdoor air, surface waters, soils, dust
commodities
agricultural
- insecticides
- pesticides
- drugs
- technical equipment
outdoor air, surface waters, soils, dust
food
wastes
- landfills
outdoor air, surface waters, soils
oral uptake
dermal uptake
inhalation uptake
?
metabolism
excretion
bioaccumulation
metabolite concentrations
in urine samples
◆ Even Same material
different source, contact media and exposure pathway


We are connected!
granules, seeds
spray
insects
air
crops
soil
cattle
dairy products
meat
groundwater
drinkingwater
surface water
earthworm
fish
Humans
Birds, mammals

2. Methodology of Risk Assessment of products

- Case study : children product

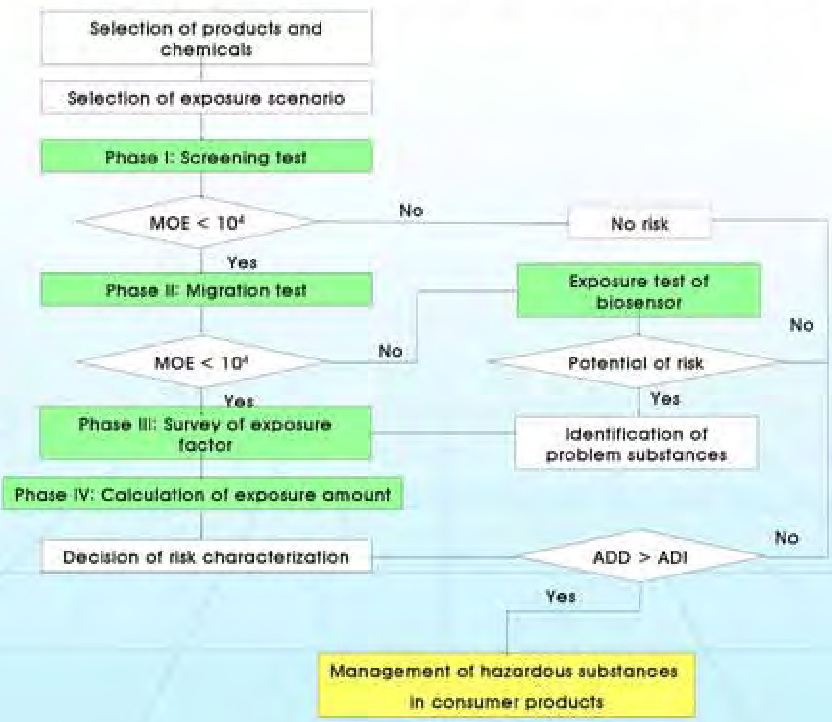
Flow chart on the risk assessment of hazardous substances in children products



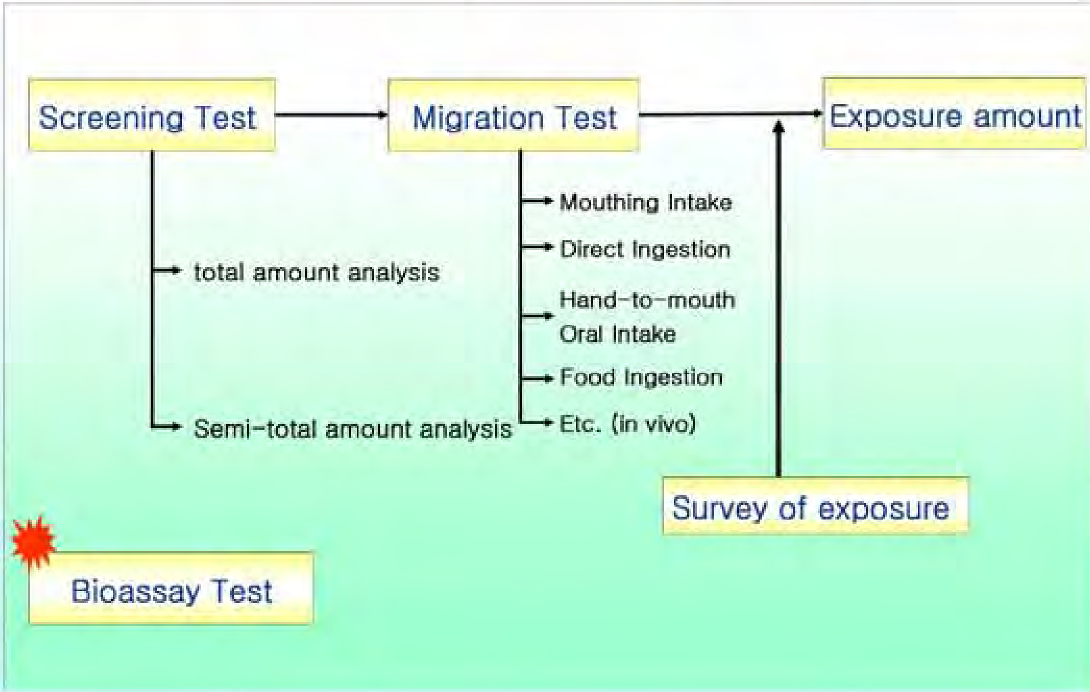
Items of hazardous chemicals

Group (18)		Chemicals (153)
Metal		Mn, Cr, Co, Ni, Cu, Zn, Ar, Se, Sr, Cd, Sn, Sb, Ba, Hg, Pb
Flame retardants		Tri-o-cresyl phosphate, Tris(2-chloroethyl) phosphate
Colourants		Disperse Blue 1, Disperse Blue 3, Disperse Blue 106, Disperse Blue 124, Disperse Yellow 3, Disperse Orange 3, Disperse Orange 37/76, Disperse Red 1, Solvent Yellow 1, Solvent Yellow 2, Solvent Yellow 3, Basic Red 9, Basic Violet 1, Basic Violet 3, Acid Red 26, Acid Violet 49
Monomers(migration)		Acrylamide, Bisphenol A, Formaldehyde, Phenol, Styrene
Slovents	migration	Trichloroethylene, Dichloromethane, 2-Methoxyethyl acetate, 2-Ethoxyethanol, 2-Ethoxyethyl acetate, Bis(2-methoxyehtyl) ether, 2-Methoxypropyl acetate, Methanol, Nitrobenzene, Cyclohexane, 3,5,5-Trimethyl-2-cyclohexene-1-one, Toluene, Ethylbenzene, Xylene(all isomers)
	inhalation	Toluene, Ethylbenzene, Xylene(all isomers), 1,3,5-Trimethylbenzene, Trichloroethylene, Dichloromethane, n-Hexane, Nitrobenzene, Cyclohexanone, 3,5,5-Trimethyl-2-cyclohexane-1-one
Wood presertatives		Pentachlorophenol and its salts, Lindane, Cyfluthrin, Cypermethrin,Deltamethrin, Permethrin
Presertatives(except wood preservatives)		Phenol, 1,2-Benzylisothiazolin-3-one, 2-Methyl-4-isothiazolin-3-one, 5-Chloro-2-methyl-4-isothiazolin-3-one, 5-Chloro-2-methyl-4-isothiazolin-3-one + 2-methyl-4-isothiazolin-3-one, Formaldehyde (free)
Plasticisers(migration)		Triphenyl phosphate, Tri-o-cresyl phosphate, Tri-m-cresyl phosphate, Tri-p-cresyl phosphate
Organo Tin compounds		MBT (Butyltin), DBT (Dibutyltin), TBT (Tributyltin), TTBT (Tetrabutyltin), MOT (Octyltin), DOT (Dioctyltin), TCyT (Tricyclohexyltin)
PBBs		Bromobiphenyl, Dibromobiphenyl, Tribromobiphenyl, Tetrabromobiphenyl, Pentabromobiphenyl, Hexabromobiphenyl, Heptabromobiphenyl,Octabromobiphenyl, Nonabromobiphenyl, Decabromobiphenyl
TDBPP		Penta-PBDE, Octa-PBDE, Deca-PBDE, Tetrabromobisphenol A, Hexabromocyclododecane, TDBPP
PAHs		Benzo[a]anthracene, Benzo[a]pyrene, Dibenzo[a,h]anthracene
Chlorinated Benzene and Toluene		Dichlorobenzenes, Trichlorobenzenes, Tetrachlorobenzenes, Pentachlorobenzenes, Hexachlorobenzenes, Chlorotoluenes, Dichlorotoluenes, Trichlorotoluenes,Tetrachlorotoluenes, Pentachlorotoluenes
Azo compounds		4-Aminodiphenyl, Benzidine, 4-Chloro-o-toluidine, 2-Naphtylamine, o-Aminoazotoluene, 2-Amino-4-nitrotoluene, P-Chloroaniline, 2,4Diaminoanisole, 4,4'-Diaminodiphenylmethane, 3,3'-Dichlorobenzidine, 3,3'-Dimethoxybenzidine,3,3'-Dimethylbenzidine, 3,3'-Dimethyl-4,4'-Diaminodiphenylmethane, p-Kresidine, 4,4'-Methylene-bis-(2-chloroaniline), 4,4'-Oxydianiline, 4,4'-Thiodianiline, o-Toluidine, 2,4-Toluylenediamine, 2,4,5-Trimethylaniline, 2-Methoxyaniline,4-Amino-azo-benzene
Phthalates		DINP, DEHP, DNOP, DIDP, DBP, BBP
Vulcanization accelerator		2-mercaptobenzothiazole (MBT), Dialkyldithiocarbamate, Dialkylthiuram
Antioxidant		2,6-bis-(1,1-dimethylethyl)-4-methylphenol (BHT), 2,2-methylene-bis-(6-(1,1-dimethylethyl)-4-methylphenol)
PCBs		Chlorobiphenyl, Dichlorobiphenyl, Trichlorobiphenyl, Tetrachlorobiphenyl, Pentachlorobiphenyl, Hexachlorobiphenyl, Heptachlorobiphenyl, Octachlorobiphenyl, Nonachlorobiphenyl, Decachlorobiphenyl

Flow chart for analysis of exposure amount



Calculation of exposure amount



Ⅲ -1. 함유 여부 조사 – 전처리 방법

Screening Test Method

	Metals	Wood Presetaves	Monomer Plasticisers Phthalate	Nitrosamine	Formaldehyde
Material	All	wood	Synthetic resin	Synthetic rubber	Wood Synthetic resin
Pretreat-ment	EN 71 Part 3	EN 71 Part 9	solvent + ultrasonic wave (DCM, 2hr)		ISO 14184
	1M HCl 1:50 mixing	distilled water, ethanol	DCM 1:125 mixing		Extracting by distilled water
Instrument	ICP	GC/MS	GC/MS		HPLC

Experimental method for migration rate

Mouthing Intake

Leaching test by artificial saliva (30 min ; Head-over-heal (H-o-H) ; 37 ˚C ; 60 rpm)

Analysis of Upper liquid after extracting organic substances

Direct Ingestion

Leaching test by artificial gastric juice (0.07M HCl+ digestive juice) (1 hr; Shaking; 37 ˚C; 60 rpm)

Analysis of Upper liquid after extracting organic substances

Food Ingestion

Leaching test by artificial extraction fluid (water, acetic acid, ethanol, olive oil) (2 ml/cm2; 30minu-tes; 60 ˚C; hand shaking or H-o-H)

Analysis of Upper liquid after extracting organic substances

Hand-to-mouth Oral Intake

Leaching test by artificial sweet

10 mins contact on the products by artificial sweet

Extracting artificial skin by acid after extracting organic substances

Application of Migration Analysis

	Classification	Exposure route			
		Mouthing intake	Direct digestion	Hand-to-mouth	Food digestion
Nursing/ weaning product	Nursing bottle	x	x	x	O
	Pacifier	O	x	x	x
	Tooth developer	O	x	x	x
	Mother'milk pack	x	x	x	O
	Soup bowl	O	x	x	O
	Baby cup	O	x	x	O
Toys/ accessory	Plastic block	O	O	O	x
	Plastic doll	O	O	O	x
	Doll others	O	O	O	x
	Wooden block	O	O	x	x
	Wooden doll	O	O	O	x
	accessories	O	O	O	x

Calculation of exposure amount by *Exposure Model*

Direct Igestion
(Wormuth, 2006)

$$E_{prod\_ing} = \frac{C_{pro}}{}$$

- Eprod_ing: 제품 섭취를 통
- Cprod: 제품내 물질의 농도
- qprod_ing: 일일 제품 섭취
- f uptake: 섭취 효율, 섭취,
- bw: 체중 (kg)

Food-Contact
(Washburn et al. 2

$$I_{ofo} = \frac{X \times FT \times}{}$$

- Iofo: 음식으로 전이된 제품
- X: 제품에 존재하는 유해물
- FT: 접촉시 음식으로 이동
- Evfa: 제품과 음식이 접촉
- Af: 음식에 접촉하는 제품
- ABS_o: 경구 흡수율, Oral A

Hand-To-Mouth Exposure Model

○ *Washburn et al. 2005)*

$$I_{oha} = \frac{X \times FT \times EV_a \times SA_a \times STF \times ABS_o}{BW}$$

- Ioha: 손에 묻어 경구노출되는 노출량 (mg/kg/d)
- X: 제품에 존재하는 유해물질 농도 (mg/cm²)
- FT: 접촉시 손으로 이동하는 비율 (1/event)
- EVa: 일일 접촉 빈도 (event/day)
- EVa: 일일 접촉 빈도 (event/day)
- SAa: 입에 접촉하는 피부의 면적 (cm²)
- STF: 피부(손)에서 침으로 전이되는 비율 (fraction
- ABS_o: 경구 흡수율, Oral Absorption Factor (fraction))
- BW: 체중 (kg)

○ *CPSC, 2006*

ADD = (M X F X Sh X Fh) / W

- ADD: average daily dose (mg/kg/d)
- M: amount of chemical that migrateds to the product
- F: fraction transferred from the product to the hand (fraction))
- Sh: surface area of the hand that is mouthed (cm²)
- Fh: hand to mouth transfer factor (1/d)
- W: body weight (kg)

odel

E = (S X Rr X Tm X Ru) / bw

되는 물질의 양 (mg/cm²/hr)

fraction)

$$I_{oma} = \frac{X \times FT \times EV_m \times A_m \times ABS_o}{BW}$$

vent)

actor (fraction)

ADD = (M X Sm X Fm) / W

s mouthed (cm2)

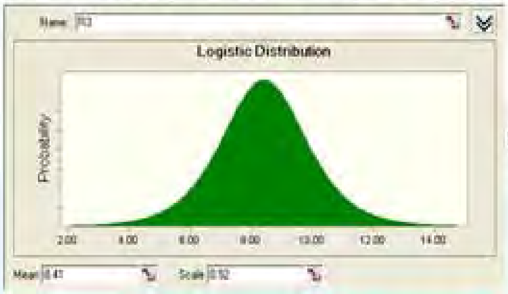
tor (1/d)

Decision of exposure factors

by *Exposure Model*

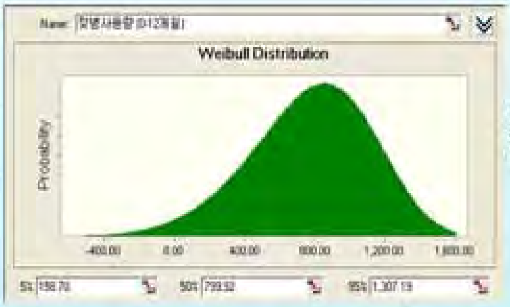
(Ingestion)
ADD (ug/kg bw/day) = migration rate (ug/ml) X feeding amount (ml/day)/ weight (kg)

Exposure factor	
weight (kg)	
0-12 months	[illegible]
13-24 months	[illegible]
Feeding amount (ml/day)	
0-12 months	986.7
13-24 months	30.89



Distribution of weight (kg) : 0-12months

product	Usage	Migration rate(ug/ml)
1-A	port	0.0012
1-B	port	0.0069
1-C	port	0.0005
1-D	port	0.0052
1-A	Electric fan	0.0004
1-B	Electric fan	0.0029
1-C	Electric fan	0.0014
1-D	Electric fan	0.0000



Distribution of Usage amount (ml/day) : (0-12months)

Decision of exposure factors

by *Exposure Model*

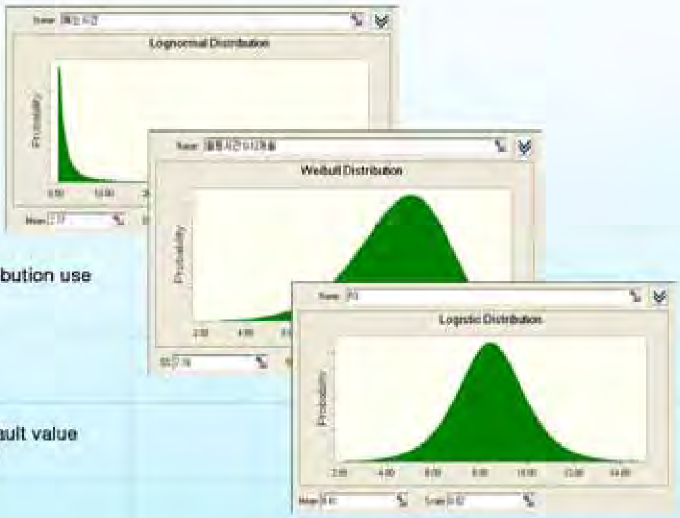
(Mouthing)
ADD (ug/kg bw/day) =
Migration rate (ug/cm2/min) X sucking time (min/hr) X area sucking product (10 cm2) X activity time (hr/day) / body wight (kg)

(Ingestion)
ADD (ug/kg bw/day) =
Migration rate (ug/g) X digestion amount of product (0.008g/day) / body weight (kg)

Exposure factor	
Sucking time(min/hr)	2.77
Activity time (hr/day)	
0-12months	13.97
13-24months	14.48
25-36months	13.18
37-60months	13.59
Body weight (kg)	
0-12months	10.97
13-24months	10.56
25-36months	11.39
37-60months	15.94
Sucking area (cm2)	10
Digestion amount (g/day)	0.008

Distribution use

Default value use



Decision of exposure factors by *Exposure Model*

For exsample

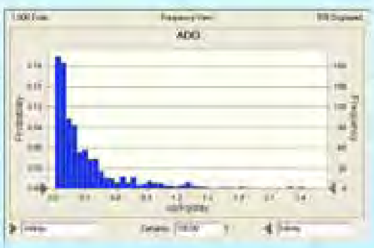
weight (kg)

activity time (hr/day)

Mouthing time (min/hr)

ADD (ug/kg bw/day) = Migration Rate (ug/cm2/min) X Mouthing Time (min/hr) X Active Hour (hr/day) X Mouthing Area (cm2) / Body Weight (kg)

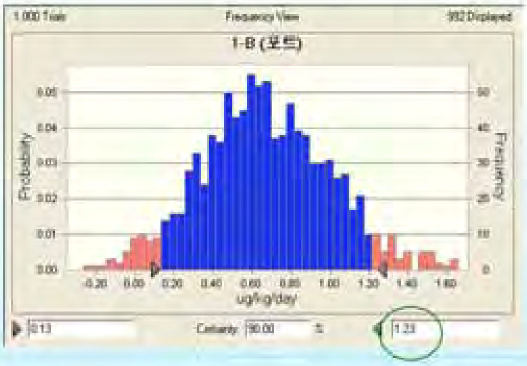
Migration rate (ug/cm2/min)



Exsample of exposure amount of nursing bottle – *Bisphenol A case*

age	product	Exposure amount (ug/kg/day)	higher 95 percentile	Ratio to TDI 95 percentile (%)
0-12months	1-A	0.12	**0.21**	0.4
port	1-B	0.71	**1.23**	2.5
	1-C	0.05	**0.09**	0.2
	1-D	0.54	**0.93**	1.9
13-24months	1-A	0.00	**0.12**	0.2
port	1-B	0.02	**0.72**	1.4
	1-C	0.00	**0.05**	0.1
	1-D	0.01	**0.55**	1.1
0-12months	1-A	0.04	**0.07**	0.1
Electric oven	1-B	0.30	**0.51**	1.0
	1-C	0.14	**0.25**	0.5
	1-D	0.00	**0.00**	0.0
13-24months	1-A	0.00	**0.04**	0.1
Electric oven	1-B	0.01	**0.31**	0.6
	1-C	0.00	**0.15**	0.3
	1-D	0.00	**0.00**	0.0

RfD (ug/kg/day)
: 50 (U.S EPA 1998)



3. Outline of Recycled products

List of Recycled Products
in permitted and stated companies for waste recycling

1. Waste acid

material	- Recycled $Al_2(SO_4)_3$ - phosphoric acid	- Recycled $Fecl_2$, $Fecl_3$ - Hydrochloric acid	- Recycled nickel sulfate($NiSO_4$)
Recycled product	- Sulface grease	- Zinc sulfate fertilizer	

2. Waste alkali

material	- Ni scarap - Copper oxide(Cu_2O)	- Cd ingot - Pd	- NaOH
Recycled product	- Nickel - cadmium battery		

3. Waste synthetic polymer compound

material	- PE - PP - ABS - PET - PVC	- PC - HDPE - SAN - Reclaimed rubber chip - Elastic packaging chip	- Tire chip - RDF - RPF(solid fuel) - Methyl-metal monoraid
Recycled product	- Rubber block - Rubber matte - Elastic bottom ash - Sanitary rubber product - Container(food packaging) - Water pipe - Sewage disposal tank - Bottom ash	- Rubber box - Boundary stone - Rubber rope - string - Agricultural vinylstring - Agricultural reflectionfilm - Insulation - Liner	- band - box - Protection box - Gutter guard - sheet - synthetic resin flexible cable tube

4. Incineration bottom ash and fly ash

material	- Regeneration sand - cobalt	- Cement subsidiary material	- Incineration fuel
Recycled product	- Filling material - Top - soil layer - compost	- brick - regeneration block - Roofing tile	- Thermal incineration - feed - compost

5. Food waste

material	- fertilizer.compost.feed, material		
Recycled product	- Fertilizer	- Compost	- feed

6. Waste refractories and ceramic wire drift

material	- Plate glass - MaO-C.castable (fefractories material) - Cement subsidiary material	- Smash glass - Slag powder - recycled aggregate - alumina	- Regeneration glass sand - Stone powder - Iron sharing - platinum
Recycled product	- Subgrade material - block	- Top - soil layer - road blocd	- Filling material - Heat insulating material (glass wool insulating material)

7. Dust

material	- Cement material - lead - manganese	- recycled aggregate - gold-silver ash - vanadium	- Solid fuel - copper ash - stainless steel
Recycled product	- Blast furnace slag cement - Road material	- Top - soil layer - brick(fire, solid)	- Filling material - fertilizer

8. sludges

material	- recycled aggregate - Cement subsidiary material - Ni - Copper ash - nickel sulfate	- Lime chip - alloy - gold - Alloy iron	- Coal ash - Al - lead - Aluminum sulfate
Recycled product	- Mixed concreate - Top - soil layer - Product Compost	- Subgrade material - Reinforced soil green - Organic fertilizer	- Fill material - soil green - feed

9. Waste fibers

material	- Needle felt - fabric	- felt - Polyester fiber	- Wool fiber material - spinning wool material - fuel
Recycled product	- clothes - Thermal insulation material	- Fiber branch pipe	- Sound absorbing plate

10. Waste leathers

material	- Leather fabric	- Leather scrap	- cowhide
Recycled product	- Organic fertilizer		

11. Waste battery

material	- Lead lump - zinc lump - Ammonium phosphate	- manganese - cadmium	- nonferrous metal - nickel
Recycled product	- Regeneration battery	- battery	

12. Waste limes

material	- Blast furnace slag powder - Calcium hydroxide	- Regeneration aggregate - Refine gypsum	- Phosphate refine lime
Recycled product	- Top - soil layer - fertilizer - chalk	- asphalt filler - land conditioner	- Blast furnace slag cement - Gypsum board

13. slag

material	- slag - coal ash - Zn - Au	- Regeneration soil - cement material - Al - pd	- Regeneration molding sand - slag - Ni - Alloy
Recycled product	- silicate fertilizer - Top - soil layer	- soil conditioner - Filling material	- Thermal insulation material (mineral wool)

14. metals

material	- aluminum alloy lump - stainless	- aluminum	- Deoxidation agent
Recycled product	- Metal can	- Wire netting	

15. organism residue

material	- Soybean oil - chitosan	- Chicken oil - Dry beer yeast	- cuttlefishes
Recycled product	- fertilizer - Ground bait	- feed	-Compost

16. Waste wood chip

material	- Squre wooden stick - waste forest tree - Sawdust(compost) - ignition briquet	- Wood chip - Fertilizer material - Solid fuel	- sawdust - Compost material - Auxiliary fuel
Recycled product	- Filling material - particle board - charcoal - Bottom ash	- Children playground chair - Boundary fence - Corrugated board box - Paking box	- Regeneration pallet - Cable drum

17. Waste organic solvent

material	- MC - ANT - IPA - TCE - D.M.F - VAM	- THF - PGMEA - acetone - solvent - thinner - toluene	-polyol - NaOH - methanol - cleaner - Coationg solution - stripper
Recycled product	- Refined oil - cutting oil	- Machine oil - rust preventive oil	- hydraulic fluid

18. Waste oil

material	- DOP	- stripper	- Feeing oil paper
Recycled product	- Lubricating oil - Machine oil - Rust preventive oil	- Grinding oil - hydraulic fluid - Grease	- Cutting oil - fuel oil(refined) - Regeneration soap

19. Waste absorbent

material	- gold	- silver	- Alloy copper lump
Recycled product	- Regeneration powdered coal - compost	- Regeneration activated cabon	- Absorbent

20. Waste catalysts

Material	- Vanadium - nickel catalyst	- molybdenum - platinum catalyst	- palladium
Recycled product	- cement	- Slag cement	

21. Waste sanddust – sandblast

material	- Cement material - Regeneration sand dust	- Regeneration sand	- Dry sand
Recycled product	- share protection block - Filling material	- brick	- Top - soil layer

22. Waste paper

material	- Compression form - heat source	- Compression waste paper	- Paper scrap
Recycled product	- Regeneration paper - Toilet paper fabric	- box	- Toilet paper

Contents for the research

- ☐ *Set up the priority inventory of recycled products for risk assessment(RA)*
- ☐ *Develop methodology of RA on the recycled product*
  - *– analytical method of environmental release & migration test*
  - *– modeling of RA for the exposure of human health & environment*
- ☐ *Practice RA on the recycled product*
- ☐ *Propose the safety guideline of recycled product*

Safe society from hazardous substances in recycled products

4. Further Plan

Suggestion for Further joint Work

The main point of research areas

- □ to establish *the analytical methods* for investigating environment release & migration rate of target substances
- □ to develop *the assessment modeling on environment release* and exposure amount from recycled products
- □ to establish *determination methods on environmental safety quality* and proposing its guidelines for target substances

Suggestion

- *to make priority inventory of recycled products for the RA*
- *to share detail roles(research areas) of each institute*
- *to have the open telecommuication or face-to-face meeting formally & informally and sometimes personal exchange*

Thank you



Workshop of The Sixth TPM

[Tripartite Presidents Meeting among NIER, CRAES and NIES]

Realization of Low Carbon Society through Climate Change Adaptation

- **Nov. 25 ~ 28, 2009**
- **SEOUL LOTTE HOTEL**

National Institute of Environmental Research
Republic of Korea

Workshop of TPM6
Opening Remarks

President. Seung-Joon YOON
National Institute of Environmental Research

It is my great pleasure to welcome you all to thisworkshop on "Realization of Low Carbon Society through Climate Change Adaptation."

Over the past year or so, the global financial crisis has been the biggest challenge of all. Despite this economic crisis, global community continues to make its efforts to tackle climate change. More and more governments around the world are working together for a new "green growth" paradigm based on low-carbon economic development. It is my understanding that we, three nations, are also headed in the direction of green growth.

In Korea, President Lee Myung-Bak announced "Low Carbon, Green Growth" as a new national vision in August 2008. The Green Growth is a sustainable growth that reduces greenhouse gases and environmental degradation and a new national development paradigm that creates new growth engines and jobs. To achieve the goal, the government will invest 38 billion dollars over the next four years on "Green New Deal" project for the development of green and low-carbon infrastructure.
In line with this, although Korea is not an Annex-Ⅰ country, however, we have set a voluntary national 2020 target for greenhouse gases reductions. The government proposed three reduction scenarios in August. A nationalconsensus was built through consultations with various stakeholders such as business sector, civil society and academia. Last week, the cabinet meeting decidedto take the biggest reduction scenario as a national target which is 30% reduction from the 2020 BAU emissions or 4% reduction from the 2005 emission level.

Japanhas always been progressive in this area, and its efforts resulted in substantial improvements in terms of energy efficiency and green technologies. China has a growing interest in the environment. It is reported that the Chinese government mentioned that green technologies and low-carbon growth will be the keys to the bright future of China.

Today, we, the three environmental research institutes will share our experience, new ideas and research outcomes on low-carbon strategy. Our meeting will be a valuable opportunity with which we can review the recent progress, assess what more needs to be done, and discuss what we can do together in moving towards the goals.

I believe today's workshop will be the most appropriate occasion to discuss the issue because Post-Kyoto negotiations are to be held in Copenhagen in December. Post-Kyoto negotiation table will be the venue where the worlddiscuss future climate change regime succeeding the first "commitment period" of the Kyoto Protocol.

In closing, I'd like to thank all speakers and participants. Thank you.

Session Ⅰ	**Introduction for Climate Change-Prediction and Impact Assessment** (Moderator : Dr. You-Deug HONG, NIER, Korea)

1-1 A new version of the atmosphere ocean coupled Global Climate Model(GCM) 'MIROC' for climate chang simulation

- Dr. Tomoo OGURA, Climate Risk Assessment Research Section, NIES, Japan

1-2 Climate change: its impacts on hydrology, Fresh water quality and stream ecology

- Dr. Kyung-Hyun KIM, Water Pollution Cap System Division, NIER, Korea

1-3 Impact Assessment of climate change on forest-steppe ecotone in Northern China

- Dr. Shihai LU, Institute of Ecology, CRAES, China

Coffee Break

1-1 A new version of the atmosphere ocean coupled Global Climate Model(GCM) 'MIROC' for climate change simulation

- Dr. Tomoo OGURA, Climate Risk Assessment Research Section, NIES, Japan

A new version of the atmosphere-ocean coupled GCM 'MIROC' for climate change simulation

Tomoo Ogura
National Institute for Environmental Studies
ogura@nies.go.jp

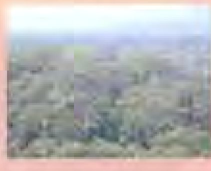
November 27, 2009

Team "MIROC-physics" in KAKUSHN project
S. Watanabe[1], T. Takemura[2], M. Chikira[1], T. Ogura[3], T. Mochizuki[1], S. Emori[3], K. Sudo[4], T. Nishimura[1], M. Watanabe[5], S. Emori[3], and M. Kimoto[5]

1: FRCGC/JAMSTEC, 2: RIAM/Kyushu Univ, 3: NIES, 4: Nagoya Univ, 5: CCSR/Univ of Tokyo

Projecting socio-economic impacts of climate change

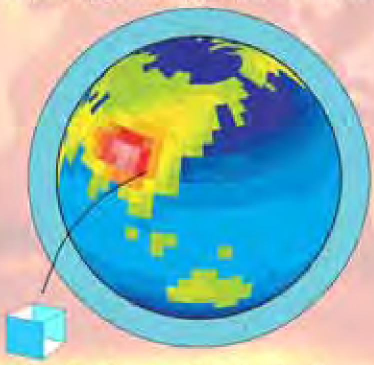

1. How will social/economic systems change?
2. How much will the emission of GHGs/aerosols be ?
3. How much will the emitted GHGs /aerosols remain in the atmosphere?
4. What is the climatic impact induced by the increase in GHGs/aerosols ?
5. What is the socio-economic impacts induced by the climate change ?


What is the climatic impact induced by the increase in GHGs/aerosols ?

Simulating the global climate with a computer model (GCM)

3-D grids (10~100km) covering atmosphere and ocean



Physical quantity (velocity, Temperature, etc) defined in each grid.

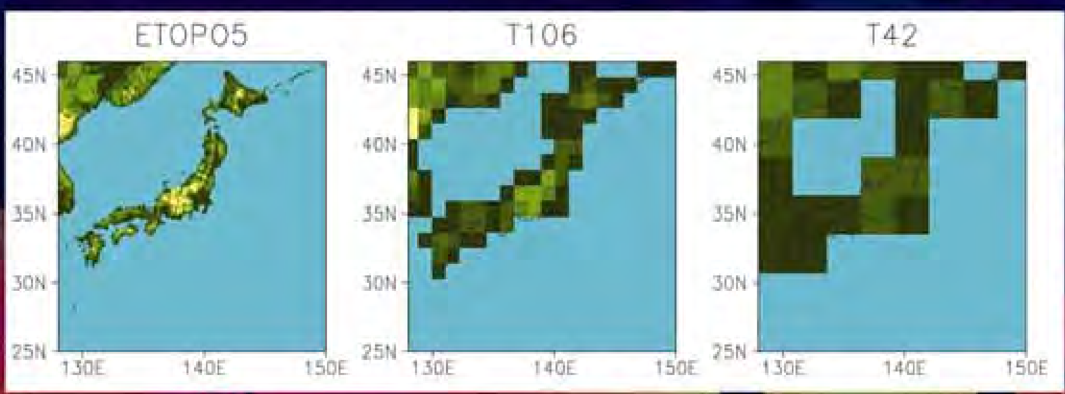
Time integration of the governing equations for atmosphere and

$$\frac{du}{dt}-\left(f+\frac{u\tan\varphi}{a}\right)v=-\frac{1}{\rho}\frac{\partial p}{a\cos\varphi\,\partial\lambda}+\boldsymbol{F_\lambda}$$

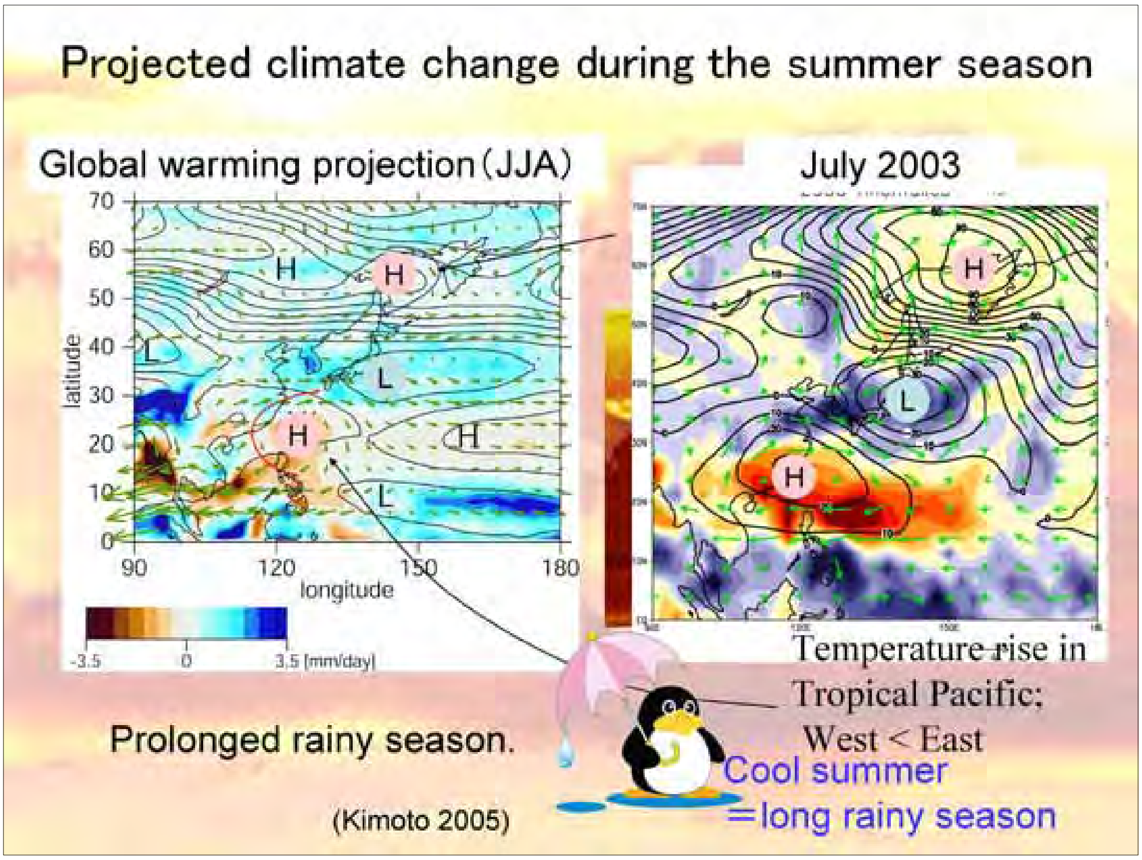
$$c_v\frac{dT}{dt}+p\frac{d\alpha}{dt}=\boldsymbol{Q}$$

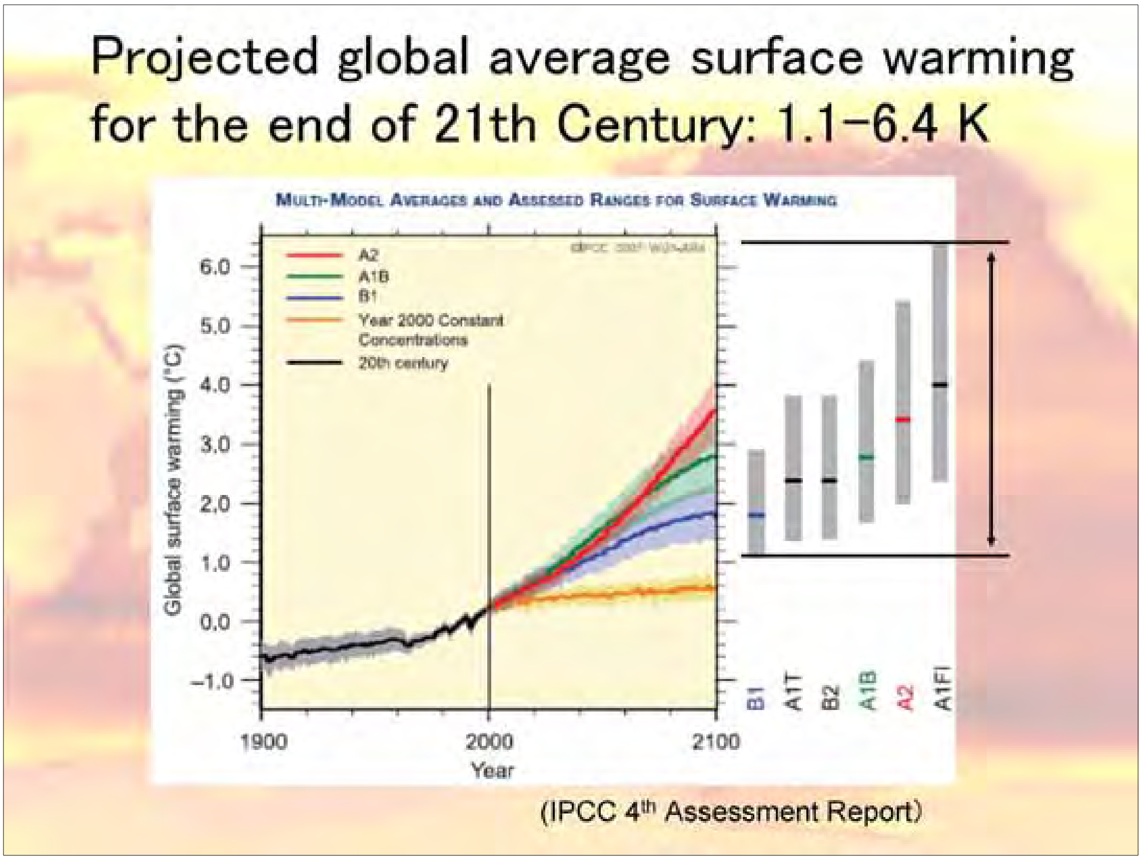
. . .

Climate Change Experiment with CCSR/NIES/FRCGC Climate Model



CCSR: Center for Climate System Research, Univ Tokyo
NIES: National Institute for Environmental Studies
FRCGC: JAMSTEC Frontier Research Center for Global Change

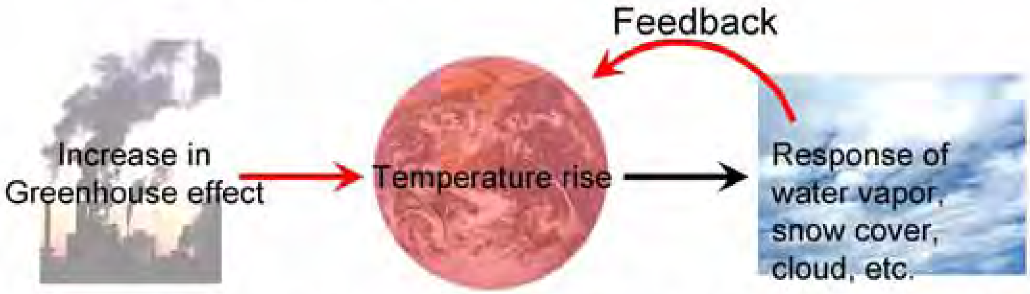

Projected climate change during the summer season
Global warming projection (JJA)
July 2003
latitude
longitude
-3.5
0
3.5 [mm/day]
Temperature rise in Tropical Pacific; West < East
Prolonged rainy season.
Cool summer
=long rainy season
(Kimoto 2005)


Projected global average surface warming for the end of 21th Century: 1.1-6.4 K
MULTI-MODEL AVERAGES AND ASSESSED RANGES FOR SURFACE WARMING
A2
A1B
B1
Year 2000 Constant Concentrations
20th century
Global surface warming (°C)
Year
B1
A1T
B2
A1B
A2
A1FI
(IPCC 4th Assessment Report)

Large uncertainty in projected temperature increase in climate models

＝Uncertainty in climate sensitivity

How much does climate respond to a given increase in greenhouse effect?

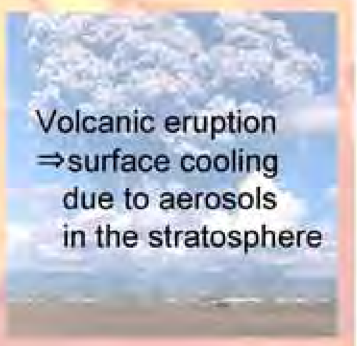


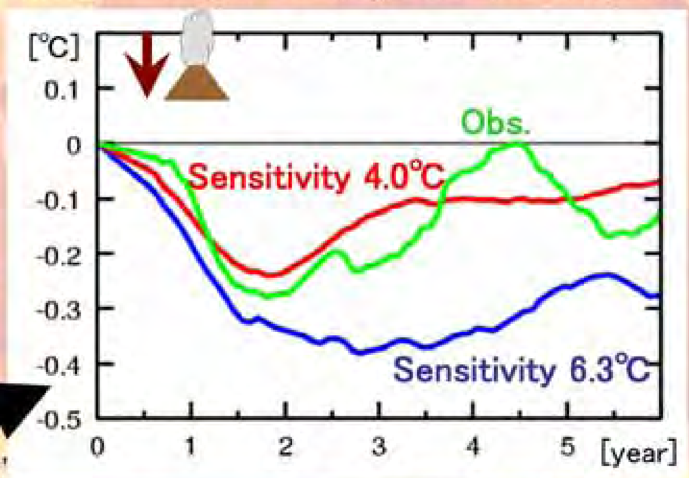
Climate sensitivity is affected by feedback strength.
Large uncertainty in cloud feedback.

Reducing uncertainty：Top down approach

eg）Global cooling after the Pinatubo eruption（1991）

Higher climate sensitivity ⇒ larger cooling after the eruption





Comparing two versions of a climate model 'MIROC'

(Yokohata et al., 2005)

Atmospheric component of MIROC

	MIROC3.2	MIROC4.1
Dynamical core	Spectral + semi-Lagrangian scheme (Lin & Rood 1996)	Spectral+ semi-Lagrangian scheme (Lin & Rood 1996)
Vertical Coordinate	Sigma	Eta (hybrid sigma-p)
Radiation	2-stream DOM 37ch (Nakajima et al. 1986)	2-stream DOM 111ch (Sekiguchi et al. 2008?)
Cloud	Diagnostic (LuTreut & Li 1991) + Simple water/ice partition	Prognostic PDF (Watanabe et al. 2008) + Ice microphysics (Wilson & Ballard 1999)
Turbulence	Level 2.0 (Mellor & Yamada 1982)	Level 2.5 (Nakanishi & Niino 2004)
Convection	Prognostic A-S + critical RH (Pan & Randall 1998, Emori et al. 2001)	Prognostic A-S + critical RH with water/ice detrainment
Aerosols	simplified SPRINTARS (Takemura et al. 2002)	full SPRINTARS + prognostic CCN
Land submodel	MATSIRO	MATSIRO mosaic

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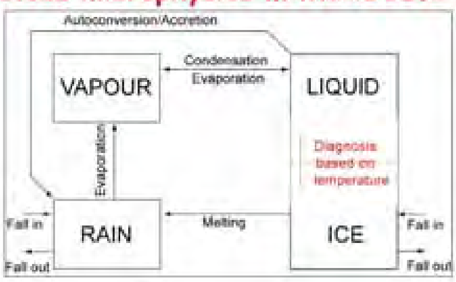
Sophisticated ice-cloud microphysics

work done by T. Ogura (NIES)

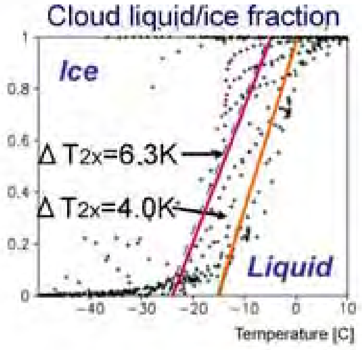
Cloud microphysics in MIROC3.2



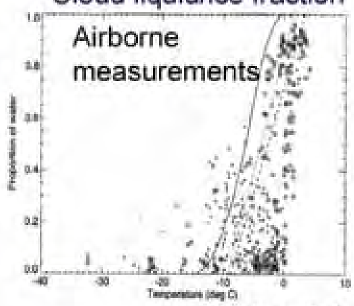
Cloud microphysics in MIROC4.1

Wilson and Ballard (1999)

Cloud liquid/ice fraction



Cloud liquid/ice fraction



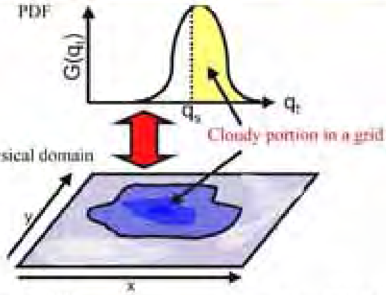
Rotstayn et al. (2000)

- In MIROC3.2 climate sensitivity has largely been affected by a parameter for cloud liquid/ice partition

CCSR NIES

Hybrid prognostic cloud (HPC) scheme

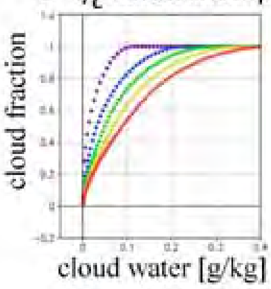
- **Large-scale condensation (LSC)**
  - ✓ Assume a subgrid-scale distribution of q_t' or $s=a_L(q_t'-\alpha_L T_l')$?
  - ✓ Predict condensate amount and cloud?



$$C=\int_{-Q_c}^{\infty} G(s)ds\ ,\ q_c=\int_{-Q_c}^{\infty}(Q_c+s)G(s)ds\ ,\ Q_c=a_l\{\bar{q}_t-q_s(\bar{T}_l,\bar{p})\}$$

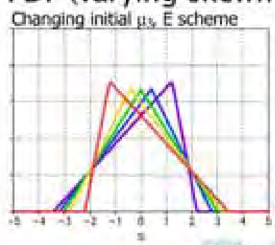
  - ✓ Prognostic equations for PDF variance & skewness
  - ✓ Quasi-reversible operator between grid quantities & PDF

C-q_c relationship



$C, q_c \rightleftarrows \mathcal{V}, S$

Basis PDF (varying skewness)



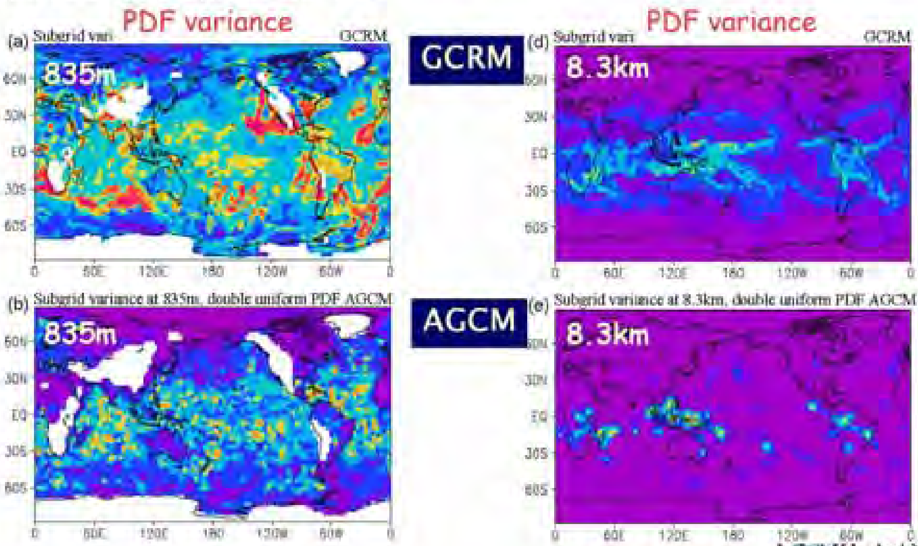
Similar approach:
Tompkins (2002, JAS)
Wilson & Gregory (2003, QJ)

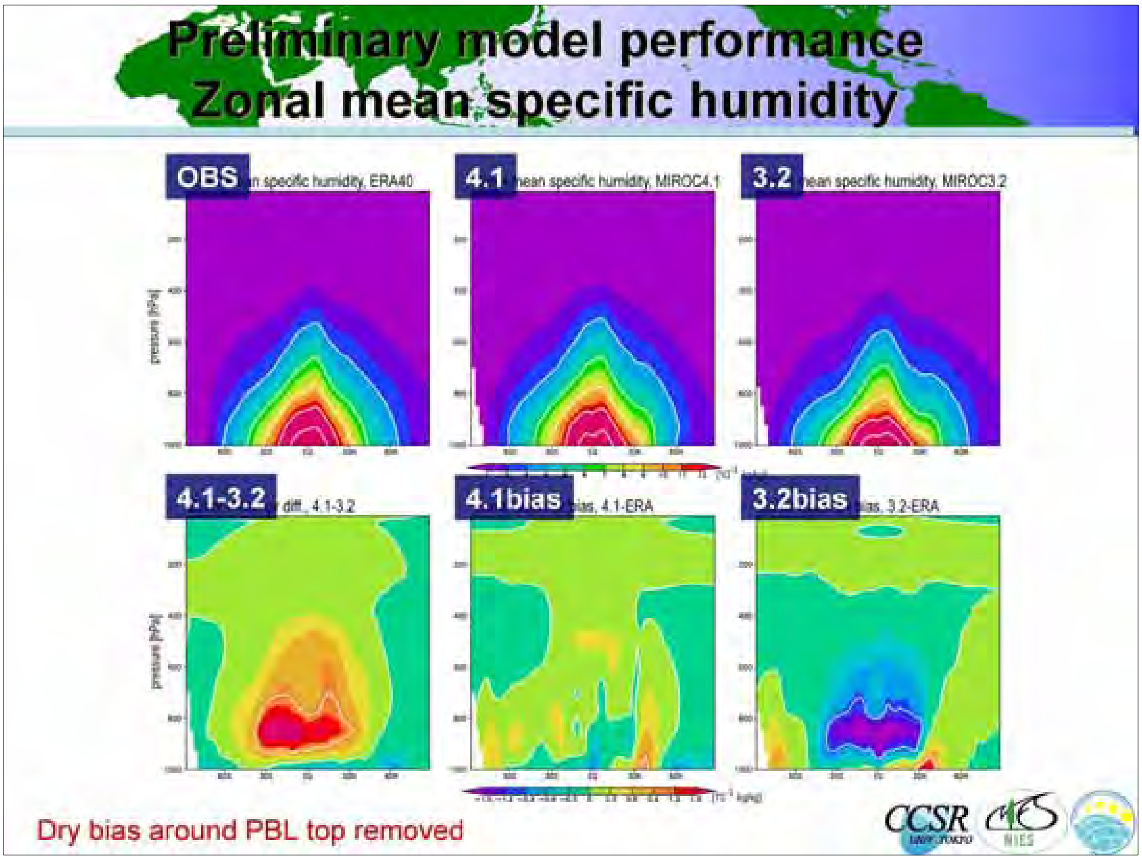
CCSR NIES

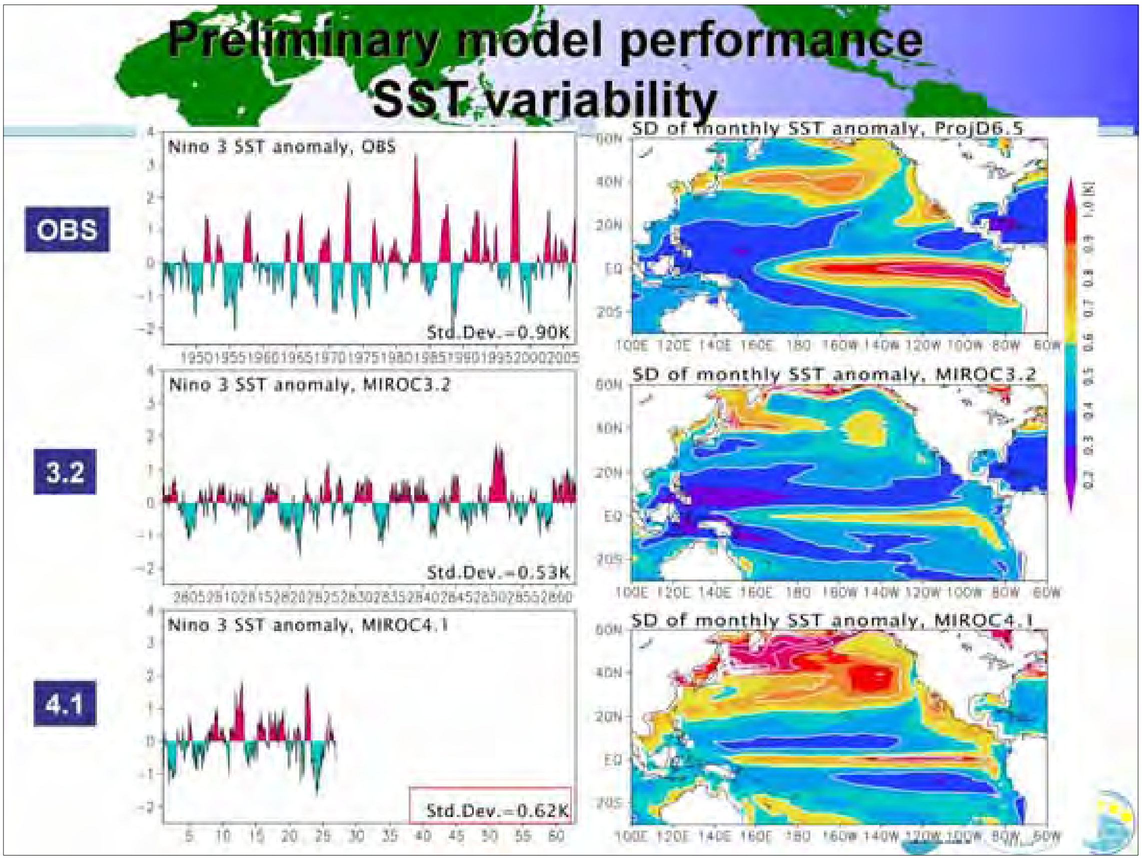
How can we verify predicted PDF moments?

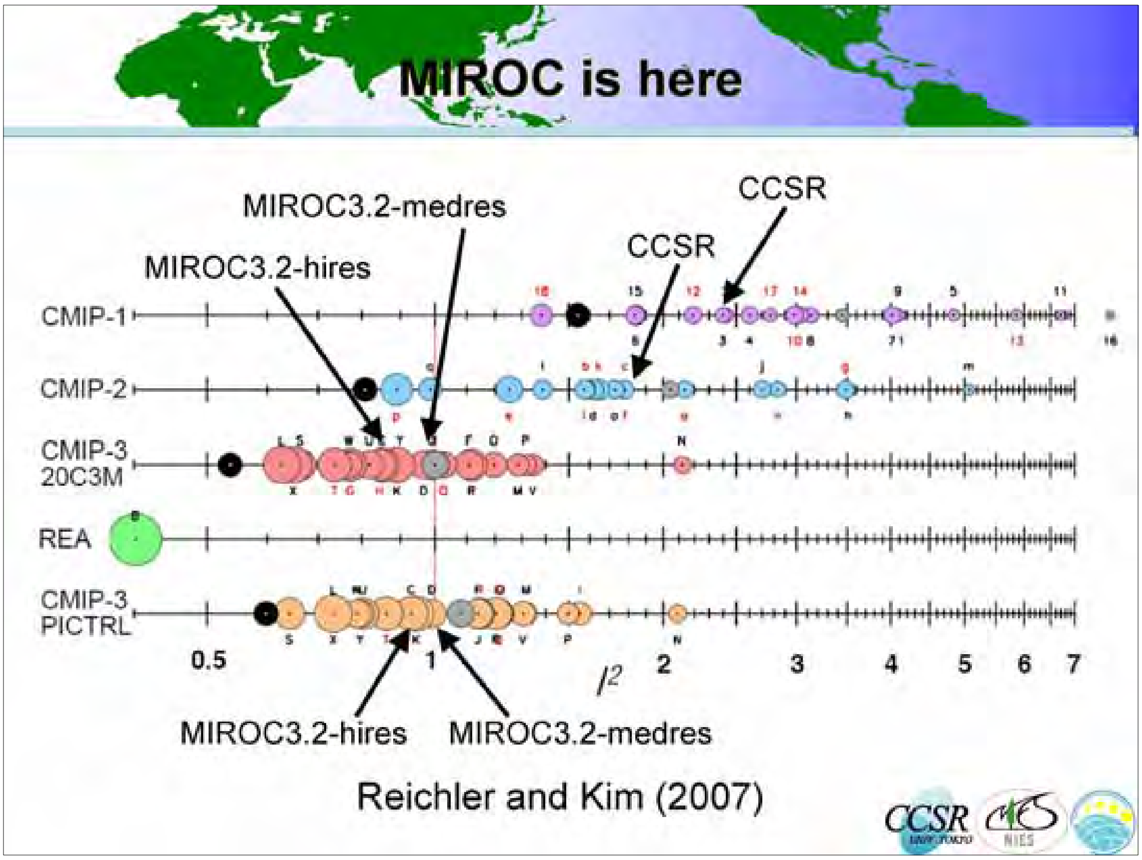
Comparison w/ GCRM: 1-week integration from Dec. 25, 2006

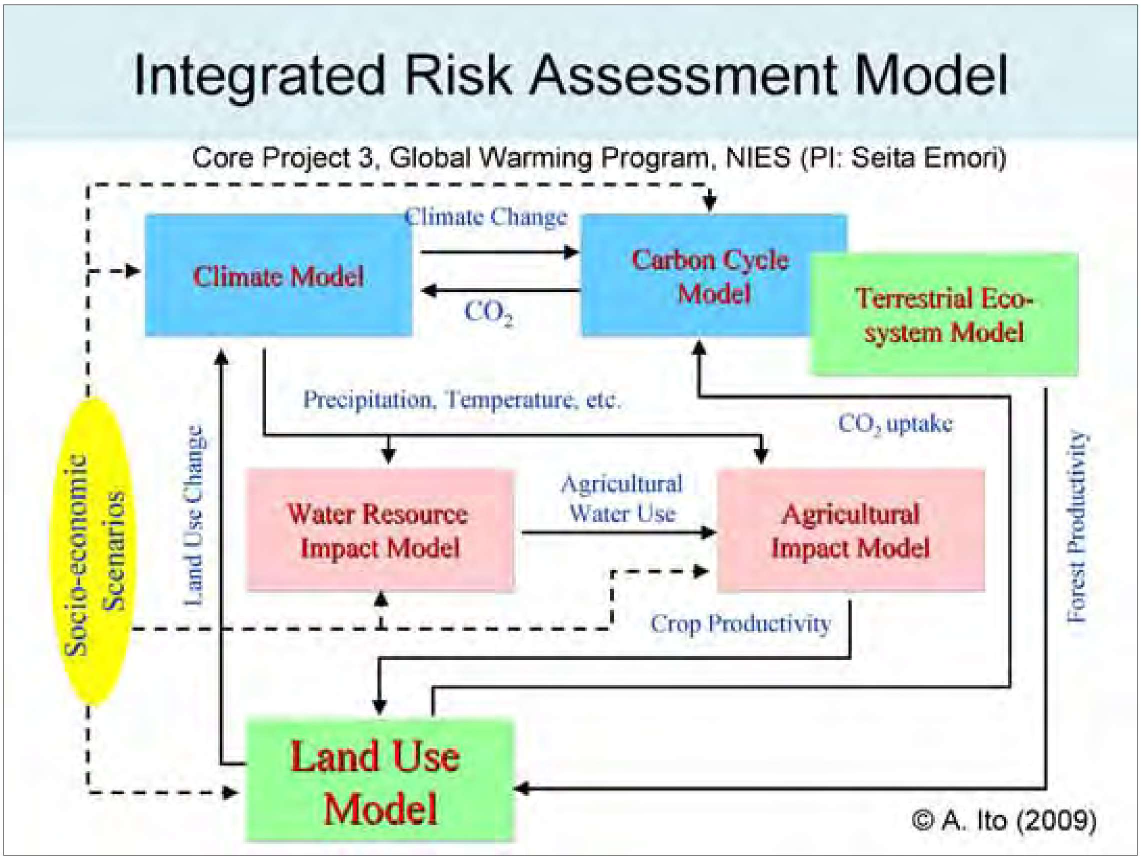
- GCRM (NICAM) w/ 3.5km grid, realistic topography
- MIROC atmosphere w/ T42




Preliminary model performance
Zonal mean specific humidity
OBS
n specific humidity, ERA40
4.1
nean specific humidity, MIROC4.1
3.2
nean specific humidity, MIROC3.2
pressure [hPa]
4.1-3.2
diff., 4.1-3.2
4.1bias
bias, 4.1-ERA
3.2bias
bias, 3.2-ERA
Dry bias around PBL top removed
CCSR
NIES


Preliminary model performance
SST variability
OBS
Nino 3 SST anomaly, OBS
Std.Dev.=0.90K
1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005
3.2
Nino 3 SST anomaly, MIROC3.2
Std.Dev.=0.53K
4.1
Nino 3 SST anomaly, MIROC4.1
Std.Dev.=0.62K
5 10 15 20 25 30 35 40 45 50 55 60
SD of monthly SST anomaly, ProjD6.5
SD of monthly SST anomaly, MIROC3.2
SD of monthly SST anomaly, MIROC4.1
60N 40N 20N EQ 20S
100E 120E 140E 160E 180 160W 140W 120W 100W 80W 60W
1.0 [K]


MIROC is here
MIROC3.2-medres
MIROC3.2-hires
CCSR
CCSR
CMIP-1
CMIP-2
CMIP-3
20C3M
REA
CMIP-3
PICTRL
0.5
1
2
3
4
5
6
7
I^2
MIROC3.2-hires
MIROC3.2-medres
Reichler and Kim (2007)
CCSR


Integrated Risk Assessment Model
Core Project 3, Global Warming Program, NIES (PI: Seita Emori)
Climate Model
Climate Change
CO_2
Carbon Cycle Model
Terrestrial Eco-system Model
Precipitation, Temperature, etc.
CO_2 uptake
Socio-economic Scenarios
Land Use Change
Water Resource Impact Model
Agricultural Water Use
Agricultural Impact Model
Forest Productivity
Crop Productivity
Land Use Model
© A. Ito (2009)

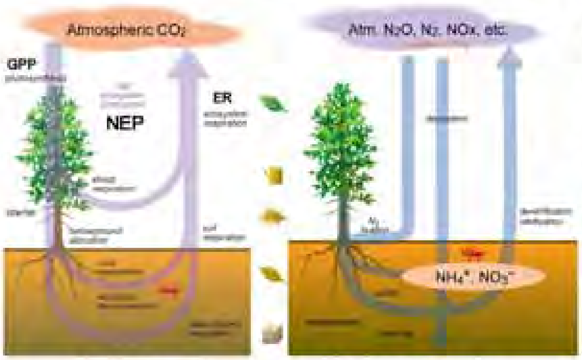
Terrestrial Ecosystem Model

VISIT **Vegetation Integrated SImulator for Trace gases**

(Developed in NIES & JAMSTEC)

Objectives

- Atmosphere-ecosystem biogeochemical interactions => IGBP-iLEAPS
- Especially, major greenhouse gases (CO_2, CH_4, and N_2O) budget
- Assessment of climatic impacts and biotic feedbacks



Carbon-cycle
(Sim-CYCLE-based)

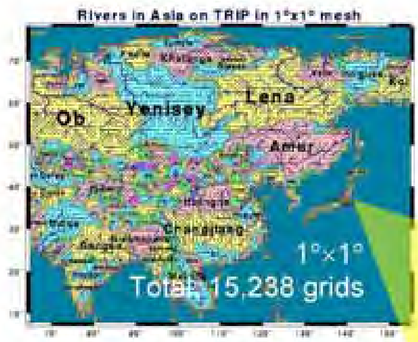
Nitrogen-cycle

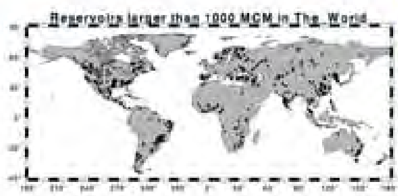
Point-global, daily-monthly

- CO_2: photosynthesis & respiration
- CH_4: production & oxidation
- N_2O: nitrification & denitrification
- LUC emission: cropland conversion
- Fire emission: CO_2, CO, BC, etc.
- BVOC emission: isoprene etc.
- Others: N_2, NO, NH_3, erosion

© A. Ito (2009)

Global Water Resource Model (H08)





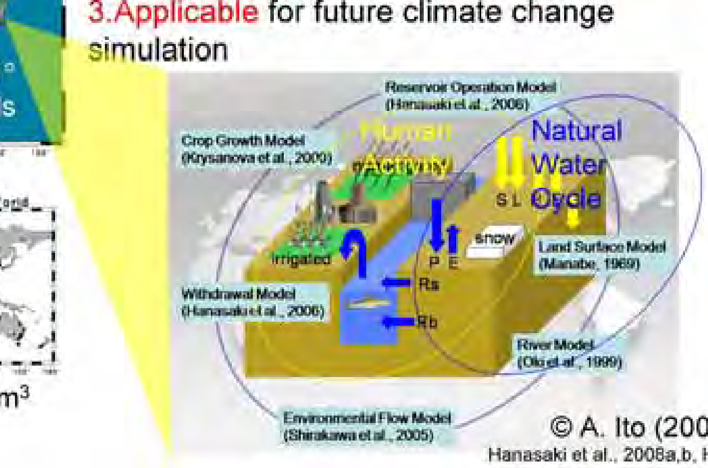
452 reservoirs, 4140 km^3

•Requirements

1.Simulate both water availability (streamflow) and water use at daily-basis

2.Deal with interaction between natural hydrological cycle and anthropogenic activities

3.Applicable for future climate change simulation



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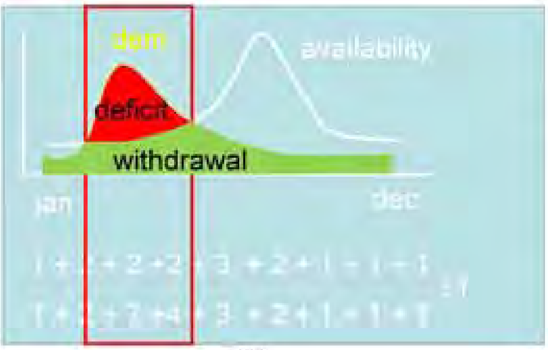
Hanasaki et al., 2008a,b, HESS

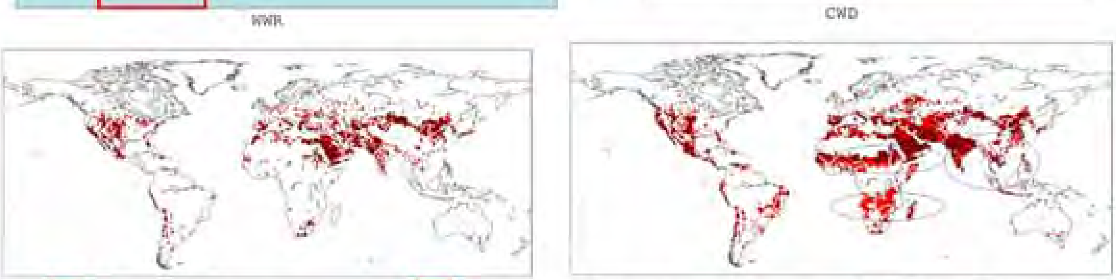
GW Risk Assessment by H08



Daily basis

$$\text{Index} = \frac{\Sigma \text{daily withdrawal (simulated)}}{\Sigma \text{daily demand (simulated)}}$$

High stress	Index<0.5
Medium stress	0.5≤index<0.8
Low stress	0.8≤Index



High Stress Medium Stress Low Stress

© A. Ito (2009) Hanasaki et al., 2008a,b, HESS

Summary

- ✓ A coupled ocean-atmosphere GCM 'MIROC' is developed cooperatively by CCSR, NIES, and JAMSTEC.
- ✓ Update of physical components help to increase our confidence in the projected climate change for the IPCC AR5.
- ✓ Coupling bet. a climate model, a terrestrial ecosystem model, and a global water resource model is underway for risk assessment.

1-2 Climate change: its impacts on hydrology, Fresh water quality and stream ecology

- Dr. Kyung-Hyun KIM, Water Pollution Cap System Division, NIER, Korea

The Sixth Tripartite President meeting among NIER, CRAES and NIES
25 - 28 November 2009, Seoul, Korea

Integrated Impact Assessment of Climate Change on Watershed Environment:

Research Framework and Preliminary Results

Kyunghyun Kim, Hong-Tae Kim and Eun-Hye Na

National Institute of Environmental Research

Background

- Thousands of scientific papers and IPCC reports made each country recognize climate change and investigate its environmental, economical and social impacts
- Research of the impacts on water quality and aquatic ecosystem is somewhat behind compared to other climate change impact assessment areas because it cannot be directly addressed from global climate model outputs.
- Rather, it requires hierarchically integrated modeling framework consist of global climate change, watershed hydrology, stream flow, water quality and aquatic ecosystem in turn.

Objectives

- To investigate climate change impacts on watershed hydrology, stream flow and water temperature.
- To assess impacts by change of stream flow and temperature on water quality and aquatic ecosystem
- Downscale issues of GCM/RCM outputs to feed into watershed model, determination of headwater temperature for water quality modeling

Possible impacts of stream flow change on water quality and aquatic ecosystem

- Increased stream water temperature may negatively affect coldwater ecosystems by direct biological impacts or changing water quality
- Heated stream water may have insufficient dissolved oxygen for aquatic life and may cause increased dissolution of soluble compounds (e.g., hydrocarbon and metals) possibly toxic to many aquatic invertebrates
- Toxic green-blue algae may dominate
- Coldwater fishes may disappear or move upstream
- Turnover in lakes may weaken so that dissolved oxygen remains insufficient near the bottom

Impacts of stream temperature change on water quality and aquatic ecosystem

- Low flow is especially important for water quality and aquatic ecosystem and thus change of it may have significant impact on them
- Decrease in low flow may worsen water quality especially in point-source-dominating streams due to increase of pollutant loading relative to flow and retention time that causes more algae growth.
- Decrease in low flow may also decrease aquatic habitat and so negative for aquatic ecosystem

Research Framework

- GCM/RCM Output Process
  - Statistical downscaling
- Hydrological Impact of Climate Change
  - Coupling of land surface process model(LSPM) and watershed model
  - Impact on watershed energy balance and soil moisture
  - Impact on flood and drought patterns
- Water Quality and Aquatic Ecosystem Impact of Climate Change
  - Impact on water temperature and water quality
  - Impact on aquatic ecosystem

Modeling Procedure

Future Climate Change
- SNURCM outputs with A1B scenario

↓

Current & Future Flow Patterns
- SWAT model

↓

Current & Future Water Temperature
- Statistical and QUALKO model

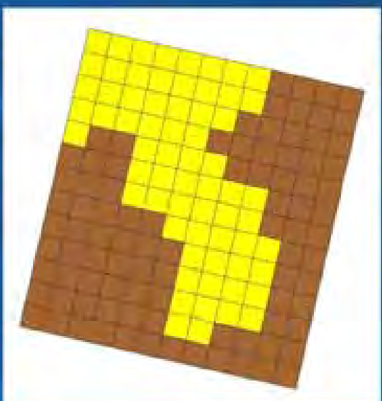
↓

Current & Future Water Quality
- QUALKO2 model

↓

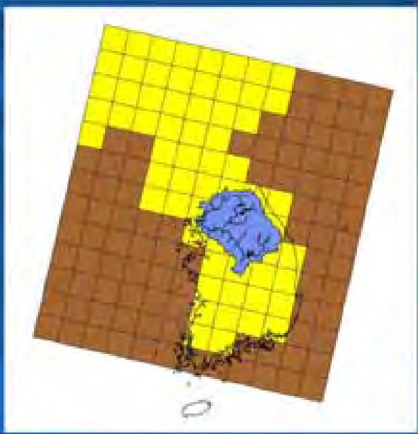
Impact on Aquatic Ecosystem

Future Climate Change



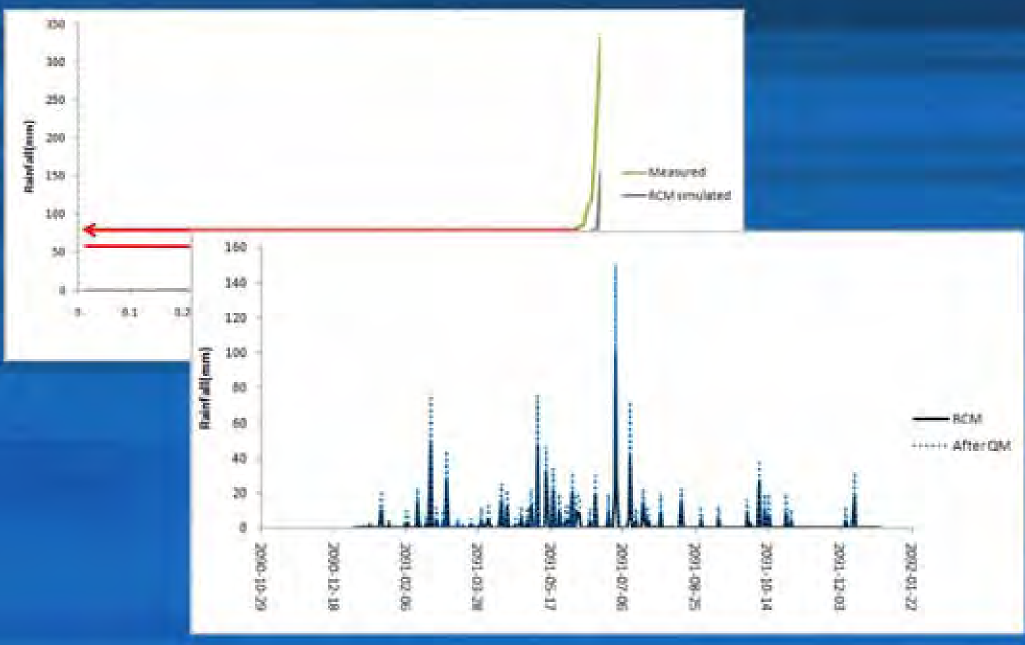
- NCARCSM/SNURCM
  - SNURCM output with the A1B scenario
  - Current climate status: daily model outputs for 9 years (1990~1998)
  - Future climate status: daily data for 9 years (2091~2099)
  - Rainfall, air temperature, solar radiation, wind, humidity

Streamflow Change



- Using SNURCM Data for SWAT
  - 12 grid cells of SNURCM cover Han River Basin
  - Quantile Mapping Method to downscale RCM outputs
- SWAT Model
  - Calibrated with measured flow data for 2006
  - Provides low flows through the modeling section

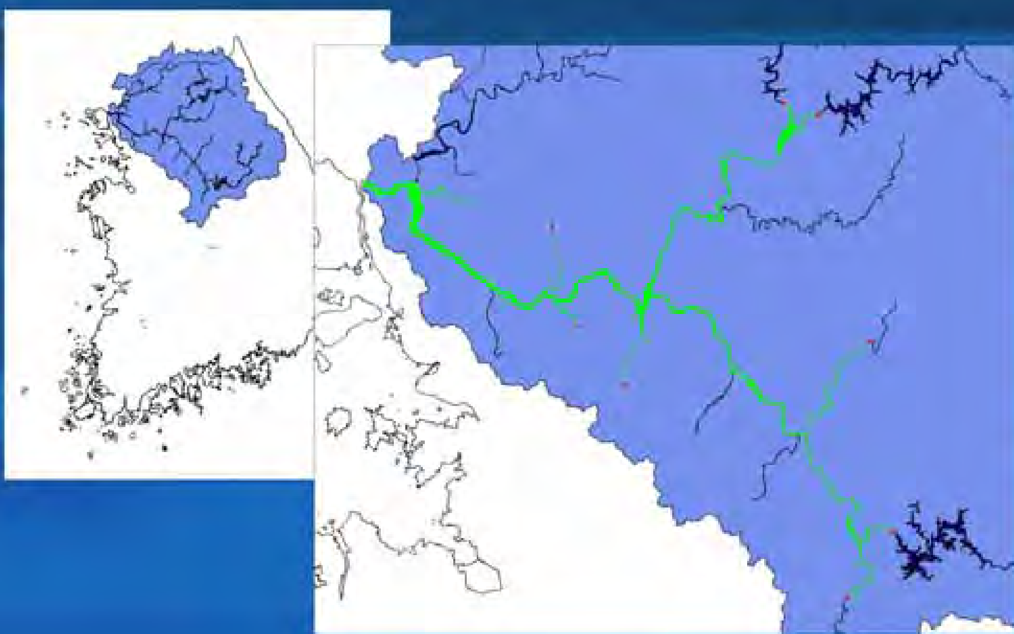
Quantile Mapping Downscaling



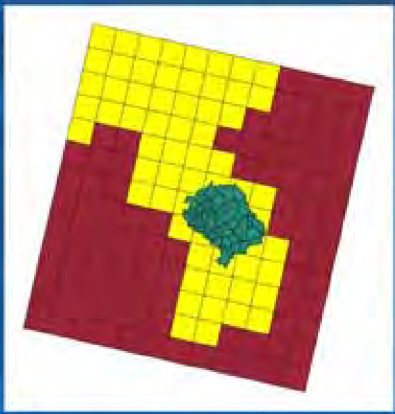
Streamwater Temperature Change

- QUALKO2 Model
  - From Chungjoo Damutput with A1B scenario
  - 9 years daily data (2091~2099)
  - Rainfall, Air temperature, Solar radiation, Wind, Humidity
  - 12 grid cells cover Han River Basin
  - Simulation based on the low flows
- Multivariate Regression Analysis
  - To obtain water temperature boundary conditions
  - Established regression equations at each BC pt. based on measured streamwater temperature and climatologic data over 30 years
  - RCM-predicted future climatologic data plugged into the equations to determine future streamwater temperature at each BC pt.

Streamwater Temperature Change



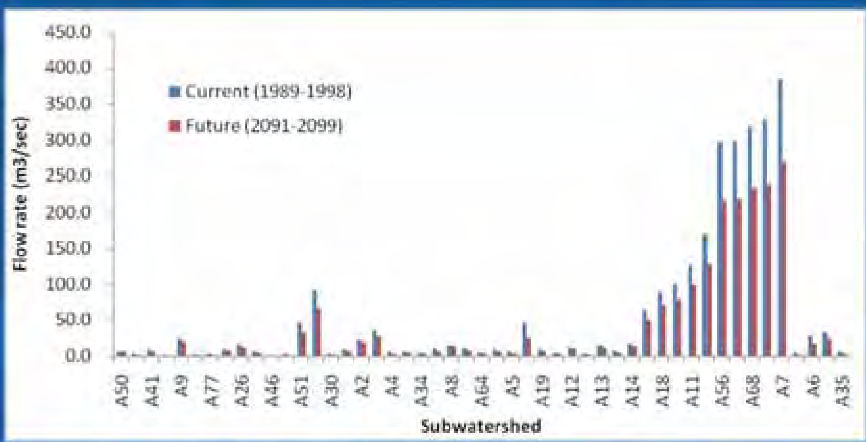
Multivariable Regression Analysis



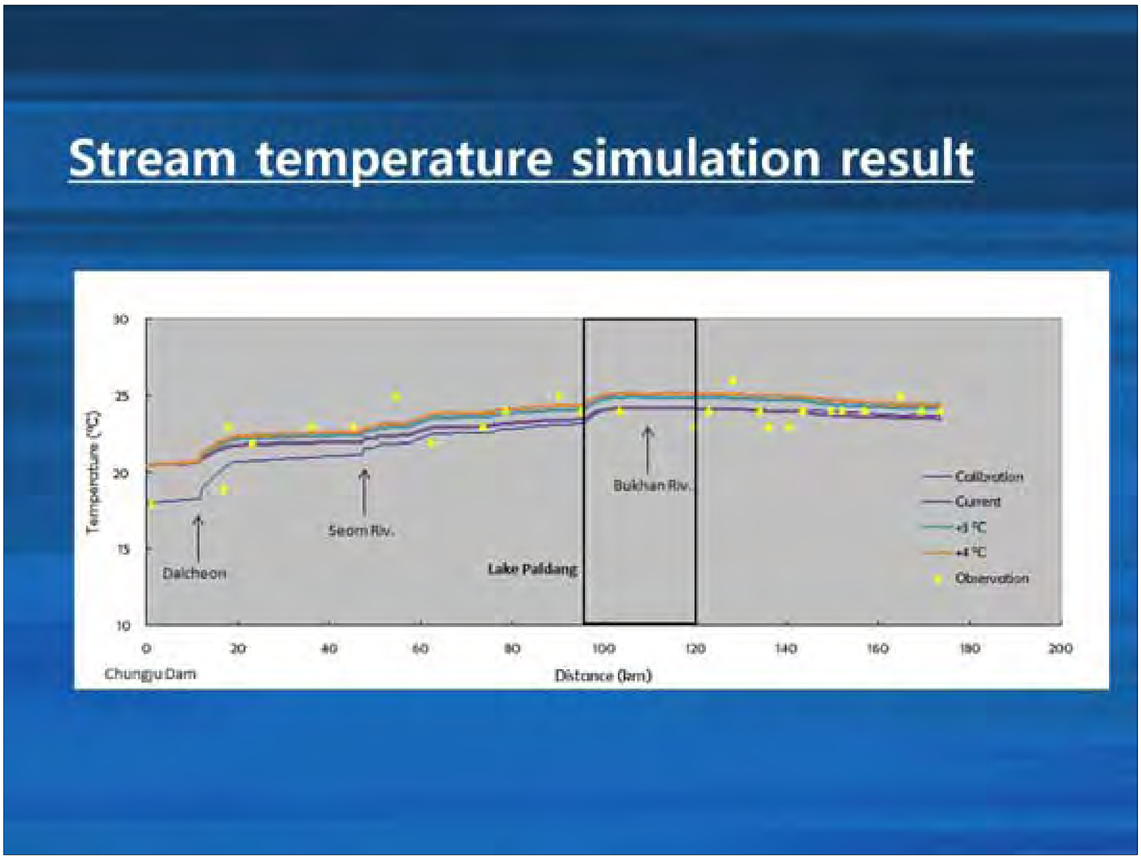
- NCARCSM/SNURCM
  - SNURCM output based on A1B scenario
  - 9 years daily data (2091~2099)
  - Rainfall, Air temperature, Solar radiation, Wind, Humidity
  - 12 grid cells cover Han River Basin
- Downscaling
  - Quantile Mapping Method

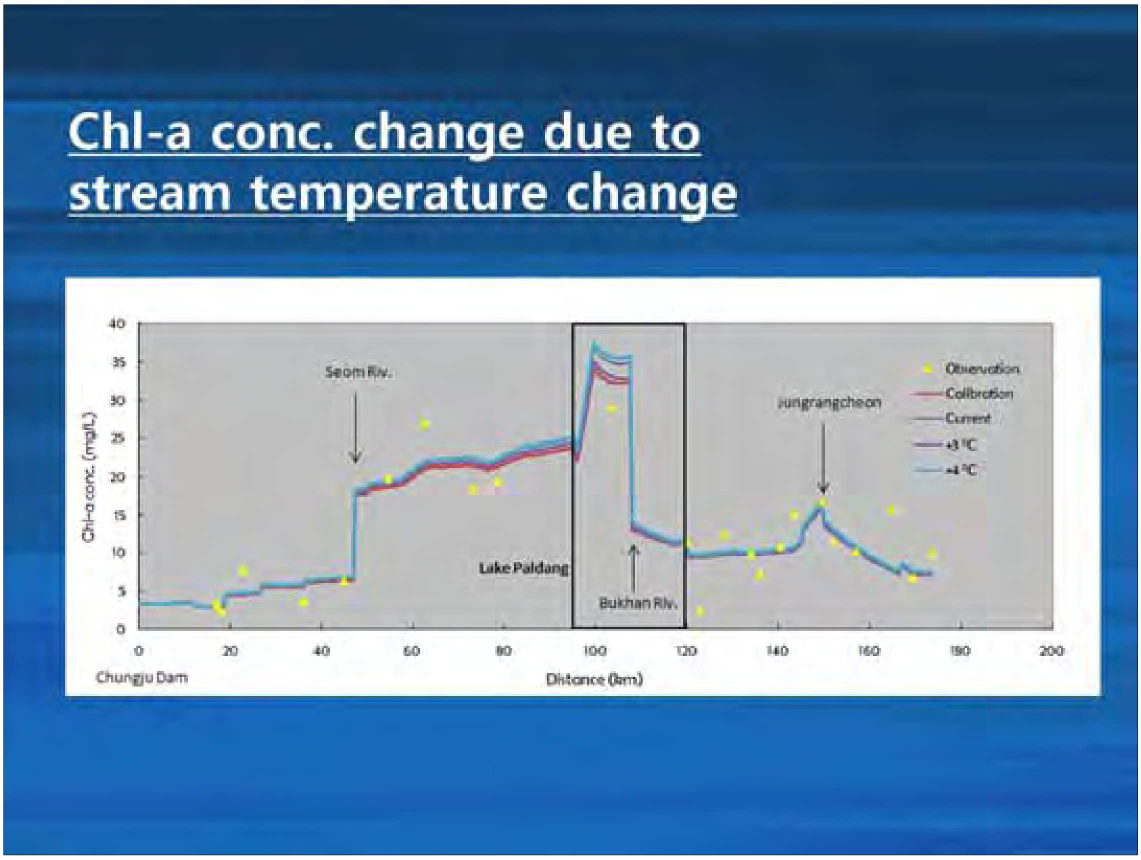
Preliminary Results

Stream low flow simulation result

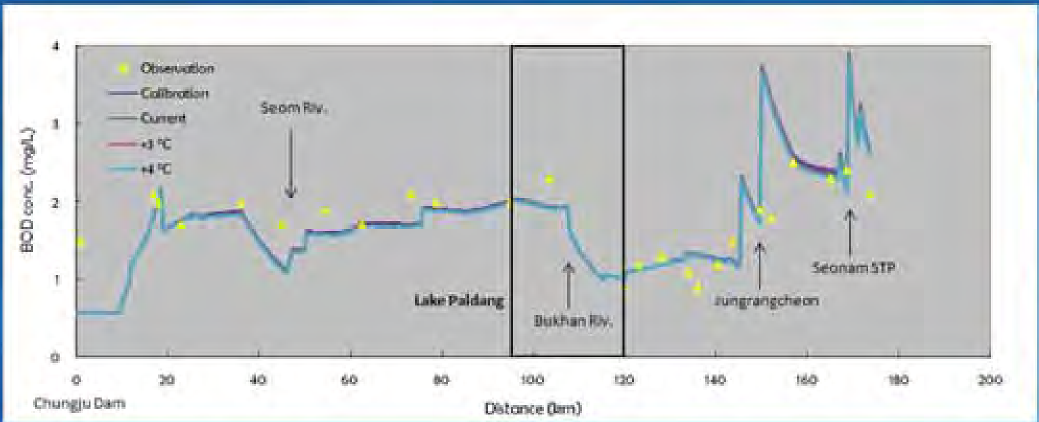


- Simulated low flows for the future period are less than those for the current period at almost all subwatershed outlets

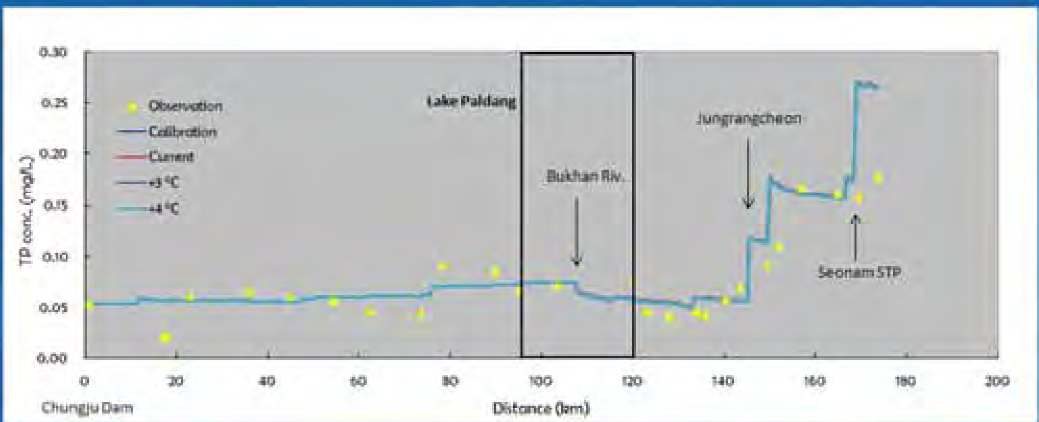

Stream temperature simulation result
30
25
20
15
10
Temperature (℃)
Dalcheon
Seom Riv.
Lake Paldang
Bukhan Riv.
Calibration
Current
+3 ℃
+4 ℃
Observation
0
20
40
60
80
100
120
140
160
180
200
Chungju Dam
Distance (km)


Chl-a conc. change due to stream temperature change
40
35
30
25
20
15
10
5
0
Chl-a conc. (mg/L)
Seom Riv.
Lake Paldang
Bukhan Riv.
Jungrangcheon
Observation
Calibration
Current
+3 ℃
+4 ℃
0
20
40
60
80
100
120
140
160
180
200
Chungju Dam
Distance (km)

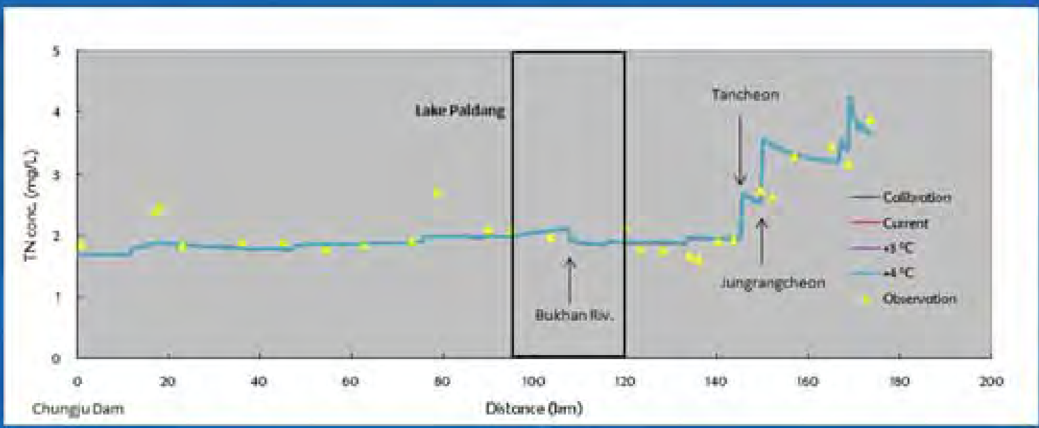
BOD conc. change due to stream temperature change



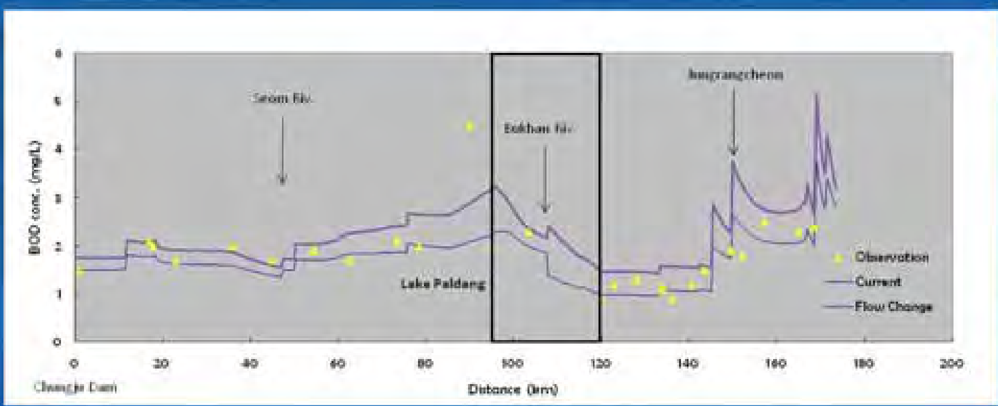
TP conc. change due to stream temperature change

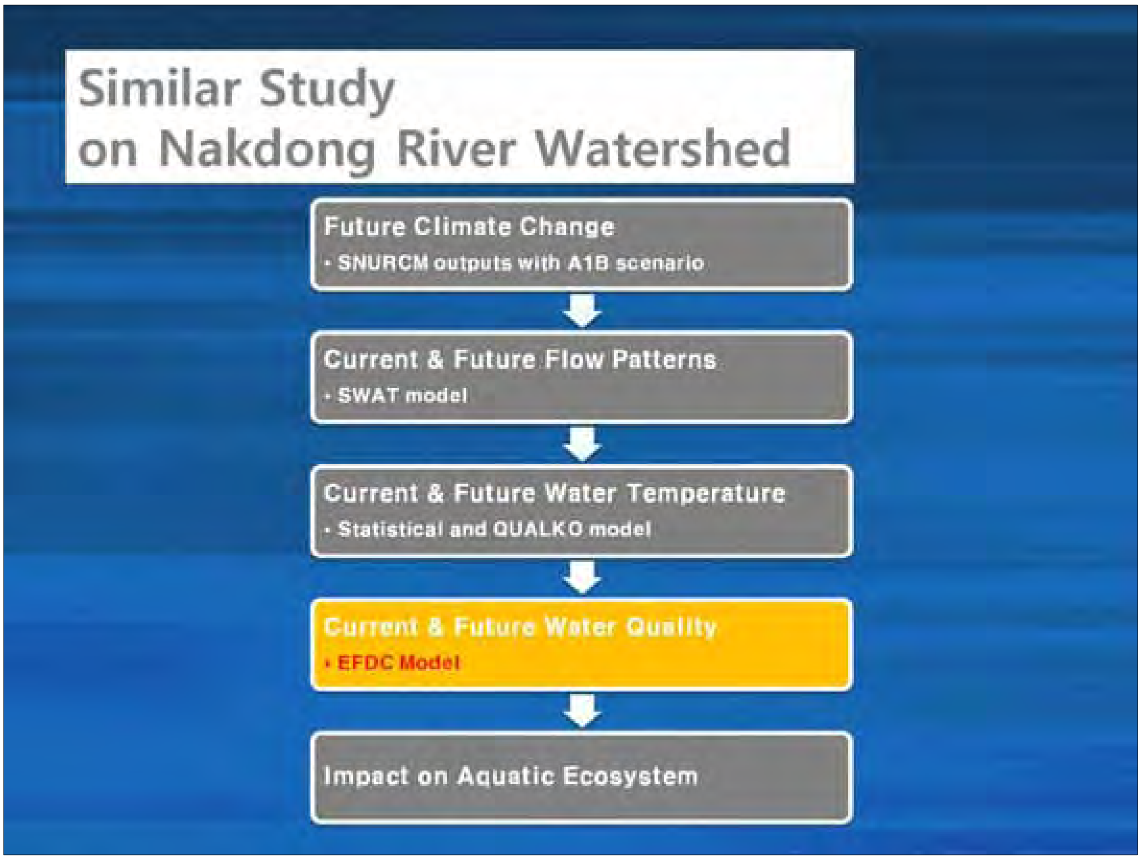


TN conc. change due to stream temperature change



BOD conc. change due to stream low flow change

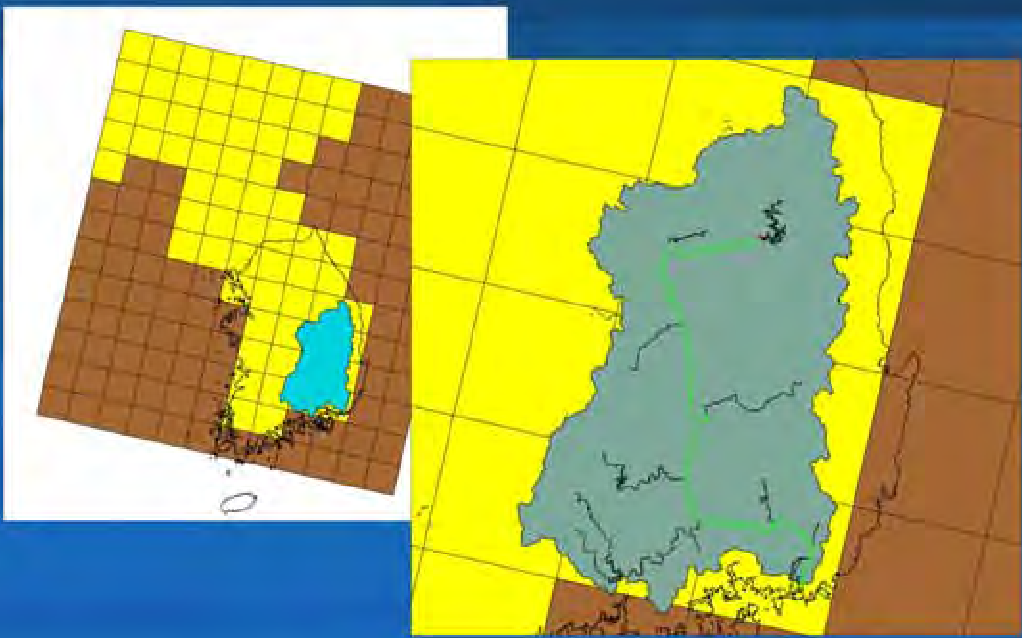




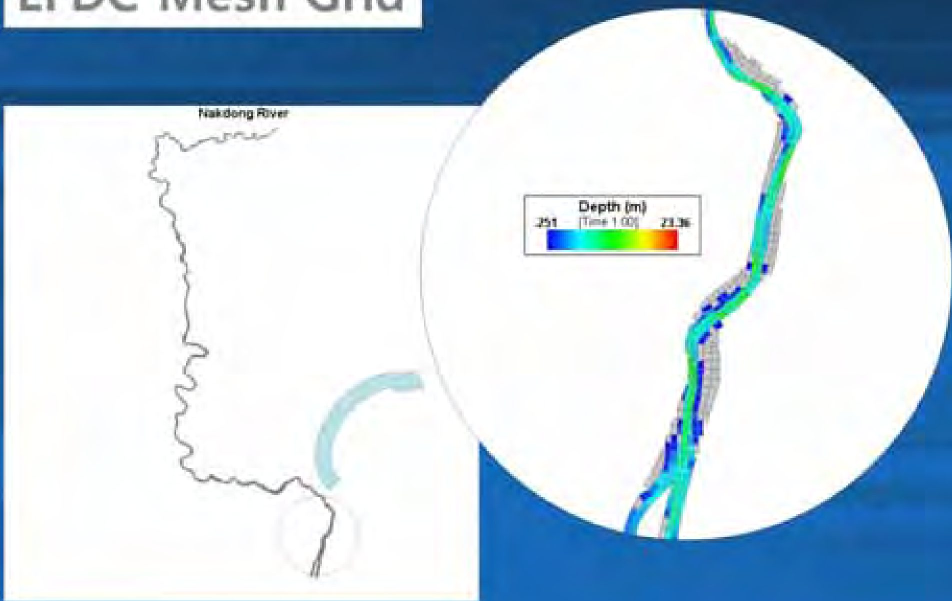
Environmental Fluid Dynamic Code(EFDC) Model

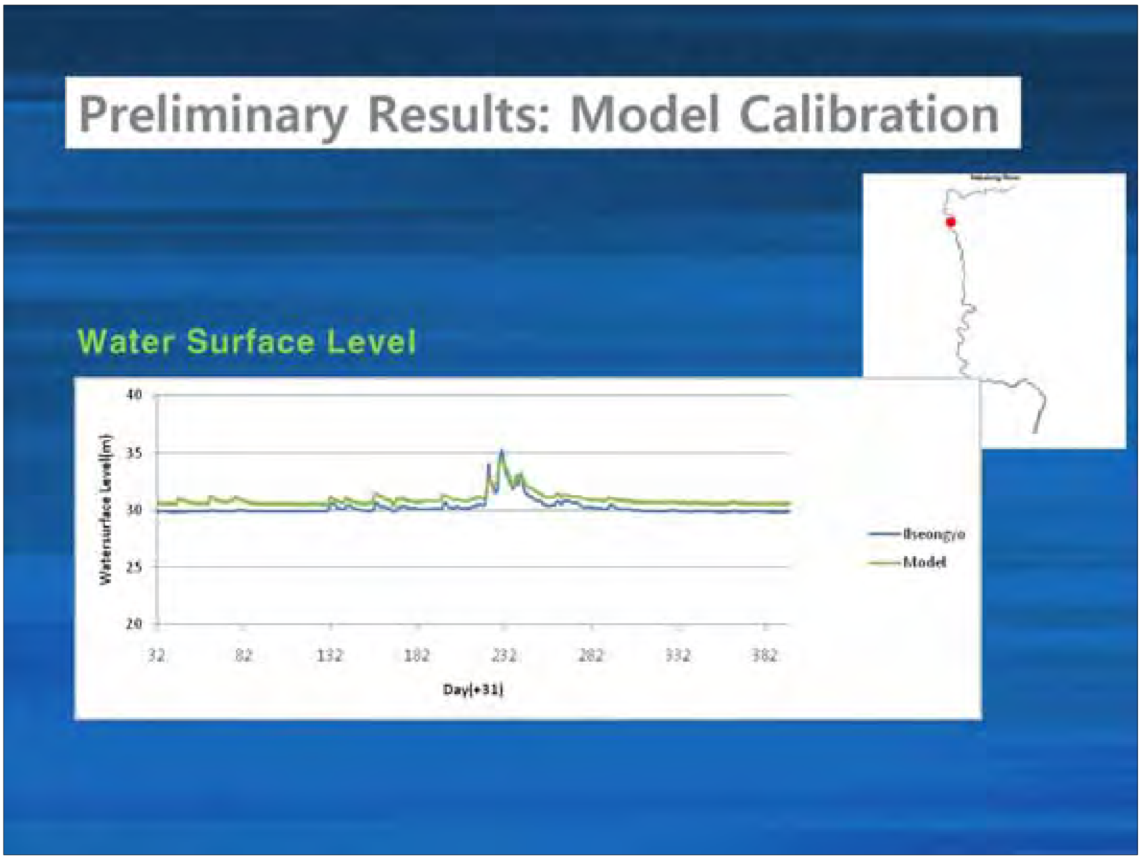
- NCARCSM/SNURCM
  - SNURCM output with A1B scenario
  - 9 years daily data (2091~2099)
  - Rainfall, Air temperature, Solar radiation, Wind, Humidity
  - 12 grid cells cover Han River Basin
- Downscaling
  - Quantile Mapping Method

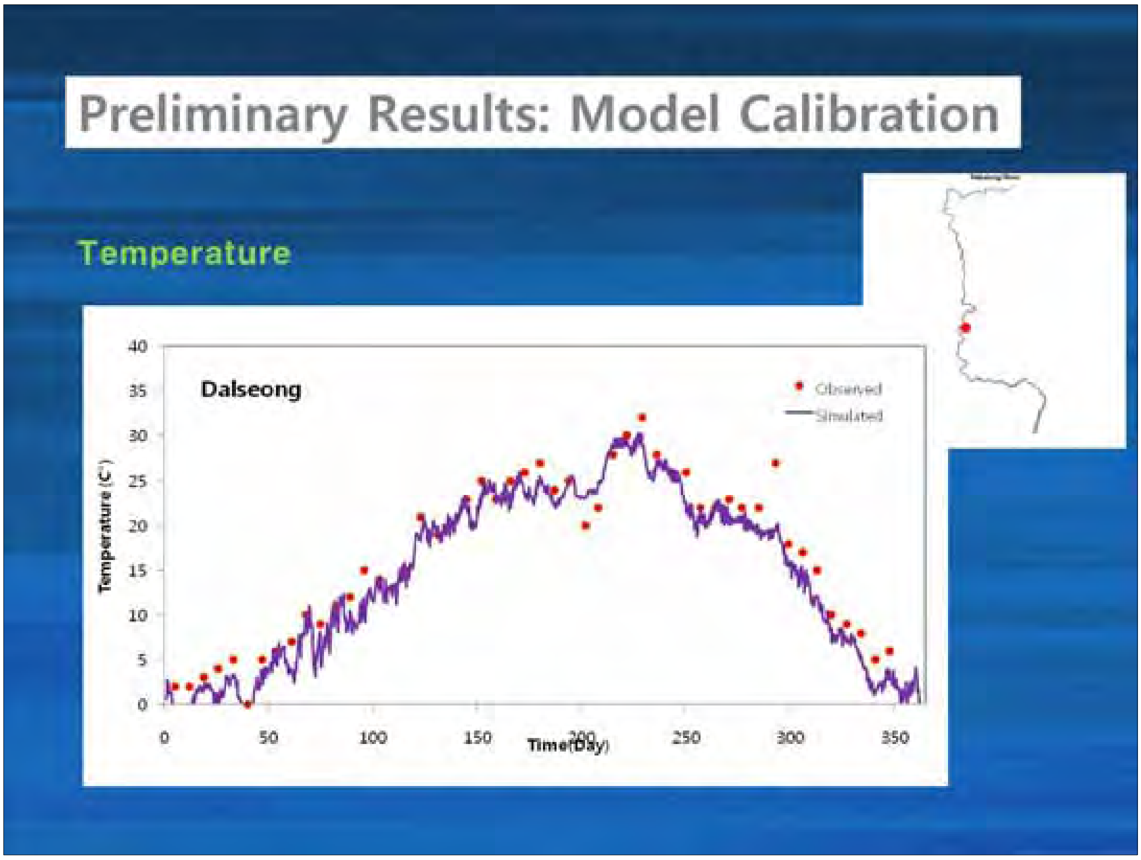
Study Area

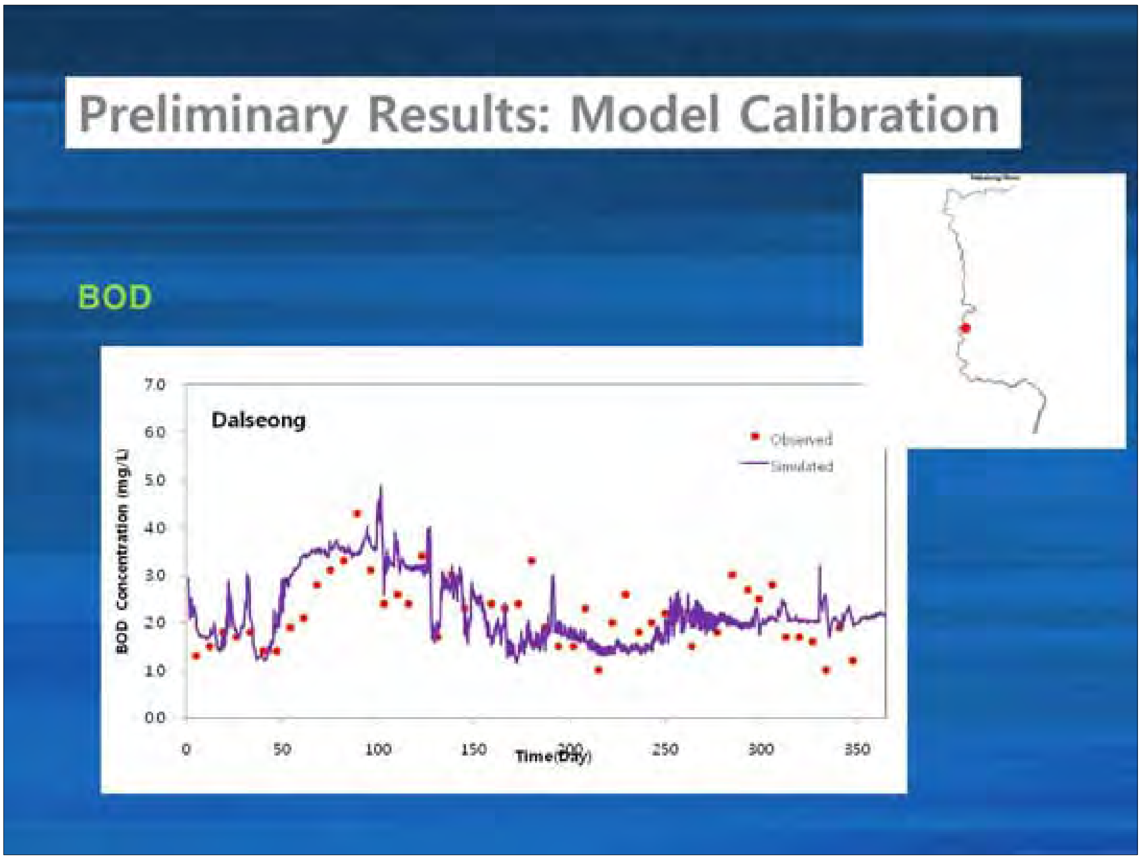


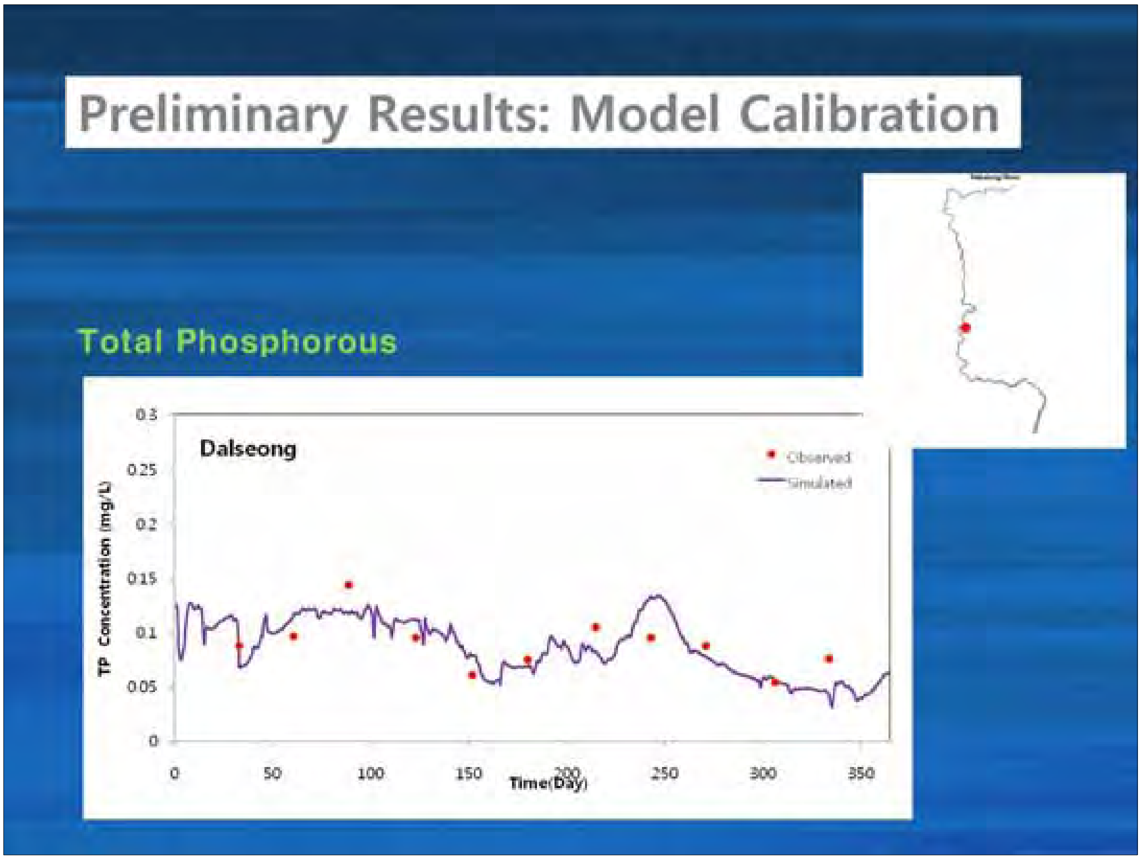
EFDC Mesh Grid




Preliminary Results: Model Calibration
Water Surface Level
Watersurface Level(m)
40
35
30
25
20
32
82
132
182
232
282
332
382
Day(+31)
Ilseongyo
Model

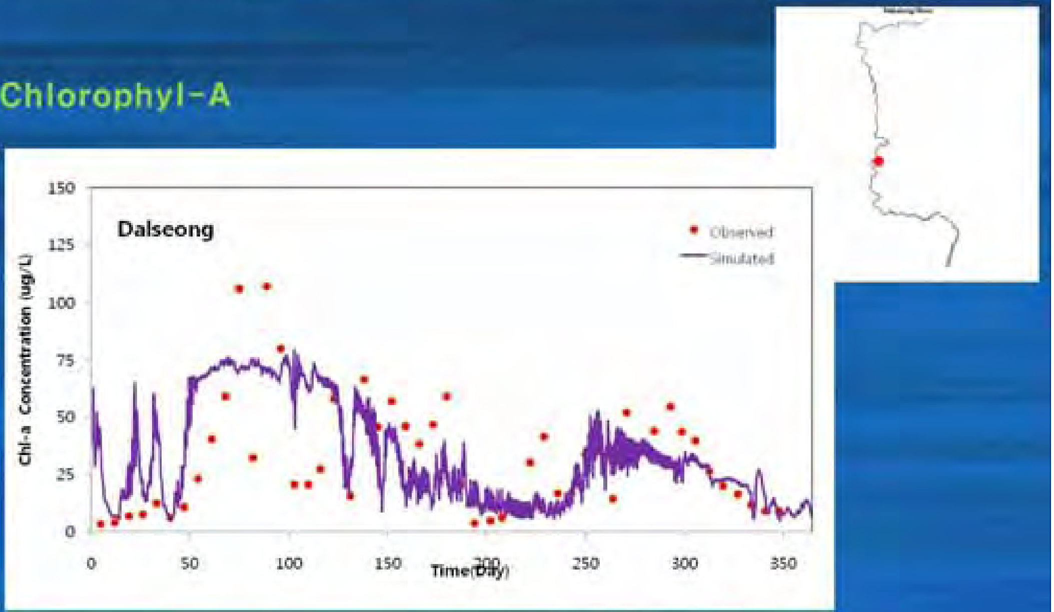

Preliminary Results: Model Calibration
Temperature
Dalseong
Observed
Simulated
Temperature (C°)
40
35
30
25
20
15
10
5
0
0
50
100
150
200
250
300
350
Time(Day)


Preliminary Results: Model Calibration
BOD
Dalseong
Observed
Simulated
BOD Concentration (mg/L)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0
50
100
150
200
250
300
350
Time(Day)


Preliminary Results: Model Calibration
Total Phosphorous
Dalseong
Observed
Simulated
TP Concentration (mg/L)
0.3
0.25
0.2
0.15
0.1
0.05
0
0
50
100
150
200
250
300
350
Time(Day)

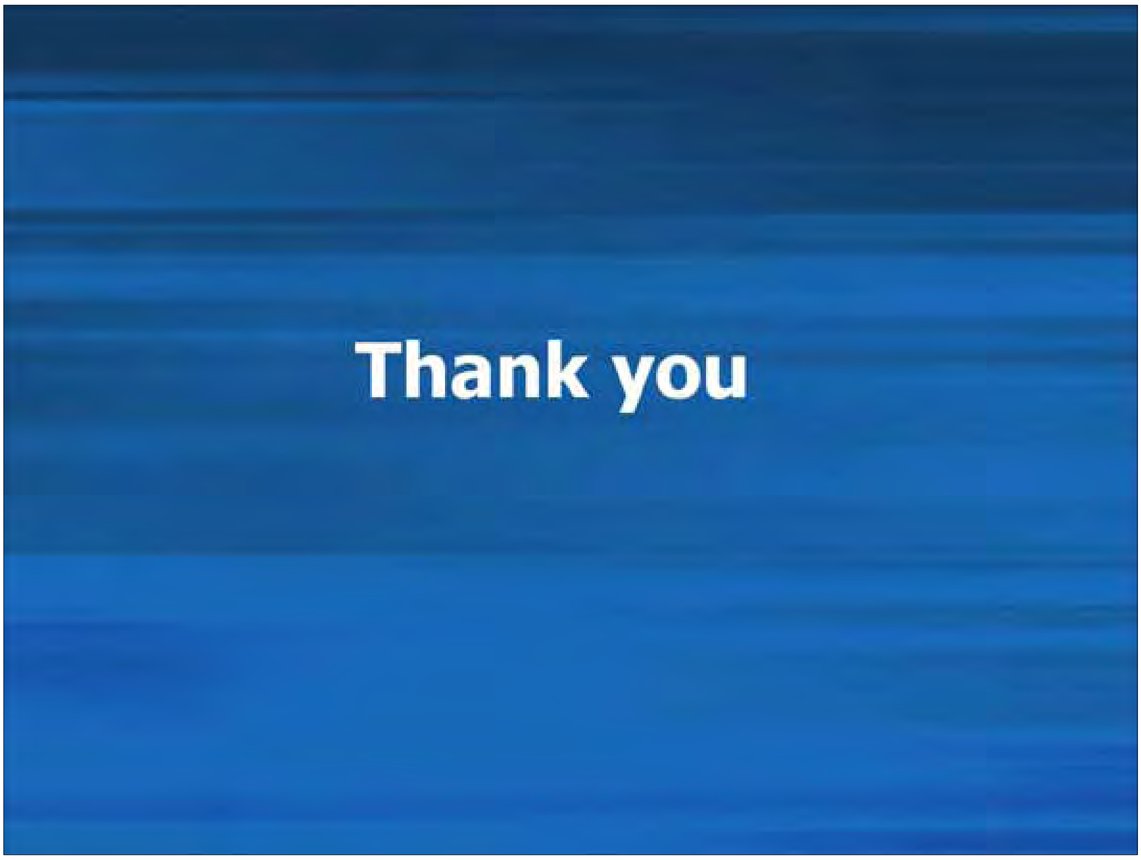
Preliminary Results: Model Calibration

Chlorophyl-A



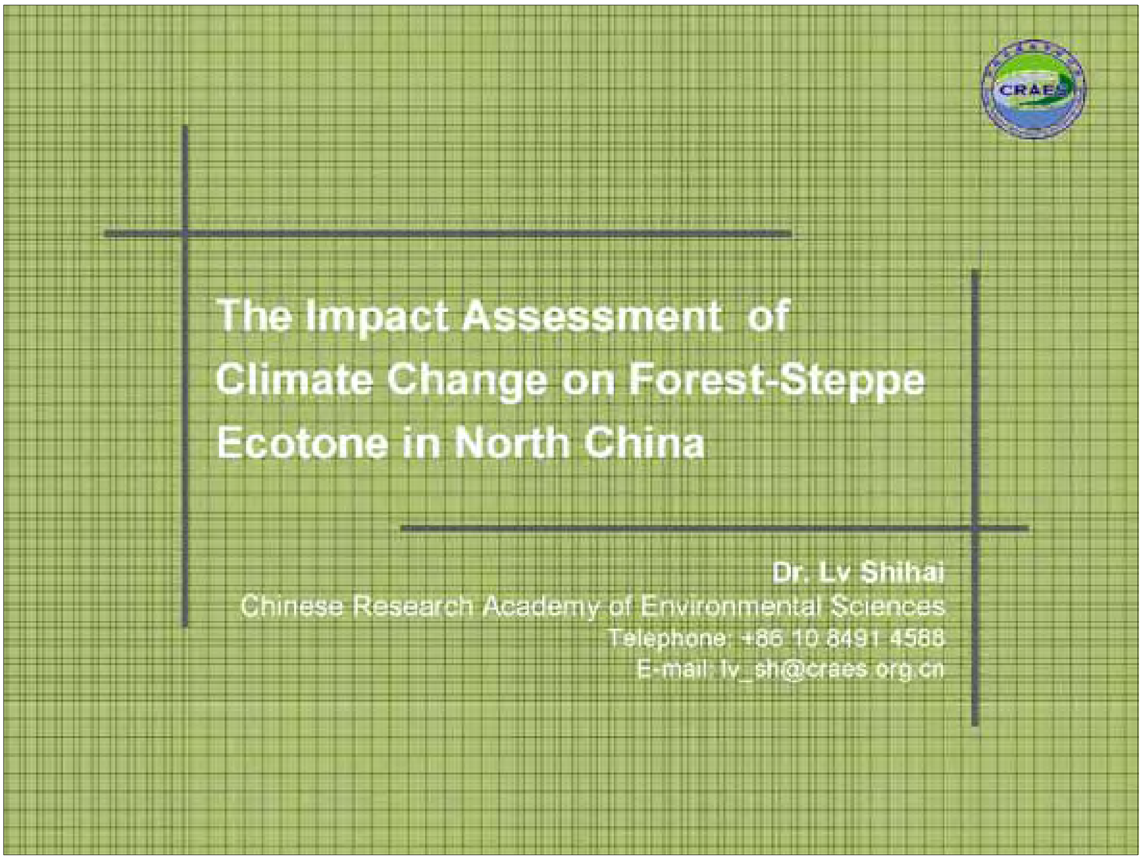
Summary

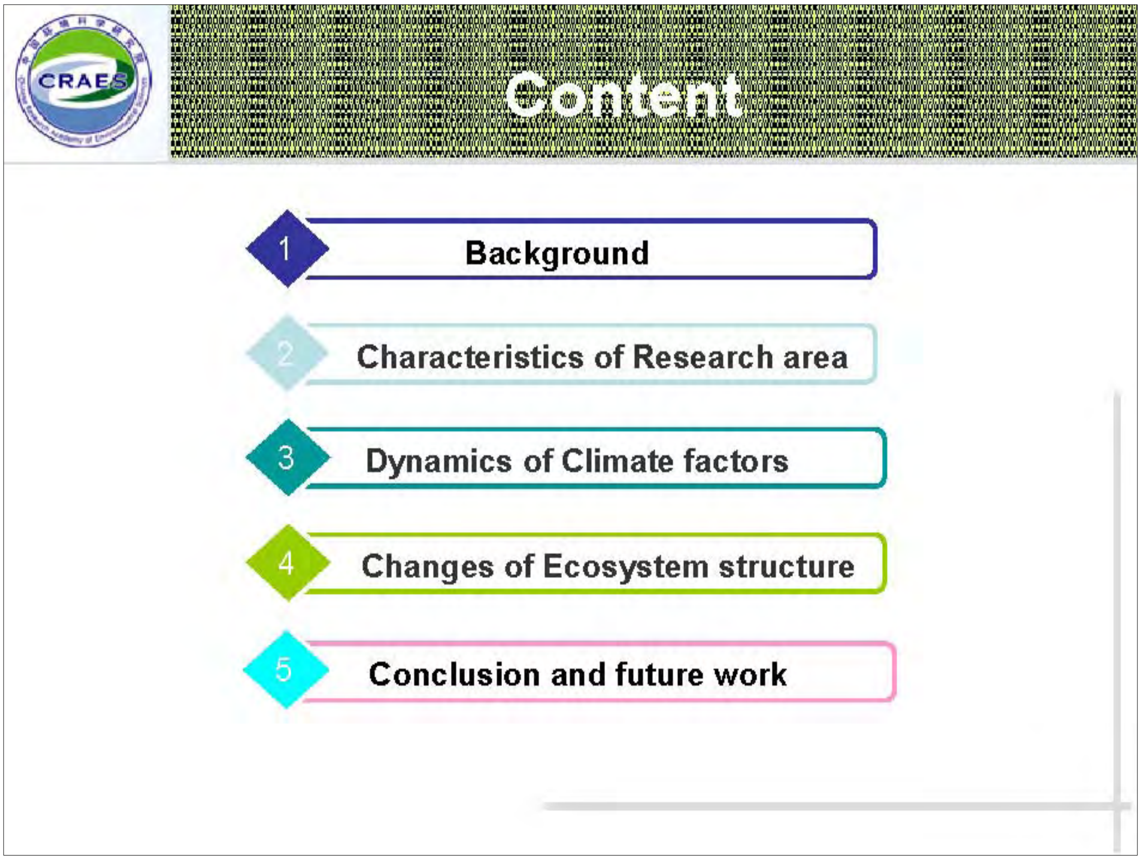
- Watershed model(SWAT) and water quality models(QUALKO2/EFDC) were used with SNURCM outputs to assess the impacts of climate change on flows and water quality
- Preliminary results showed that some changes of water quality variables, especially Chl-a at the lake area, but not much for other variables.
- There are issues:
  - Downscaling of SNURCM outputs to feed a watershed model
  - Boundary conditions of a water quality model, especially headwater temperatures → Needs energy and heat modeling for the watershed?

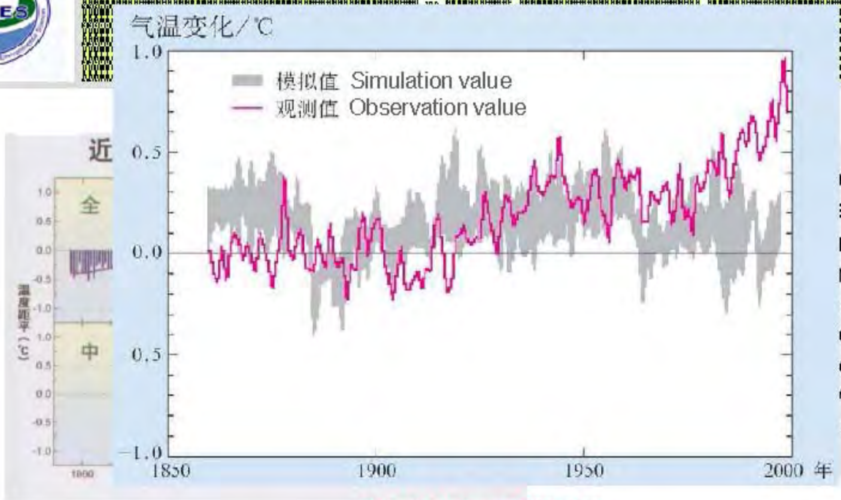

Thank you

1-3 Impact Assessment of climate change on forest-steppe ecotone in Northern China

- Dr. Shihai LU, Institute of Ecology, CRAES, China


CRAES
The Impact Assessment of Climate Change on Forest-Steppe Ecotone in North China
Dr. Lv Shihai
Chinese Research Academy of Environmental Sciences
Telephone: +86 10 8491 4588
E-mail: lv_sh@craes.org.cn


CRAES
Content
1 Background
2 Characteristics of Research area
3 Dynamics of Climate factors
4 Changes of Ecosystem structure
5 Conclusion and future work

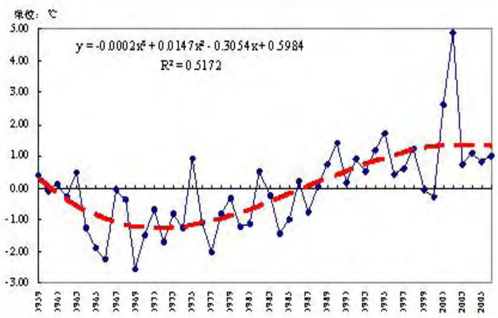


al climate
ecome a
rld. As the
nge, a lot of
ave
cement, for
em,
etland
osystem,

The data from CNCCP

- During the past 150 years, Annual average temperature has increased by 0.5~1.2℃ in China, which was slightly larger than the average global temperature rise. The most significant temperature increase occurred in winter, and 20 consecutive warm winters has been observed nationwide from 1980 to 2000.

Background

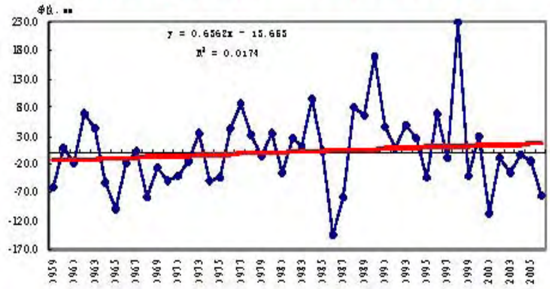


Change of annual average temperature in north of China from 1959 to 2005

- In the northeast of China, especially in the high latitude region, the eco-effects of the global climate change has become increasingly obvious, for example air temperature increment, climate aridity, forest borderline receding, grassland degradation and desertification ,wetland shrinking, and so on.

Background

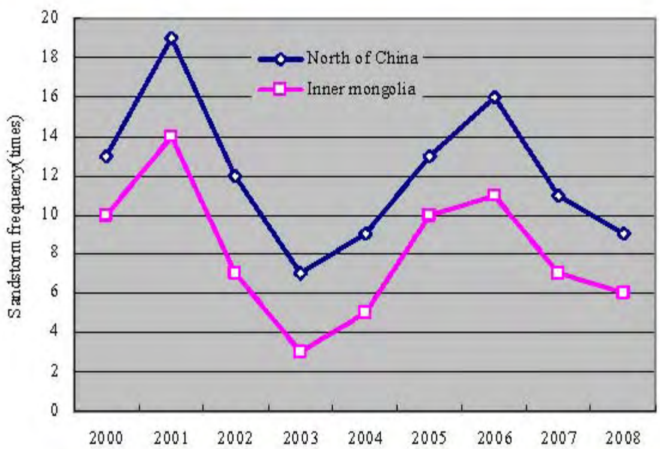
Precipitation --- From CNCCP



Change of annual precipitation in north of China from 1959 to 2005

- The annual precipitation has increased slightly in the north part of China from 1959 to 2005, which is about averaging 20~40 mm/10a, but the evaporation and transpiration also increased about 20~60 mm/10a with the temperature rising, the climate aridity has caused severe natural disasters, and it has become an important factor of restricting sustainable development of the region.

Background



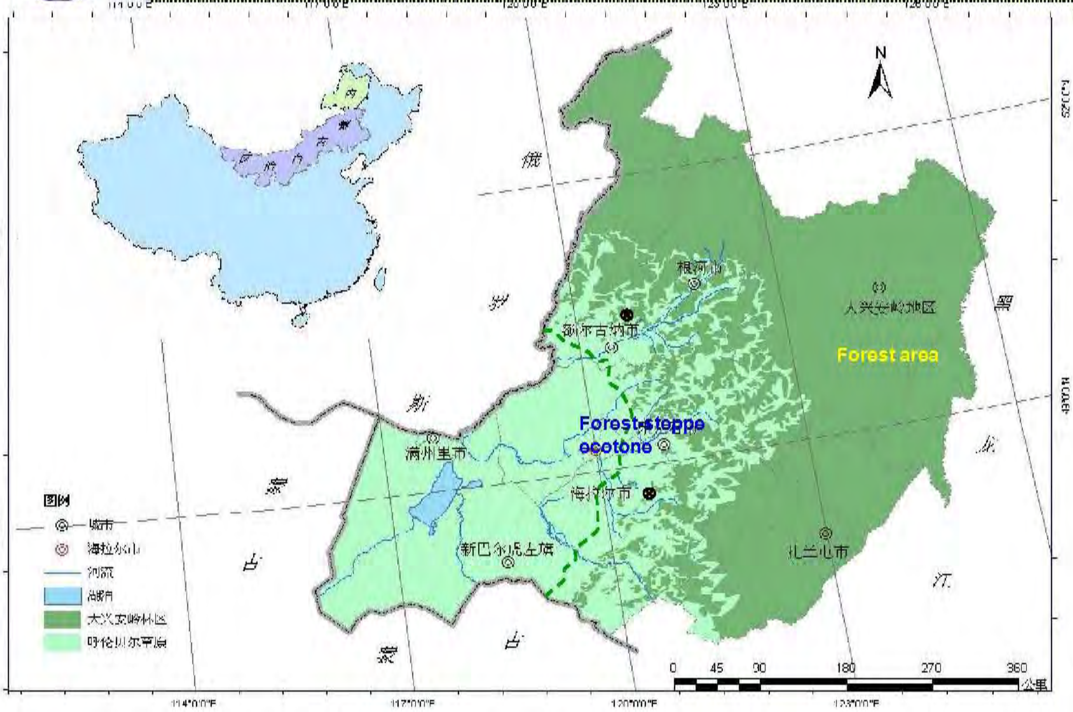
The Dust sandstorm frequency in the north part of China and Inner Mongolia grassland from 2000 to 2005

Background

- Climate change could have serious effects on forested ecosystems (Loehle and LeBlanc, 1996).
- In forest and grassland ecotone, the climate warming could have adverse effects on forest, these effects should be most evident at biome transition zones (Loehle, 2000).
- A number of past simulation studies have suggested that impacts in a variety of forest types could include geographic range shrinkages, conversion to grassland, and catastrophic forest decline or dieback(Dale and Franklin, 1989; Overpeck et al., 1991; Lindner et al., 1996).

Content

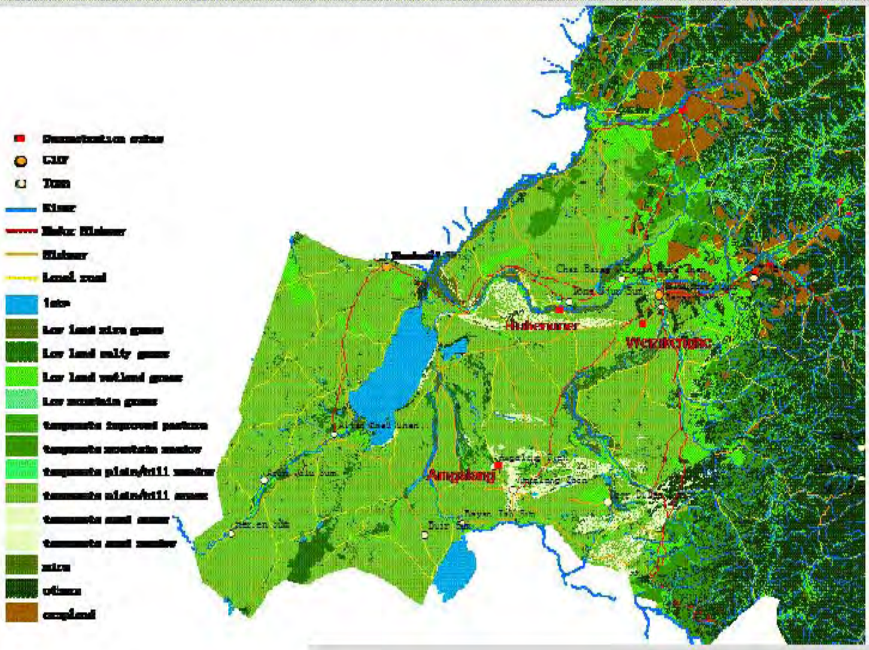
Characteristics of Research Area



Characteristics of Research Area

- In the north part of China, forest-steppe ecotone located in the transition zone of Daxing'anling forest and Hulunbeir altiplano.
- District: Hulunbeir, Inner Mongolia of China
- Climate type: Temperate zone, Sub humid-Semiarid climate
- Area: 253,000 Km^2
- Vegetation: a typical forest-steppe ecotone

  （a mixed conifer-broadleaf forest-steppe ecotone）



- In Hulunbeir forest-steppe ecotone of Northern China, there are rich ecosystem types

  for instance, the taiga forest ecosystem, mixed conifer-broadleaf forest ecosystem, meadow steppe ecosystem, typical grassland ecosystem, lowland or swamp meadow ecosystem, wetland ecosystem, sand-shrub ecosystem, etc.

- Species diversity: 15 flora, 108 families, 468 genus, 1352 species (*Vascular Plant*)

Content

1 Background

2 Characteristics of Research area

3 Dynamics of Climate factors

4 Changes of Ecosystem structure

5 Conclusion and future work

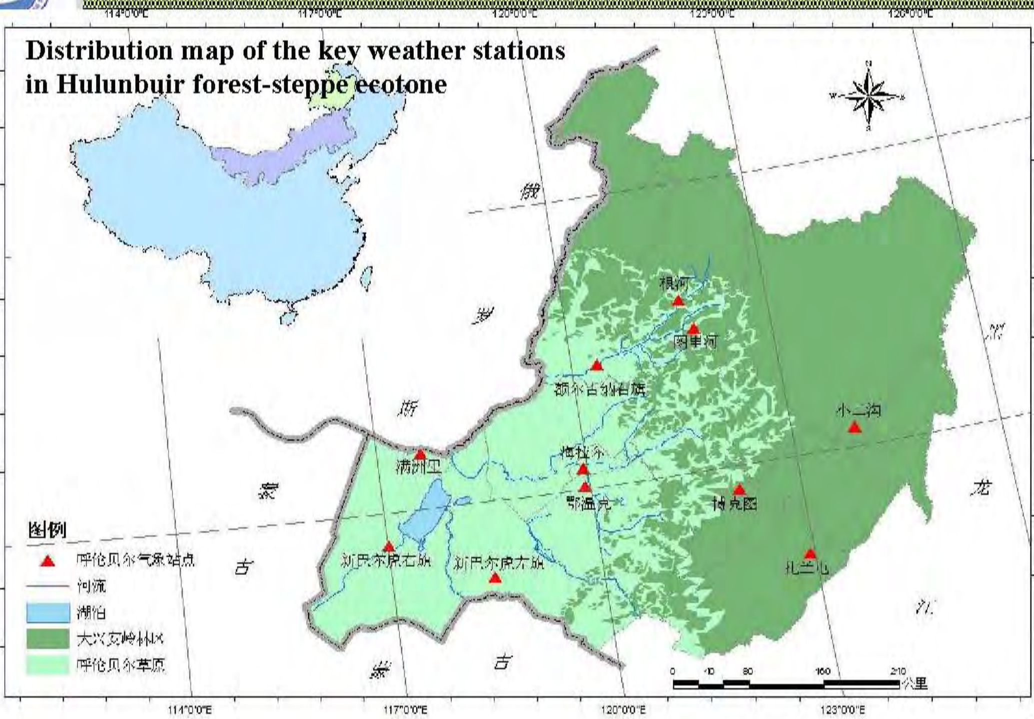
Dynamics of Climate factors

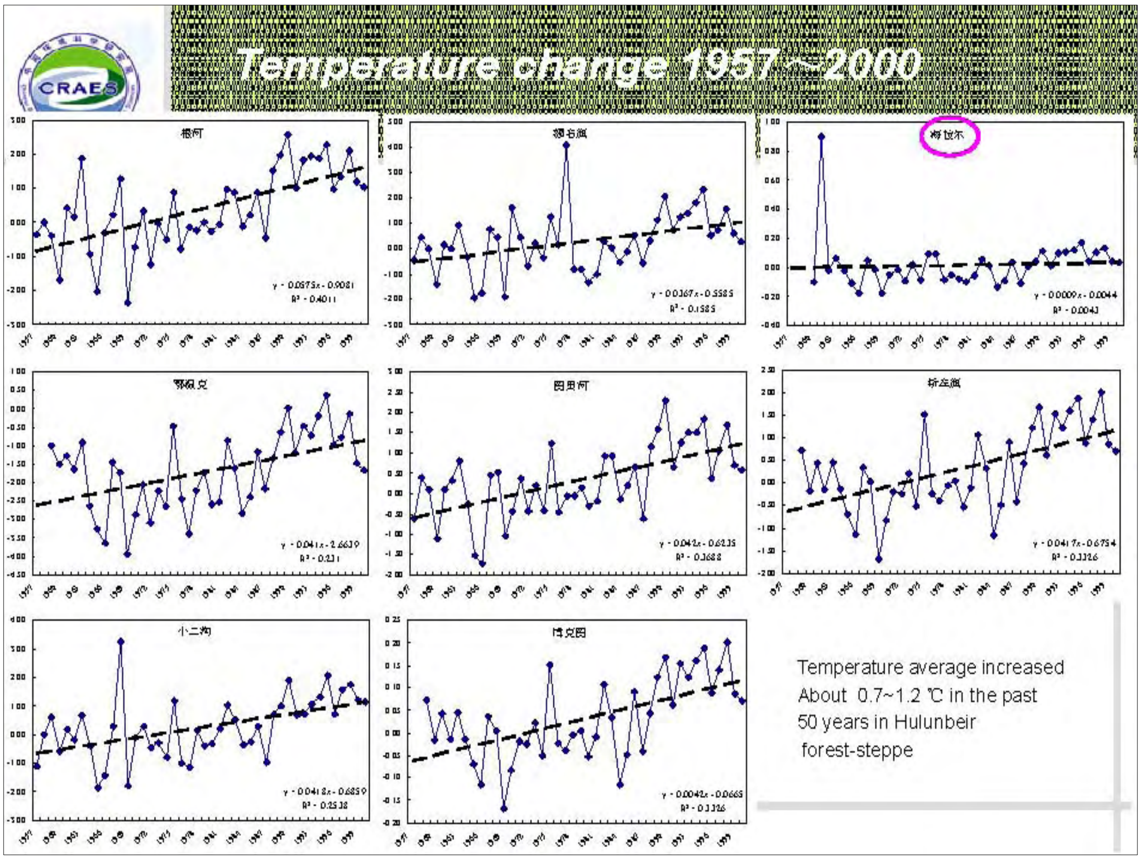
In Hulunbeir forest-steppe ecotone of northern China, the pattern of temperature and precipitation has occurred the obvious variety with being influenced by the global climate change in the past 50 years.

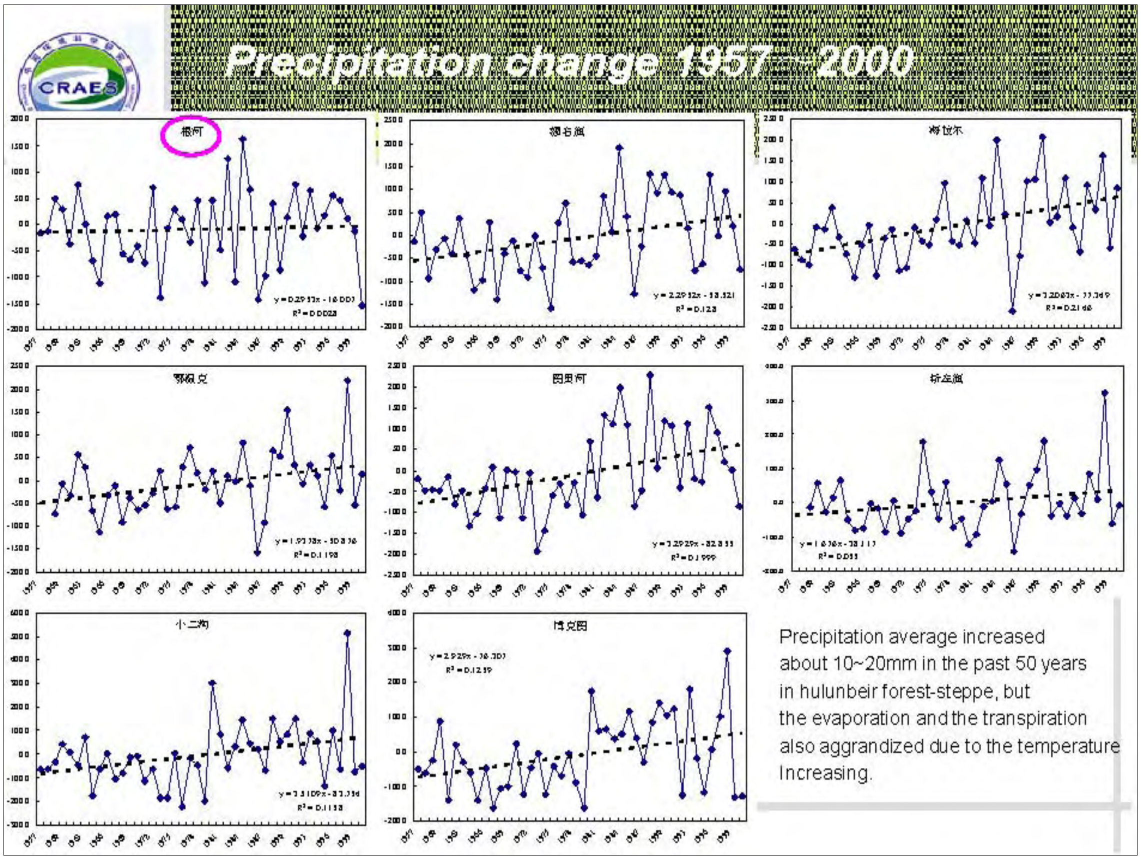
Observation data of 8 key weather station was studied...

- Air temperature change...
- Annual precipitation change...
- Atmosphere Drought Index...

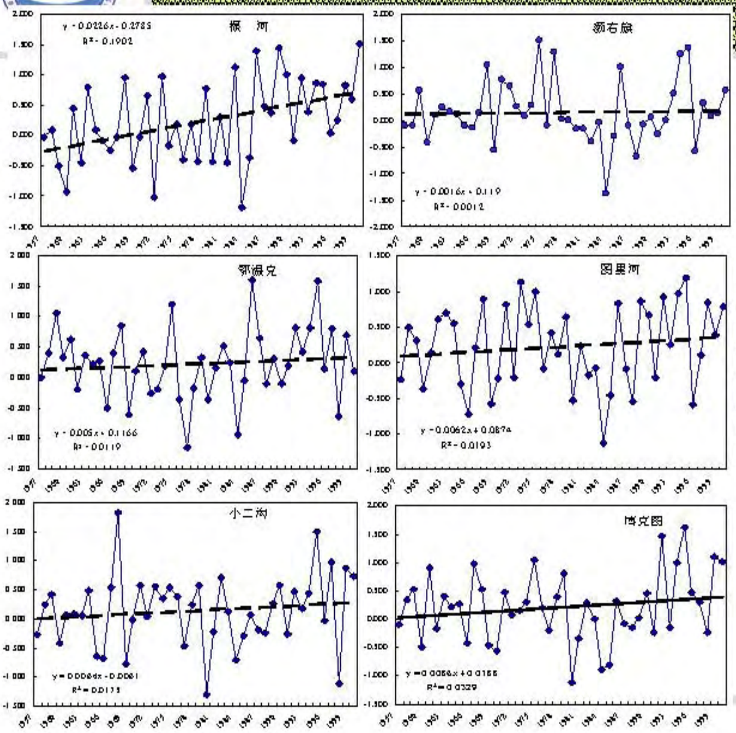
Distribution map of key weather station




CRAES
Temperature change 1957～2000
Temperature average increased
About 0.7~1.2 ℃ in the past
50 years in Hulunbeir
forest-steppe


CRAES
Precipitation change 1957～2000
Precipitation average increased
about 10~20mm in the past 50 years
in hulunbeir forest-steppe, but
the evaporation and the transpiration
also aggrandized due to the temperature
Increasing.

Drought Index change 1957~2000

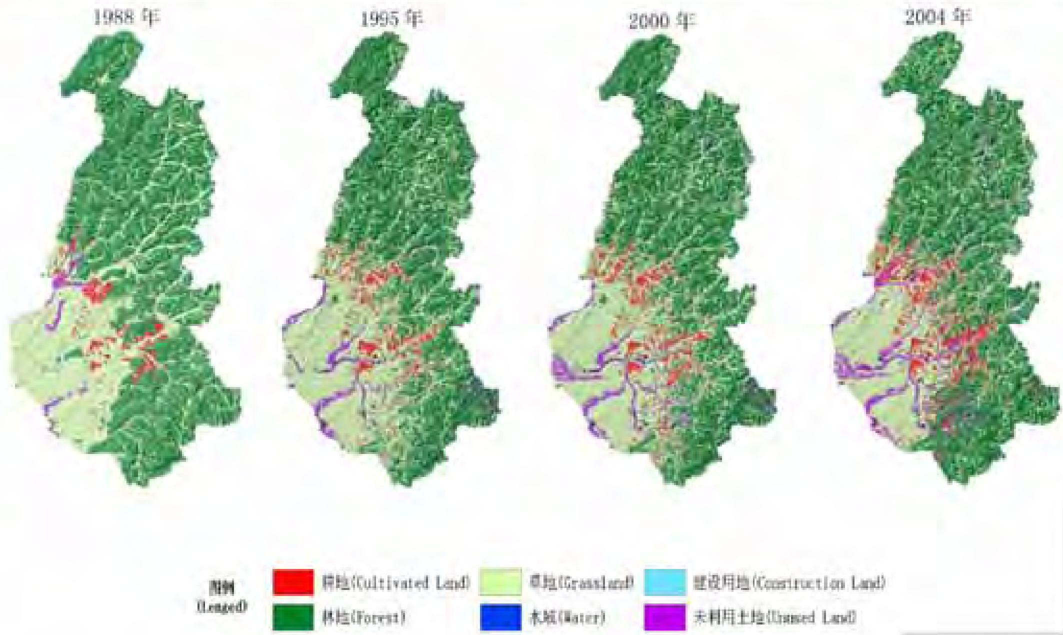


The evaporation and the transpiration become stronger and more drought with temperature Increase in past 50 years in Hulunbeir forest-steppe ecotone

Content

1. Background
2. Characteristics of Research area
3. Dynamics of Climate factors
4. Changes of Ecosystem structure
5. Conclusion and future work

Landscape pattern changes in ecotone



Landscape pattern changes in ecotone

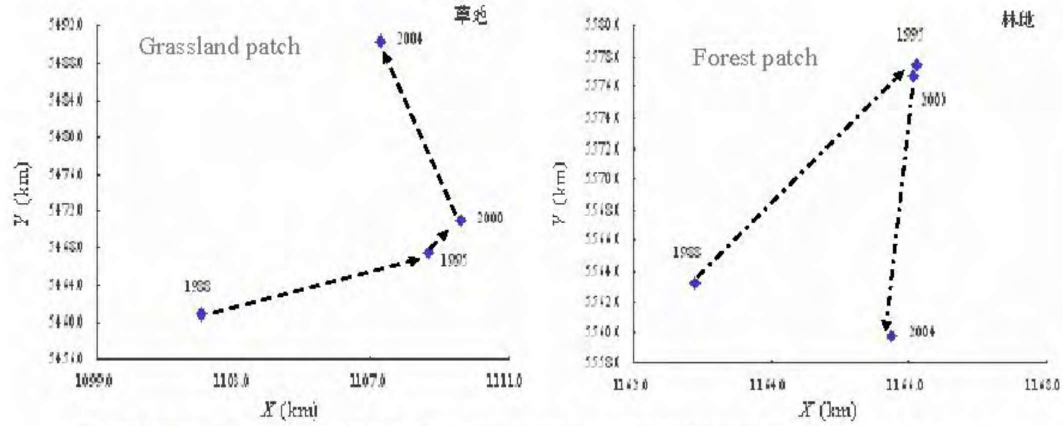
Change of forest and grassland centroid in Hulunbuir from 1988 to 2004（Unit: km）

Types	1988		1995		2000		2004		1988~2004	
	X	Y	X	Y	X	Y	X	Y	△X	△Y
Forest	1162.9	5563.3	1166.1	5577.5	1166.1	5576.8	1165.8	5559.8	+2.9	-3.5
Grassland	1102.1	5460.9	1108.7	5467.5	1109.6	5471.1	1107.3	5490.4	+5.2	+29.5

- The centroid of the forest patch has moved 3~4 km southeast.
- The centroid of the grassland patch has moved about 30.0 km northeast.

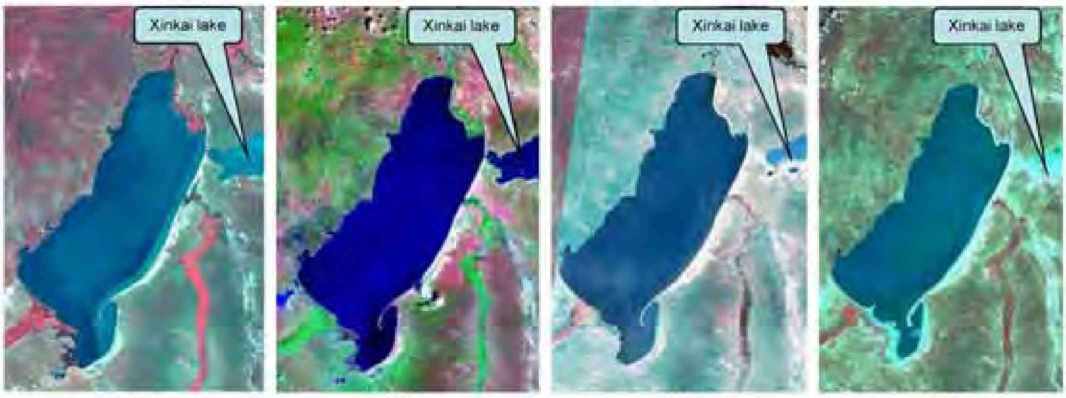
Landscape pattern changes in ecotone

Dynamic change of the patches centroid of forest and grassland in Hulunbeir forest-steppe ecotone from 1988 to 2004.



- As impact on the global climate change and human activities, the ecotone timberline moved up about 3~4 km, and grassland area enlarged about 3000~6000 square kilometer(km^2) in the past 20 years.

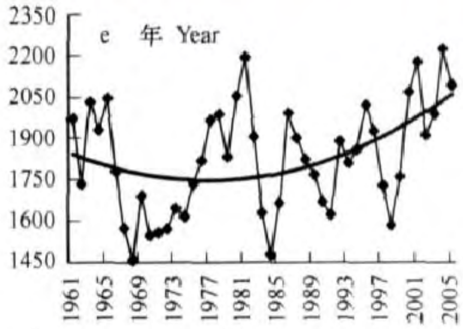
Changes of dalai lake wetland in ecotone



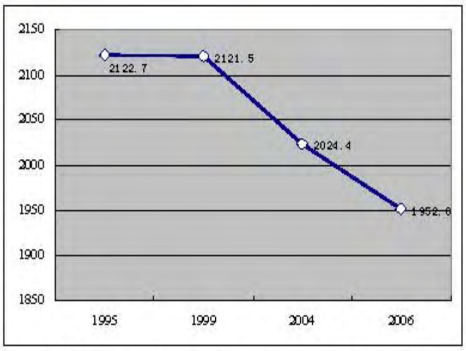
1995 1999 2004 2006

Comparition of TM images on dalai lake wetland from 1995 to 2006

- As impact on the global climate change and human activities, wetland area of Dalai lake natural reserve decreased gradually in the past decades, and Xinkai lake has disappeared since 2006.



The annual evaporation change in Dalai lake wetland from 1961 to 2005.(unit:mm)
(Data from: ZHAO HuiYing, 2008)



The change of Dalai lake wetland area from 1995 to 2006.(unit:km²)

- These figures were seen that the annual evaporation of Dalai lake Wetland Natural Reserve has an increased trend year after year, and the area decreased about 170 km^2 in the past decades, because of impact on climate change and human activities.

Changes of dalai lake wetland in ecotone

Correlation analysis between water area and meteorological factors (Temperature, Precipitation and Evaporation) in Dalai Lake

Time	Temperature		Precipitation		Evaporation	
	Correlation *r*	Change rate (km^2/℃)	Correlation *r*	Change rate (km^2/mm)	Correlation *r*	Change rate (km^2/mm)
Spring	0.211	-20.60	0.323*	1.86	0.122	-0.25
Summer	0.517**	-49.69	0.290	0.56	0.393*	-0.37
Autumn	0.357*	-35.49	0.051	0.22	0.502**	-0.82
Winter	0.348*	-28.09	0.219	1.45	0.446**	-1.20
All year	0.576**	-79.93	0.243	0.43	0.456**	-0.24

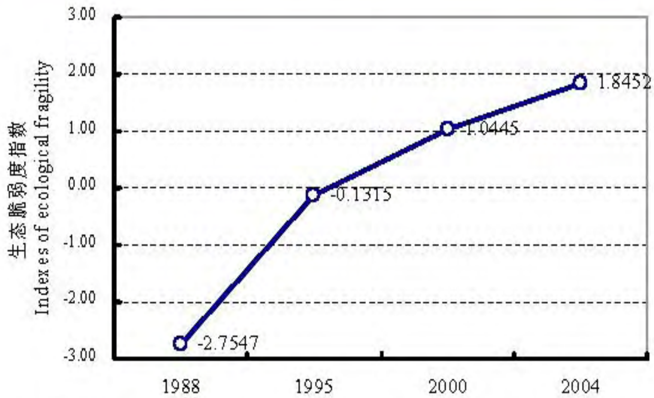
Changes of the community structure

Changes of ecotone community structure in the past 20 years

Community types	Distribution	Height (cm)		Coverage (%)		Biomass (kg/hm^2)	
		1988	2006	1988	2006	1988	2006
Betula platyphylla	Top mountainou area	35.7	30.4	40	50	2790	2210
Spirae salicifolia	High mountainou area	39.7	30.2	85	75	5190	3760
Filifolium sibiricum	Gentle slope hills	41.5	28.6	80	65	4980	2940
Stipa baicalensis	Middle mountainous area	53.5	40.7	75	60	4770	3060
Leymus chinense	Other hills	45.3	31.3	80	60	3930	2540
Other grasses	Valley	36.2	23.9	85	70	4360	3040

The community structure of the ecotone has occurred obvious degradation in the past 20 years

Changes of ecological fragility in ecotone



Trends changing of eco-fragility in Hulunbeir forest-steppe ecotone

- The result of synthesis assessment indicated that the fragile degree of forest-steppe ecotone has increased more than 2 times from 1988 to 2004.

Content

1. Background
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Conclusion

- In Hulunbeir forest-steppe ecotone of Northern China, the effect of climate drought has a obvious increased trend in the past 50 years, because of impact on the global climate change.
- The ecosystem structure have occurred degradation to some extent, for example timberline shrunk, grassland patch enlarged, wetland area reduced.
- Plant community structure degenerated year after year, and species, grass height, vegetation coverage and the above ground biomass decreased significantly.
- The result of synthesis assessment indicated that the fragile degree of forest-steppe ecotone has increased more than 2 times in the last decades.

Next Research plan

- Long time trends of climate change.
- Mechanism of climate change.
- Ecological effect assessment on climate change.
- Cause of climate change.
- Countermeasures and adaptive capacity on climate change.

Session Ⅱ	**Global Climate Change Monitoring, Adaptation and Mitigation** (Moderator : Dr. Fan MENG, CRAES, China)

2-1 Industrial pollution reduction and green technologies

- Dr. Yanping LI, Center of Cleaner Production and Circular Economy, CRAES, China

2-2 Observation of global carbon distribution by GOSAT and its role in Climate change research

- Dr. Yoshifumi YASUOKA, NIES, Japan

2-3 Climate change: its impacts and adaptation

- Dr. Chang-Geun SONG, Climate Change Research Division, NIER, Korea

Lunch

2-1 Industrial pollution reduction and green technologies

- Dr. Yanping LI, Center of Cleaner Production and Circular Economy, CRAES, China

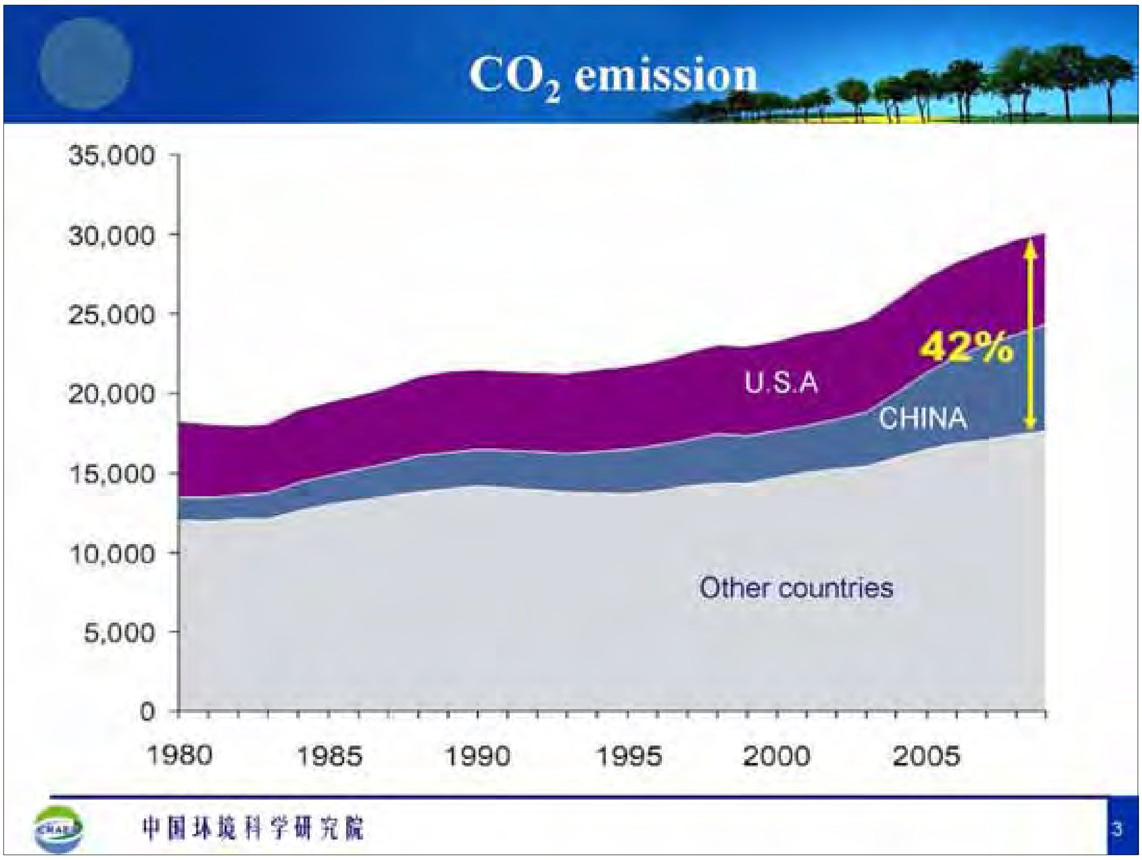
Industrial pollution reduction and green technologies

-Pathways to Low Carbon Economy for China

LI Yanping
Chinese Research Academy of Environmental Sciences
2009.11.27

Outline

1. Background
2. Low Carbon Economy (LCE)
3. Challenges for China
4. Industrial pollution reduction and green technologies



CO2 emission
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1980
1985
1990
1995
2000
2005
U.S.A
42%
CHINA
Other countries
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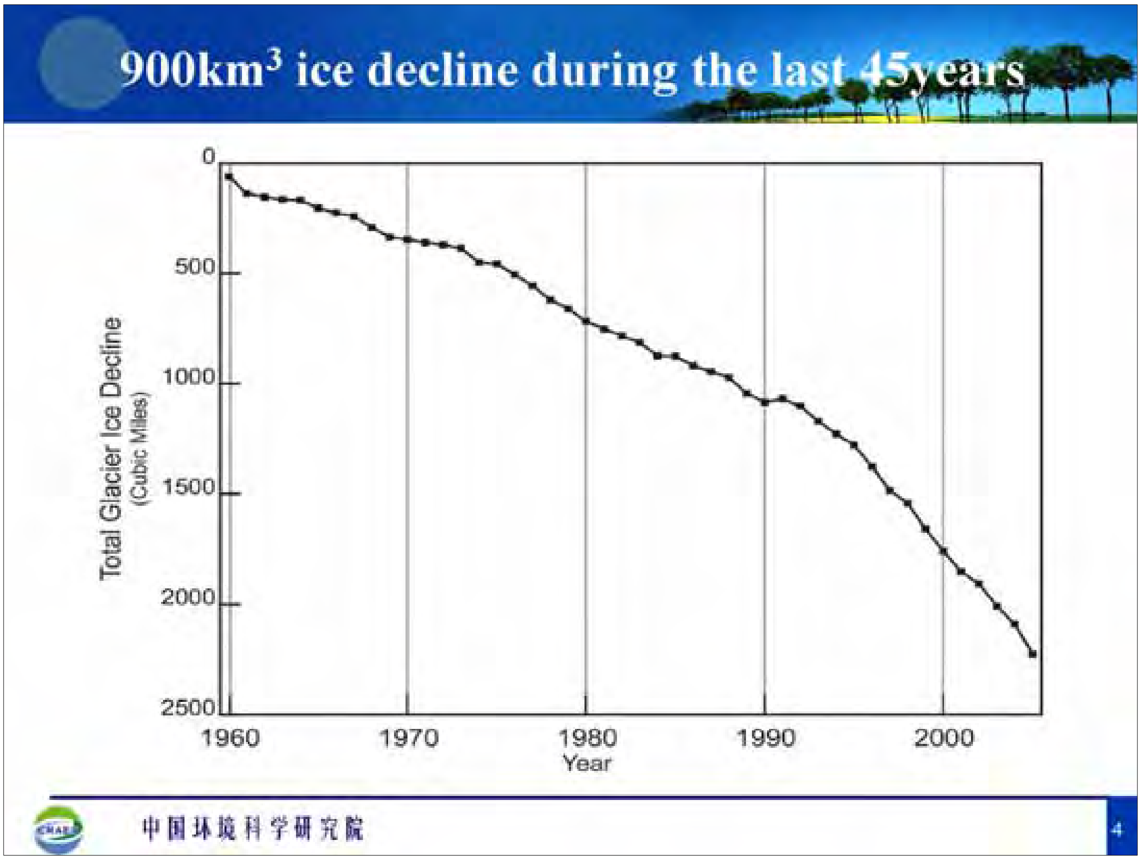

900km3 ice decline during the last 45years
Total Glacier Ice Decline
(Cubic Miles)
0
500
1000
1500
2000
2500
1960
1970
1980
1990
2000
Year
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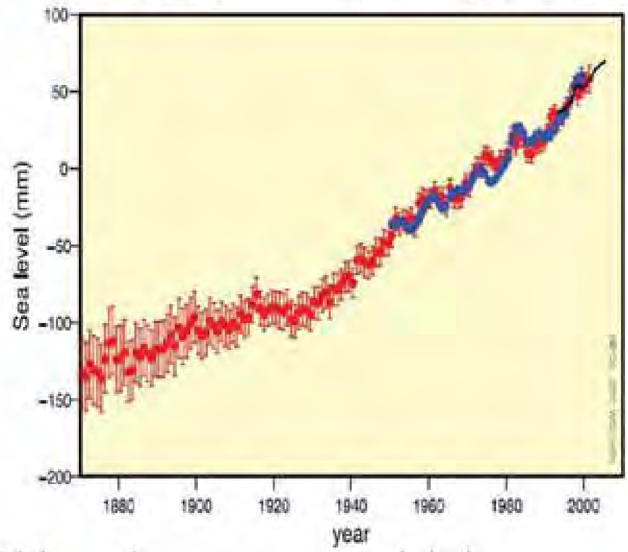
Global sea level

----From technical introduction of IPCC in 2007



① **Last 2000years:**

0.1-0.2mm/Y

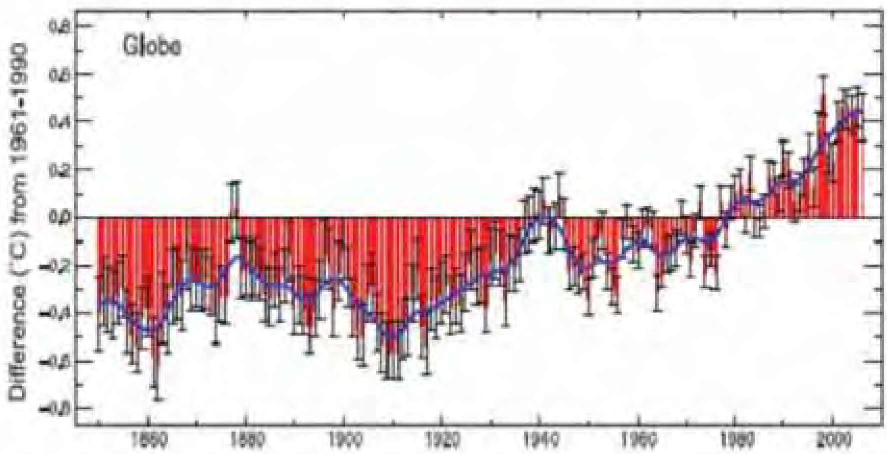
② **1870-1890:**

0.6mm/Y

② **1990-2008:**

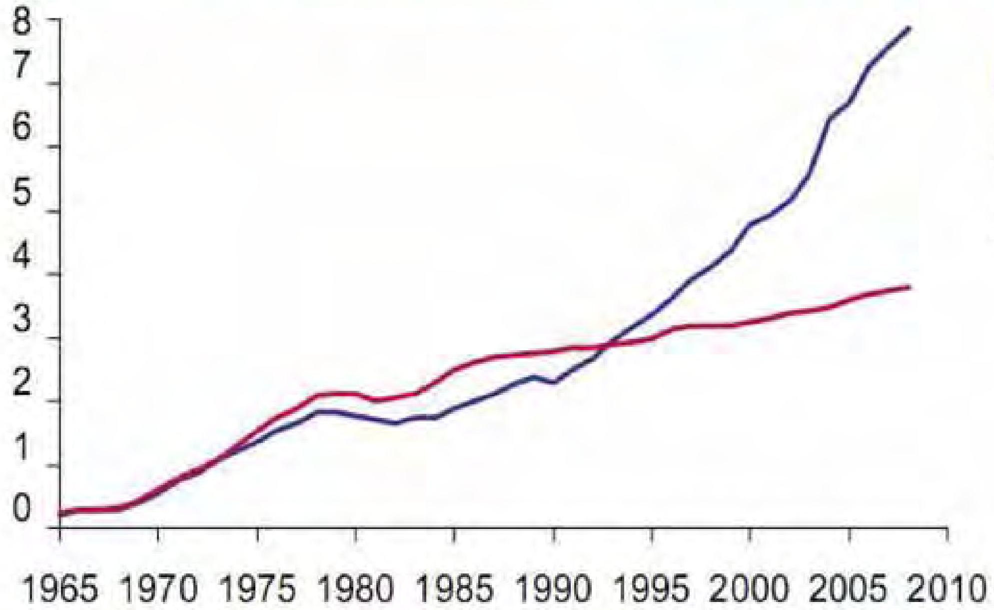
3.0/Y

Global greenhouse gas (1961-2000)



From the 4th assessment report on climate change by IPCC in 2007

Net import of oil for China in 1990



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2.Low Carbon Economy

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Low Carbon Economy (LCE)

LCE, refers to a low energy-consuming and low pollution-based economy that has a minimal output of Greenhouse Gas emissions into the biosphere. Its core is technological innovation and fundamental transfer of the development concept.

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Model of LCE

$$E_t = P \times C \times GDP \times E_e$$

E_t------*total emission of carbon;*

P ------population;

C ------ gross domestic product (GDP) per capita;

GDP------ gross domestic product;

E_e------ *emissions per unit of energy consumption*

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3. Challenge for China

Background

Resource:

Half of the world' average;

Not abundant to half of the world's average for major mineral

Consumption:

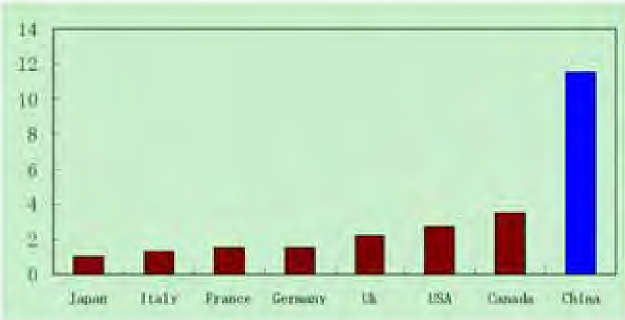
Energy ,material and water consumption of unit GDP is far bigger than that of developed countries.

Environmental pollution:

Structural and complex and compressed in type

Resource and energy consumption of China

Resource consumption	coal	iron	steel	cement	GDP
Percentage to the world(%)	31	31	30	40	4



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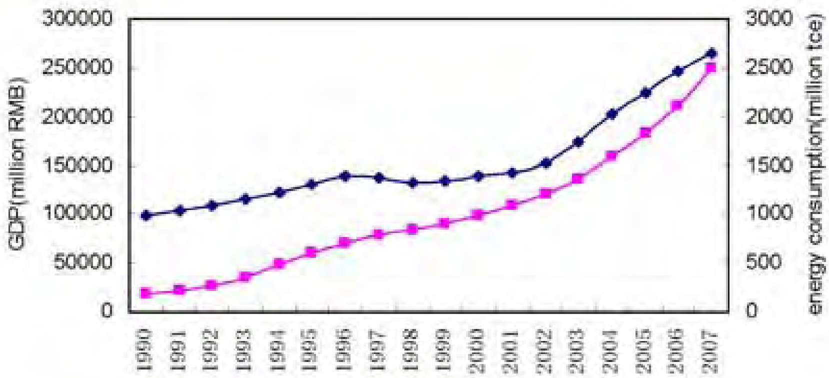
Challenge for China



Economy increase 13.37times
Energy consumption increase2.69times during 1990-2007

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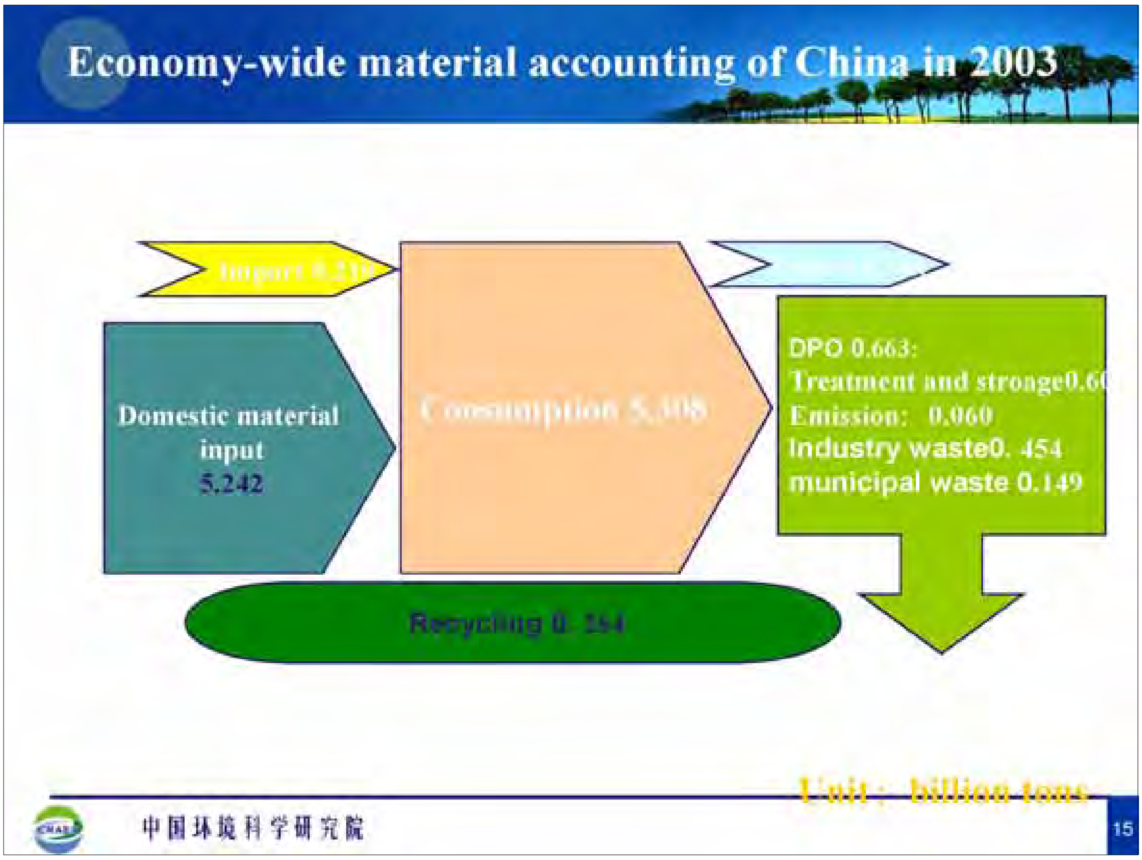
Economy-wide material accounting of China in 2003
Import
Domestic material input 5.242
Consumption
DPO 0.663:
Treatment and stronge0.6
Emission: 0.060
Industry waste0. 454
municipal waste 0.149
Recycling
Unit : billion tons
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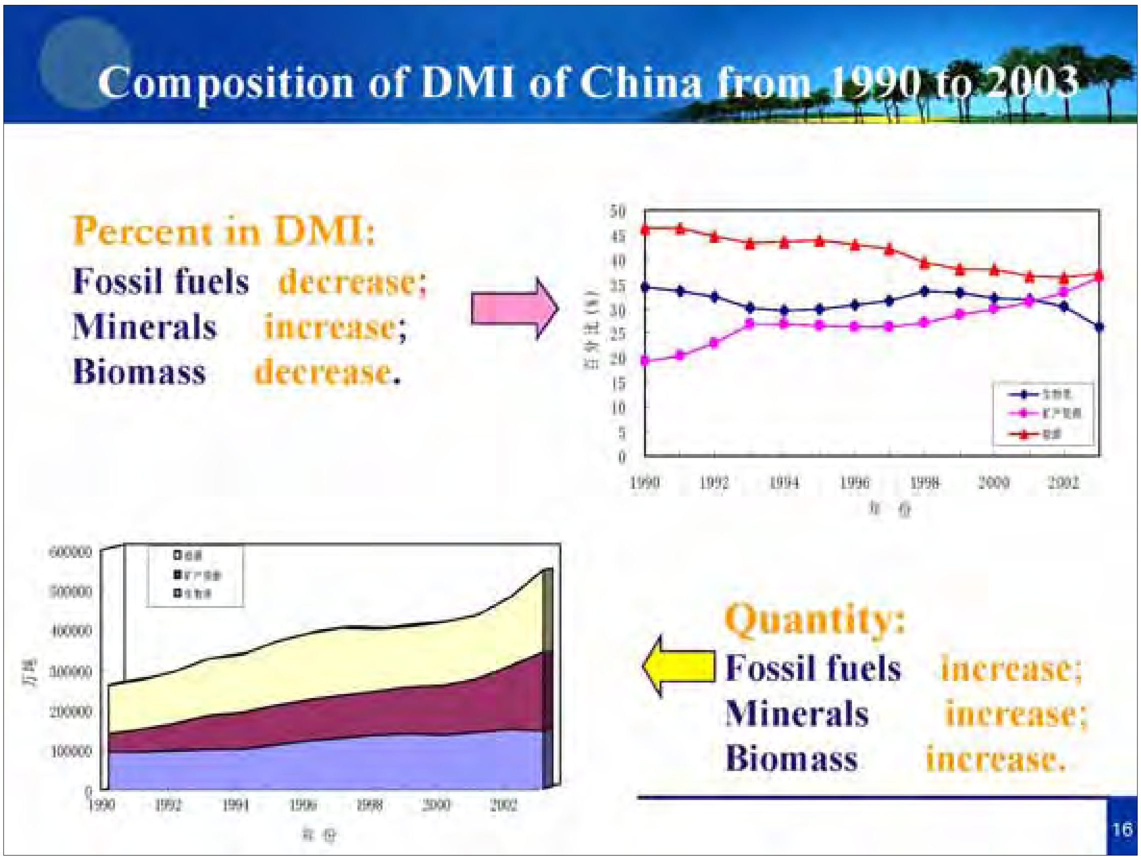
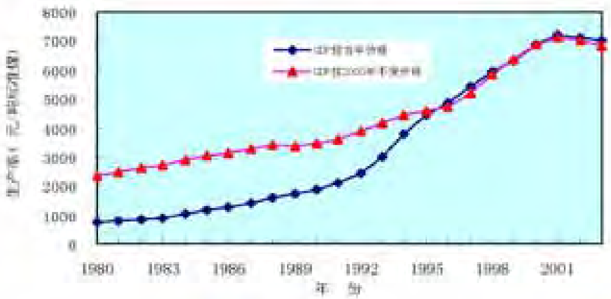
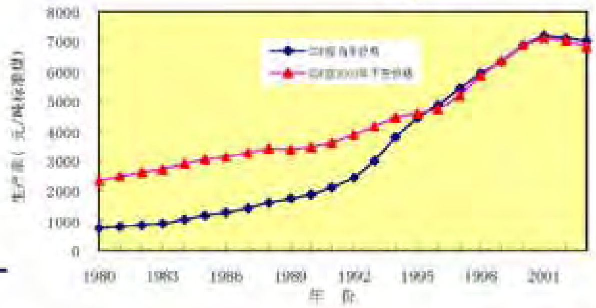

Composition of DMI of China from 1990 to 2003
Percent in DMI:
Fossil fuels decrease;
Minerals increase;
Biomass decrease.
Quantity:
Fossil fuels increase;
Minerals increase;
Biomass increase.
16

Material productivity of Fossil fuels



Industry

Fossil fuels



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Environmental pollution trend

The environmental pollution will be more 4-5 times than 2000 in China in 2020.

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Shares of cumulative emission of China

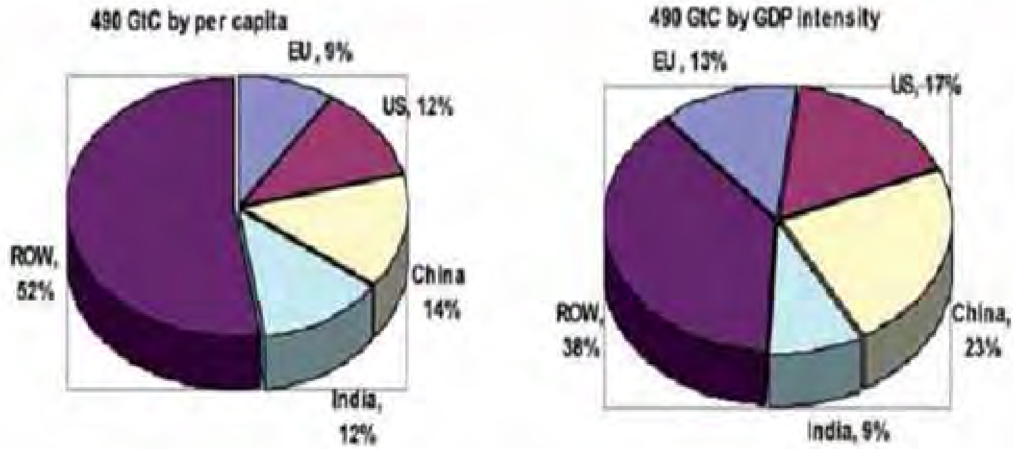
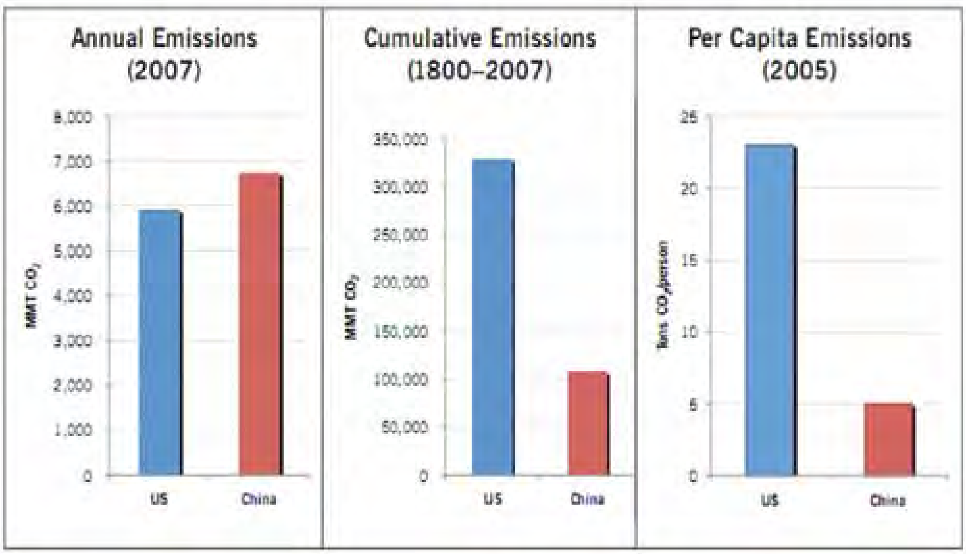
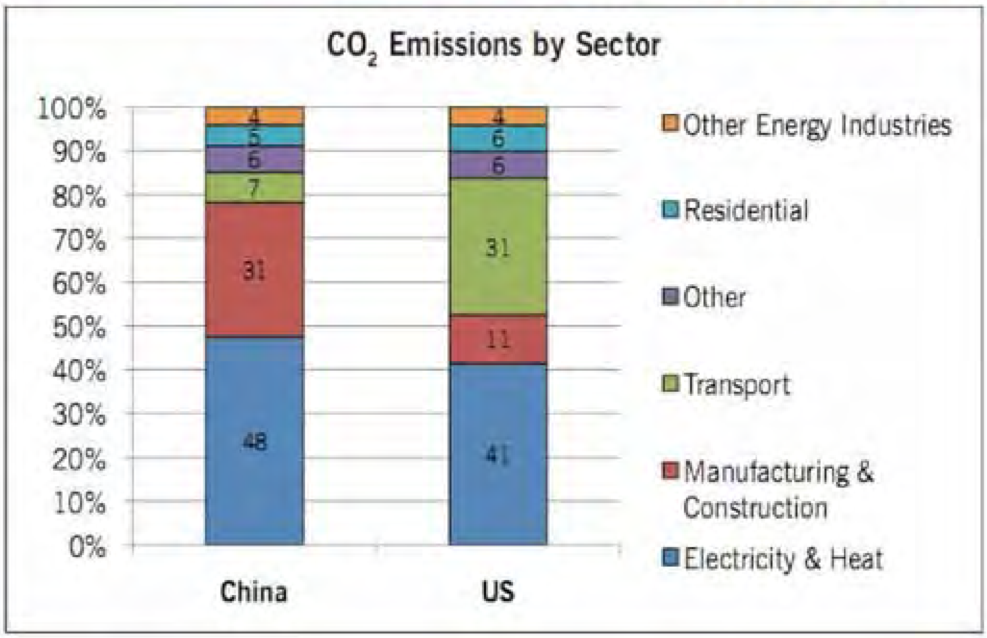


Figure 5: Shares of cumulative emission under two approaches

CO_2 emission in China



CO_2 emission by sector



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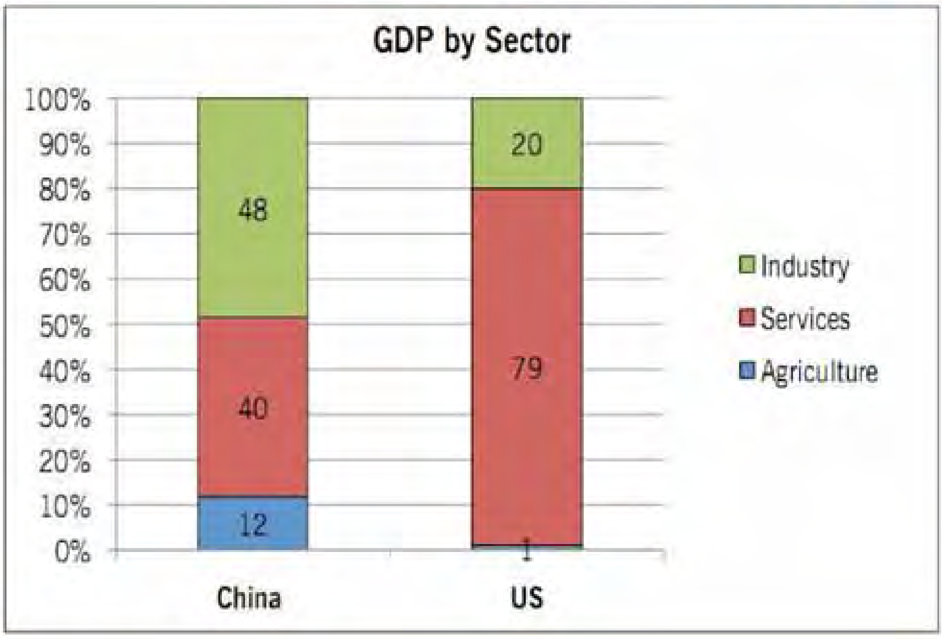
GDP composition



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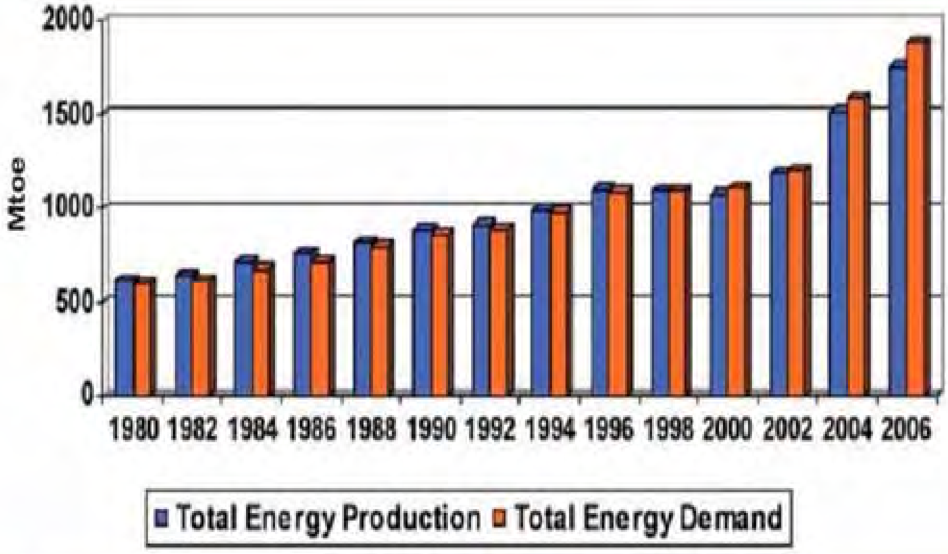
Energy production and demand in China



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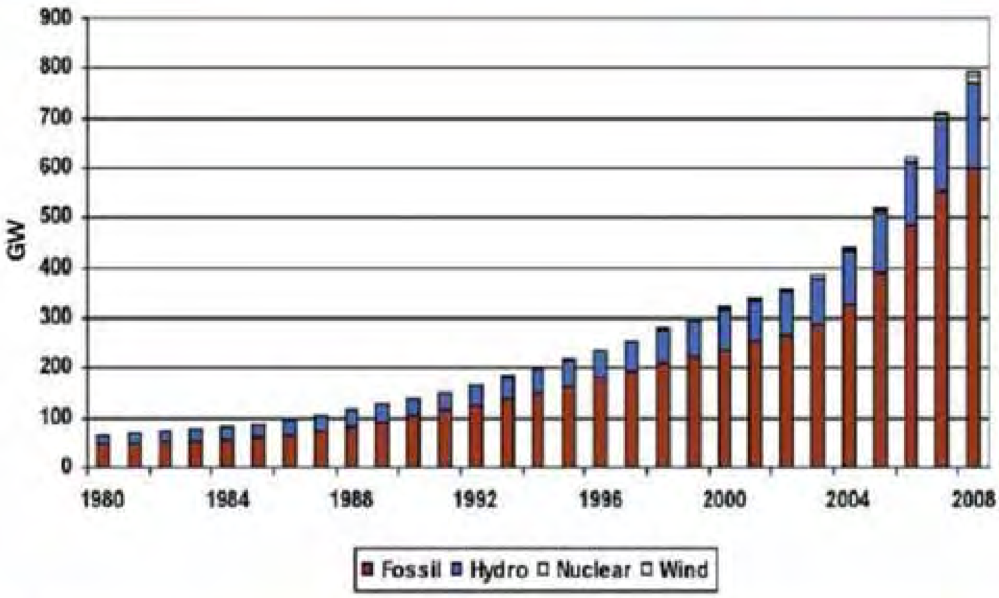
Energy composition in China



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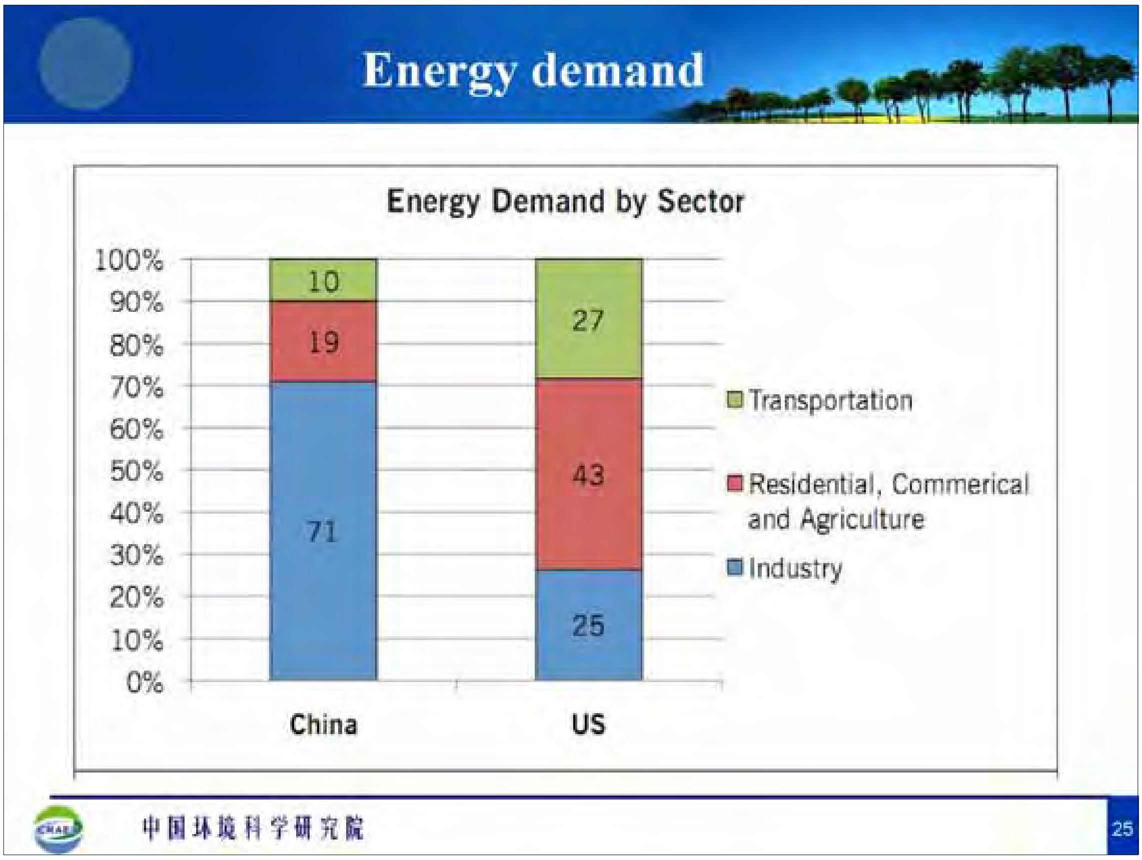
Energy demand
Energy Demand by Sector
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
10
19
71
27
43
25
China
US
Transportation
Residential, Commerical and Agriculture
Industry
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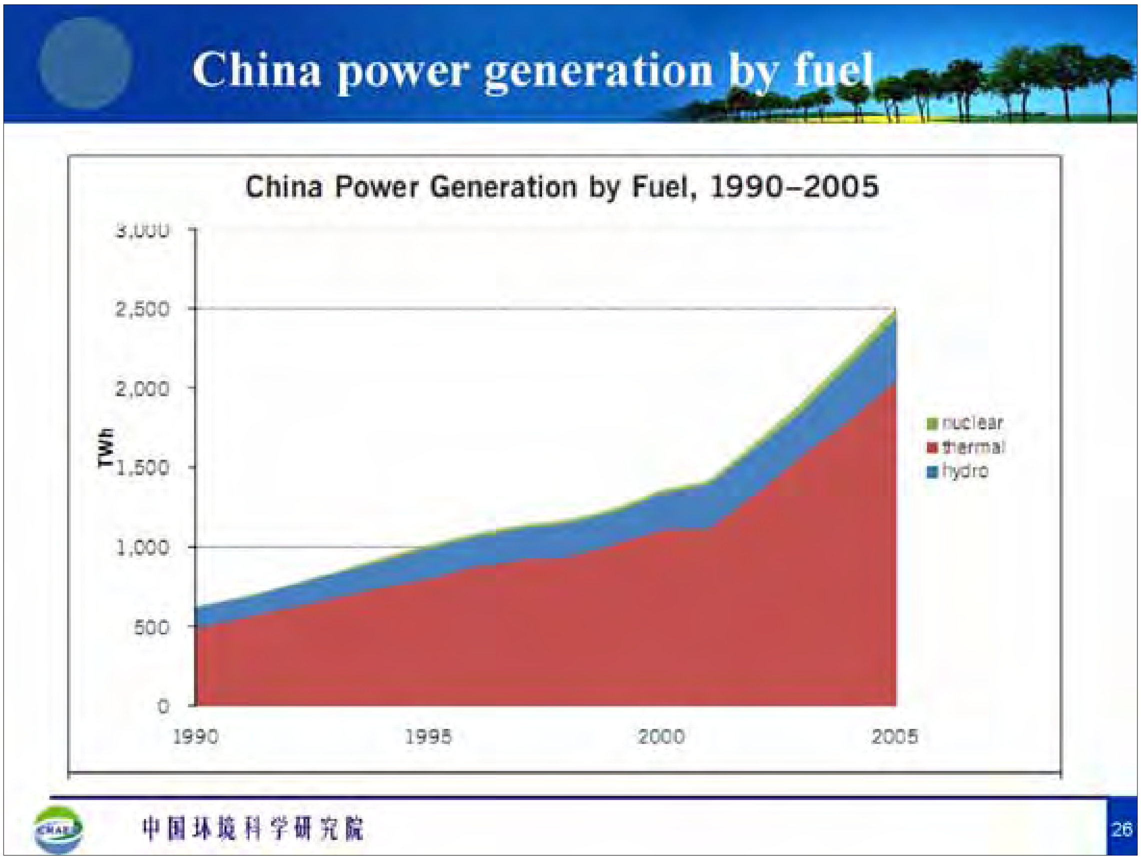
China power generation by fuel
China Power Generation by Fuel, 1990-2005
3,000
2,500
2,000
1,500
1,000
500
0
TWh
1990
1995
2000
2005
nuclear
thermal
hydro
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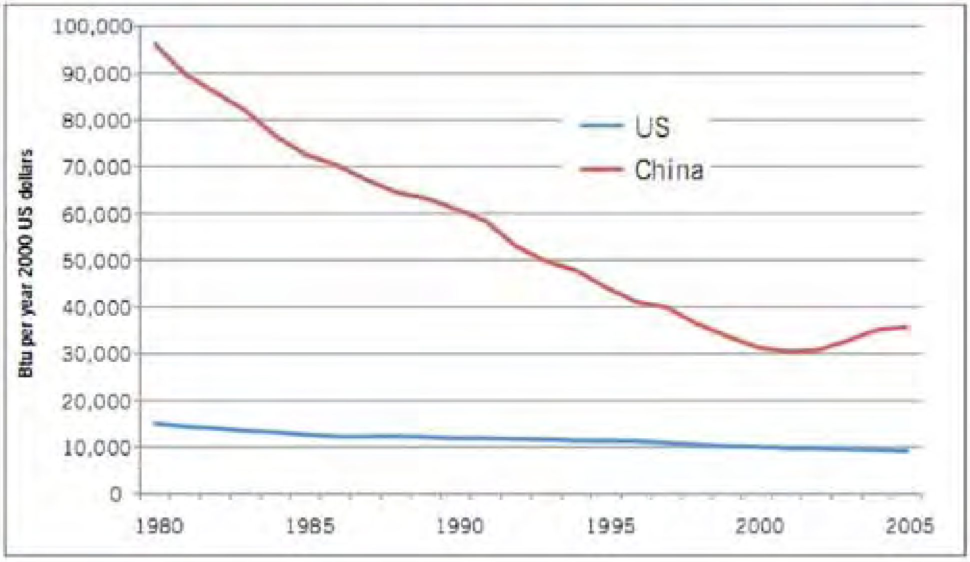
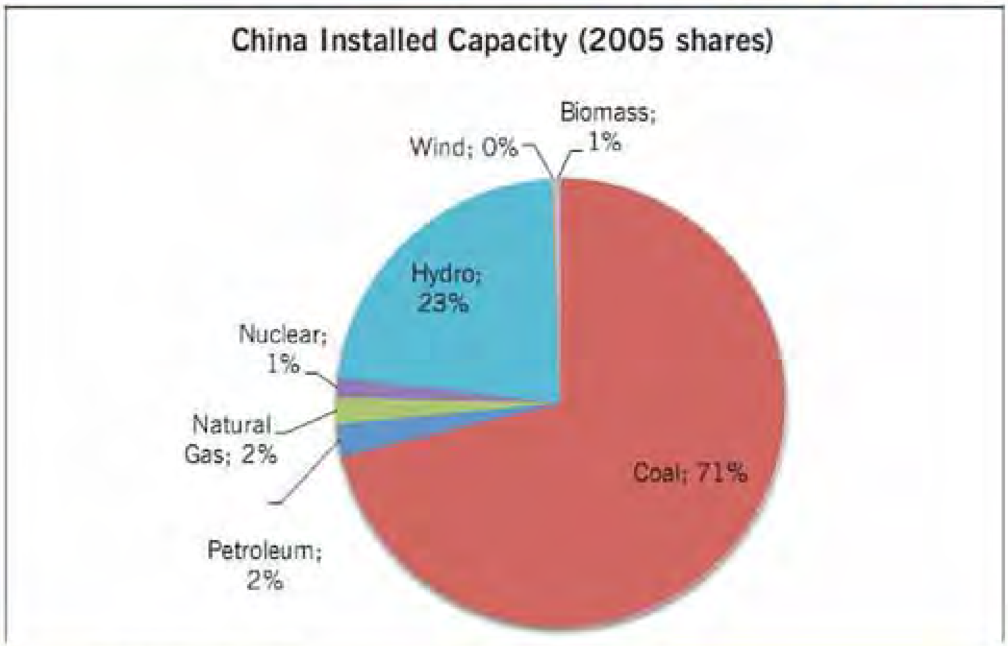
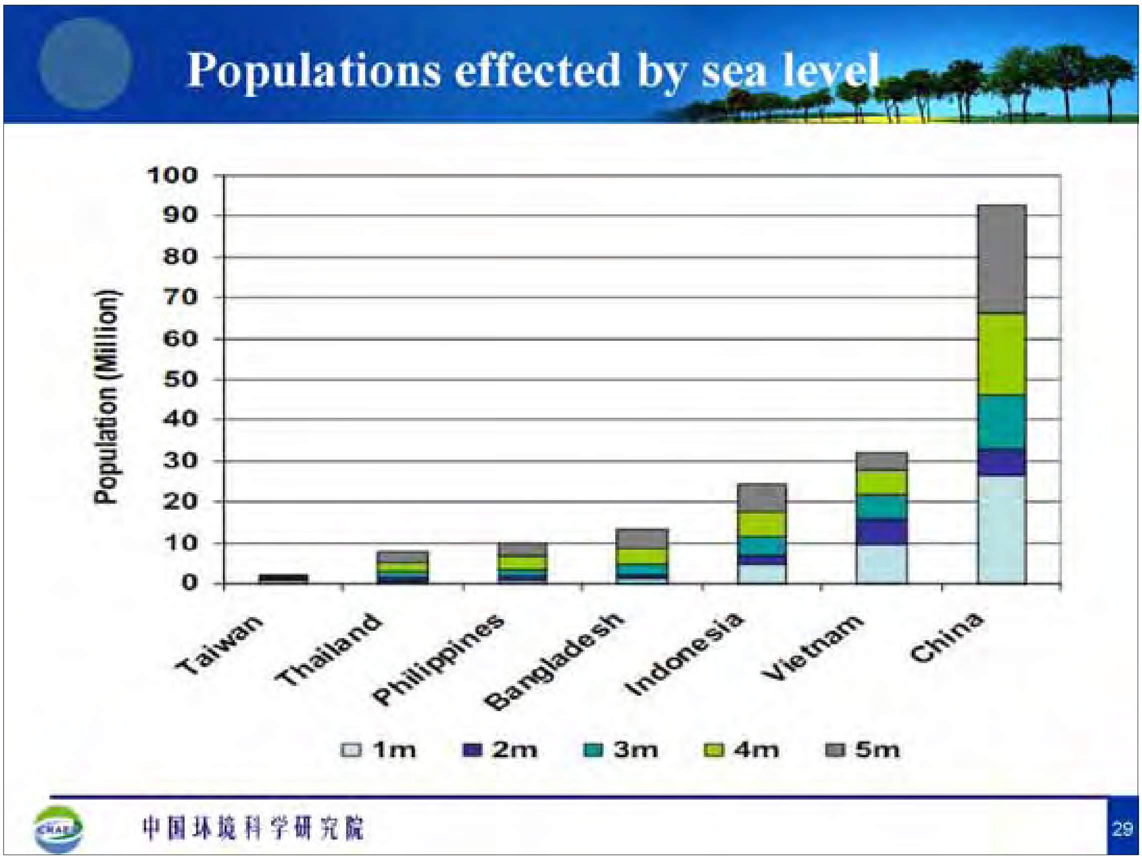
Energy intensity trends (1980-2005)

Figure 2. United States and China: Energy Intensity Trends (1980-2005)[26]



China installed capacity




Populations effected by sea level
Population (Million)
100
90
80
70
60
50
40
30
20
10
0
Taiwan
Thailand
Philippines
Bangladesh
Indonesia
Vietnam
China
1m
2m
3m
4m
5m
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CO2
MONGOLIA
CHINA
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Challenge for China

- Material productivity lower than developed countries;
- LCE& decoupling industrial emission;
- Green economy &Circular Economy &Low Carbon Economy;
- Importance of decoupling industrial emission to Low Carbon Economy in China.

4. Industrial pollution reduction and green technologies

Industrial pollution reduction of China

China is expected to grow its economy between two and four times between 2005 and 2020, while at the same time reducing its energy intensity by 20% and COD and SO2 emission by 10%with a net result of 1.6-3.2 times the emissions come 2020 vs. 2005.

Pattern of circular economy in China

"3+1":

- Micro-level: Enterprise· cleaner production
- Middle level: Industrial parks· eco-industrial parks
- Macro-level: Environmental-friendly and resource-saving society
- Industry sector: Venous industry

Development

Macro level:

National stratagem planning and policies:

- The National Development and Reform Commission and Ministry of Environmental Protection :strategic study;
- Ministry of Science and Technology: Researches on key technologies of national CE,CE technological-economic policy in middle or long-term;
- Ministry of Environmental Protection: Research on cleaner production technology assessment of key industry sectors;
- Ministry of Environmental Protection: Cleaner Production Standards;
- Ministry of Environmental Protection: National Eco-industrial parks demonstration
- The Academy of Engineering of China: To promote CE in the urbanization process.

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Development

Regional demonstration and planning and strategy:

- The Northeast industry base: Liaoning;
- The Yangtze river delta: Jiangsu, Zhejiang;
- The Pearl river delta: Shenzhen;
- The areas around Bo Sea: Beijing;
- The West area: Guiyang, Chengdu;
- The Southeast area: Fuzhou

Micro level:

Cleaner production audit in enterprises

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Cleaner Production Standard

In accord with the rule of LCA, CPS is made up of six kinds of indicators ,technical equipment and technology, resource and energy ,product, waste, recycle and reuse of waste and environmental management which guides the cleaner production of enterprise。

Environmental standards on green technology

There are 51 CPS issued by MEP of China (by 2009)

序号	标准名称	标准起草单位
1	清洁生产标准 石油炼制业 HJ/T 125-2003	辽宁省清洁生产中心 中国石油化工集团公司清洁生产技术中心
2	清洁生产标准 炼焦行业 HJ/T 126-2003	山西省环境科学研究院
3	清洁生产标准 制革行业（猪轻革） HJ/T 127-2003	中国轻工业清洁生产中心 四川省环境科学研究院中国皮革工业协会
4	清洁生产标准 啤酒制造业 HJ/T 183-2006	中国环境科学研究院 中国酿酒工业协会啤酒分会
5	清洁生产标准 食用植物油工业（豆油和豆粕） HJ/T 184-2006	大连市环境科学设计研究院 中国环境科学研究院
6	清洁生产标准 纺织业（棉印染） HJ/T 185-2006	北京纺织环境保护中心 中国环境科学研究院
7	清洁生产标准 甘蔗制糖业 HJ/T 186-2006	广西壮族自治区环境保护科学研究所 中国环境科学研究院
8	清洁生产标准 电解铝业 HJ/T 187-2006	抚顺市环境保护研究所 中国环境科学研究院
9	清洁生产标准 氮肥制造业 HJ/T 188-2006	辽宁省清洁生产中心 化工清洁生产中心 中国环境科学研究院
10	清洁生产标准 钢铁行业 HJ/T 189-2006	辽宁省清洁生产中心 冶金清洁生产技术中心 中国环境科学研究院
11	清洁生产标准 基本化学原料制造业（环氧乙烷/乙二醇） HJ/T 190-2006	北京机电院高技术股份有限公司 北京东方石化有限责任公司东方化工厂 中国环境科学研究院
12	清洁生产标准 汽车制造业（涂装） HJ/T 293-2006	南昌航空工业学院， 中国环境科学研究院，中国汽车工业协会， 中国表面工程协会涂装分会， 南昌市环境保护研究设计院
13	清洁生产标准 铁矿采选业 HJ/T 294-2006	马鞍山矿山研究院， 中国环境科学研究院
14	清洁生产标准 电镀行业 HJ/T 314-2006	中国环境科学研究院 北京电镀协会
15	清洁生产标准 人造板行业（中密度纤维板） HJ/T 315-2006	黑龙江省环境保护科学研究院 中国环境科学研究院
16	清洁生产标准 乳制品制造业（纯牛乳及全脂乳粉） HJ/T 316-2006	黑龙江省环境保护科学研究院， 中国环境科学研究院， 内蒙古自治区清洁生产中心
17	清洁生产标准 造纸工业（漂白碱法蔗渣浆生产工艺） HJ/T 317-2006	北京工商大学 中国环境科学研究院

中国环境科学研究院 39

Pathways to LCE for China

a. The success and speed of economic and industrial structural change towards a more balanced economy ;
b. Improving Energy efficiency and conservation;
c. Promoting Renewable Energy;
d. Quantifying Emissions and Financing Low-Carbon Technologies;
e. Policies and standards on green technology .

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New energy development in China (wind power)

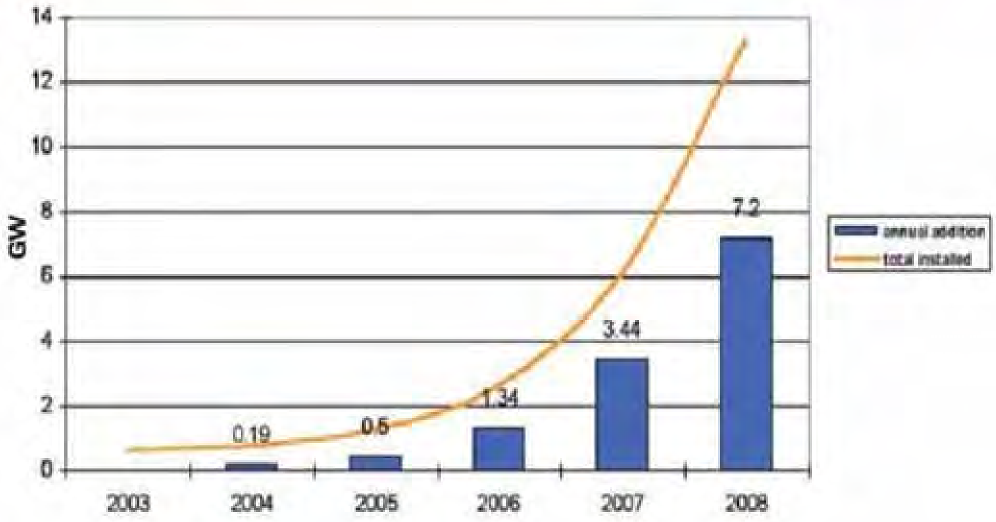


Figure 3: China's wind power growth 2004 – 2008

中国环境科学研究院 41

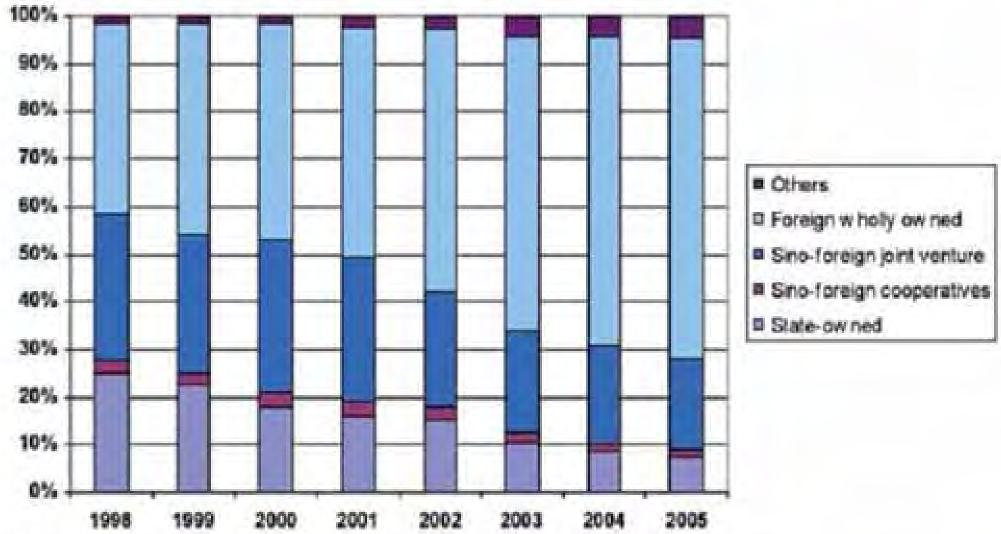


Figure 4: Chinese high-tech exports by ownership of firms Source: OECD (2008)

中国环境科学研究院 42

Leeyp@craes.org.cn

http://www.craes.org.cn

Tel:+86-10-84920936(o)

中国环境科学研究院 43

Thanks!

中国环境科学研究院 44

2-2 Observation of global carbon distribution by GOSAT and its role in Climate change research

- Dr. Yoshifumi YASUOKA, NIES, Japan

TPM6 2009, Seoul

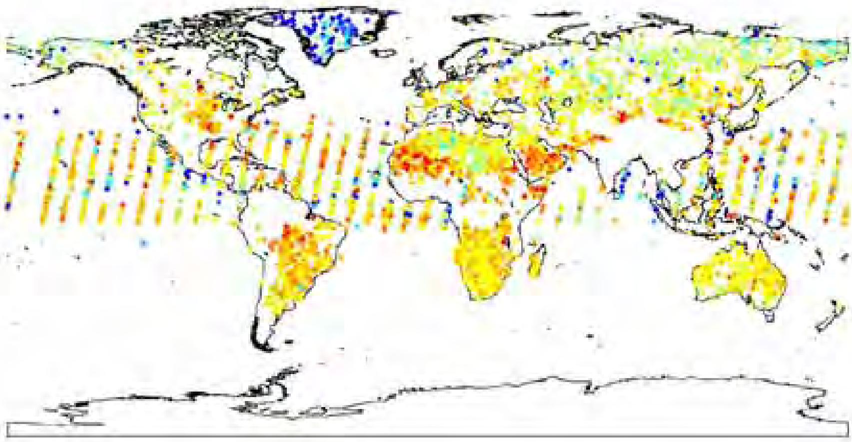
Observation of global carbon distribution by GOSAT and its role in climate change research

Yoshifumi YASUOKA
Executive Director
National Institute for Environmental Studies

Seoul, November 24, 2009

CO_2 (column density)

(2009/08/04-08/19)



un-calibrated and un-validated

NIES、MoE、JAXA
Press release

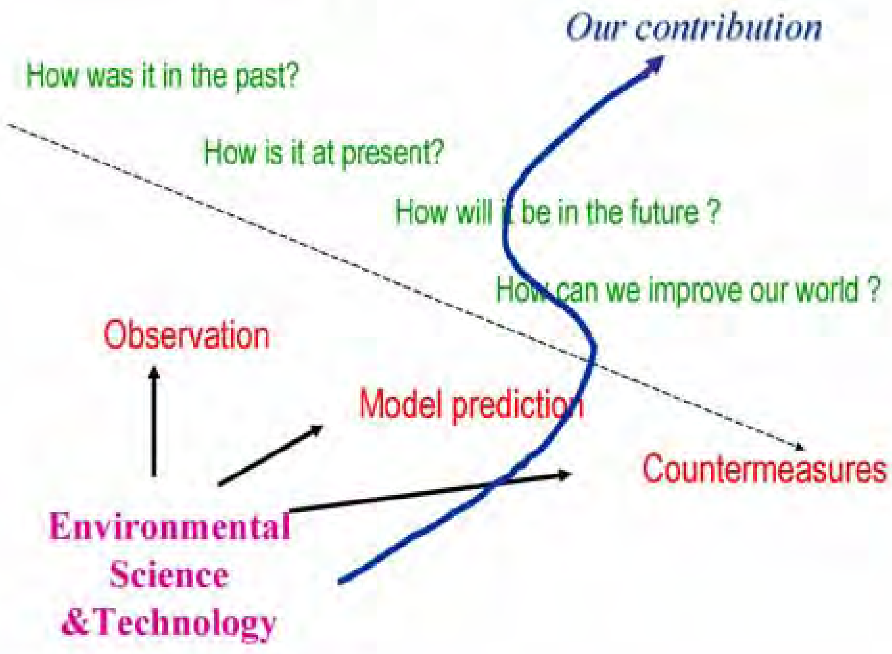
Why do we need to observe CO2 at a global scale ?

We need to assess whether GHG will be reduced at global scale (50% by 2050).

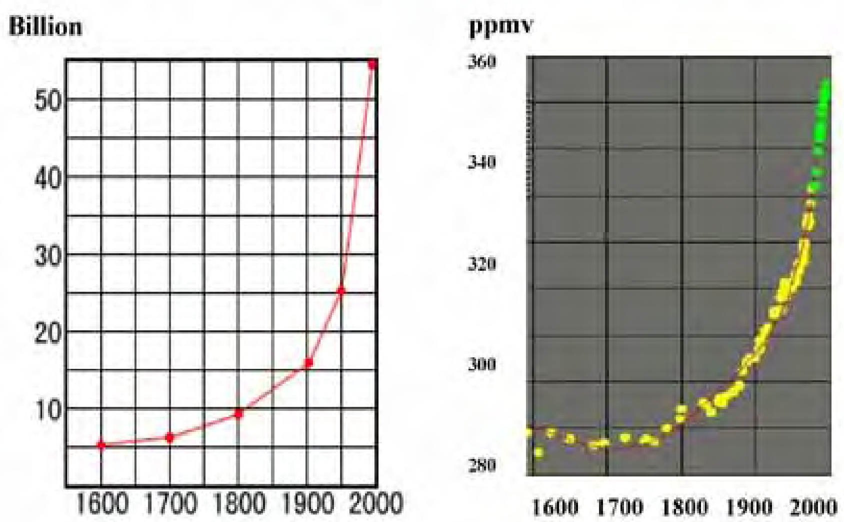
We need also to assess the impact of global warming at global scale.

Observing the global distribution of CO2 is the first step to assess CO2 behavior and its impact at a global scale, and to devise counter measures.

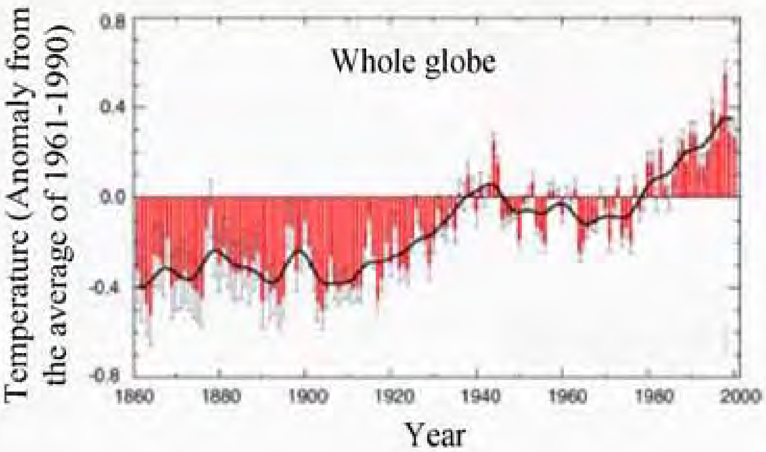
Tackling with Climate Change



Changes in population and CO2

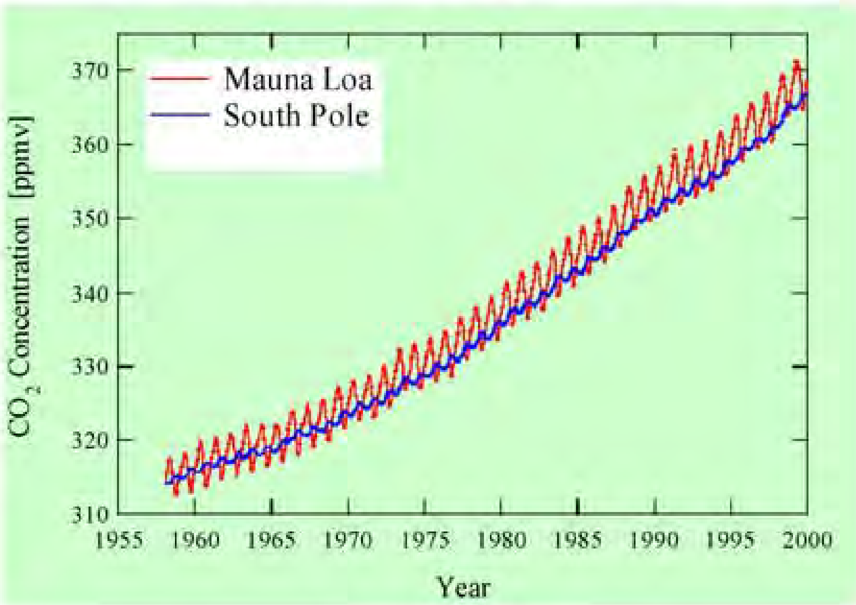


Temperature



IPCC

Long-term CO2 trend



Questions on climate change

\# Is our earth really changing?

\# How is the condition of our earth ?

\# How is the future of our earth ?

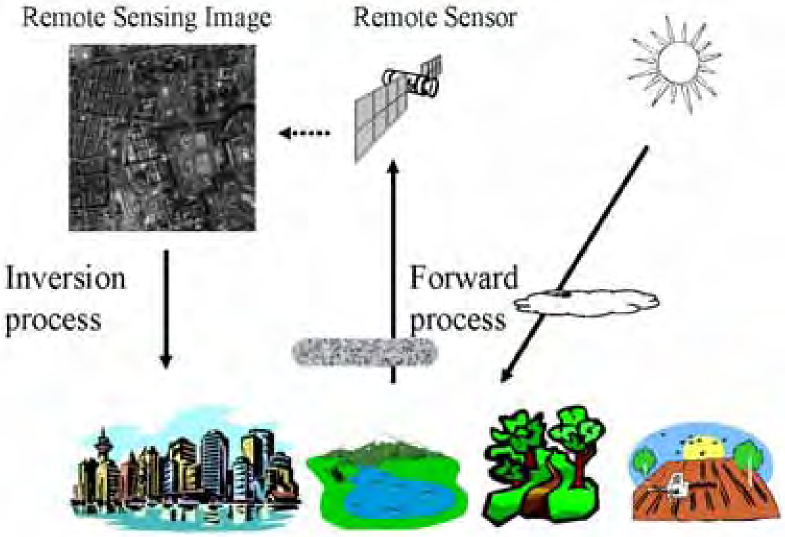
\# How can we improve our world ?

Can we answer to these questions ?

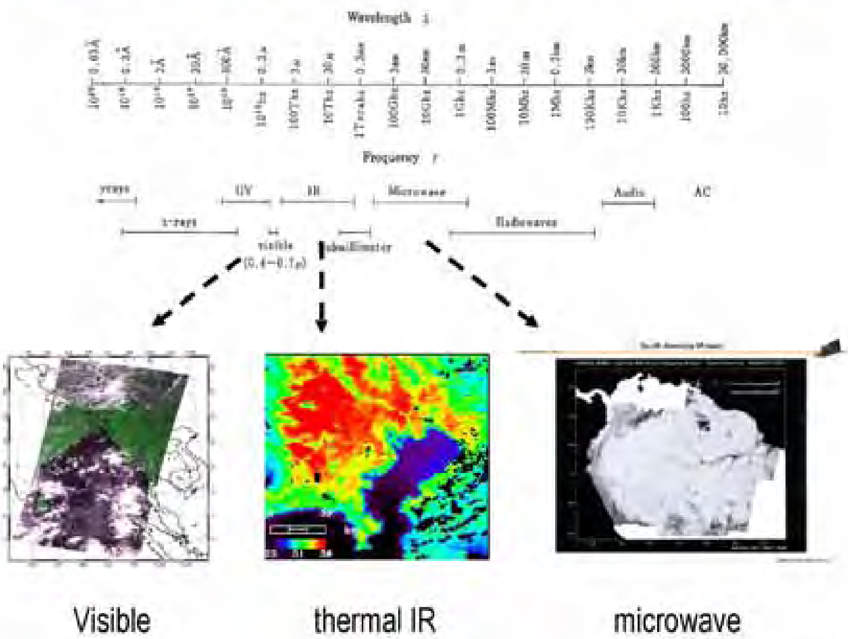
Yes !!!

How ???

Remote Sensing



Remote sensing in different wavelength range



Questions on climate change

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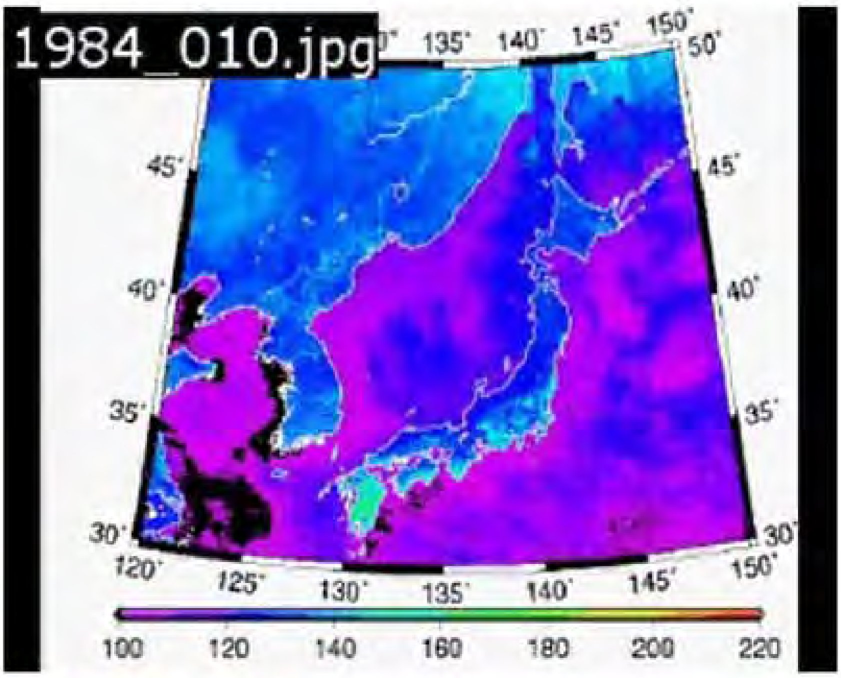
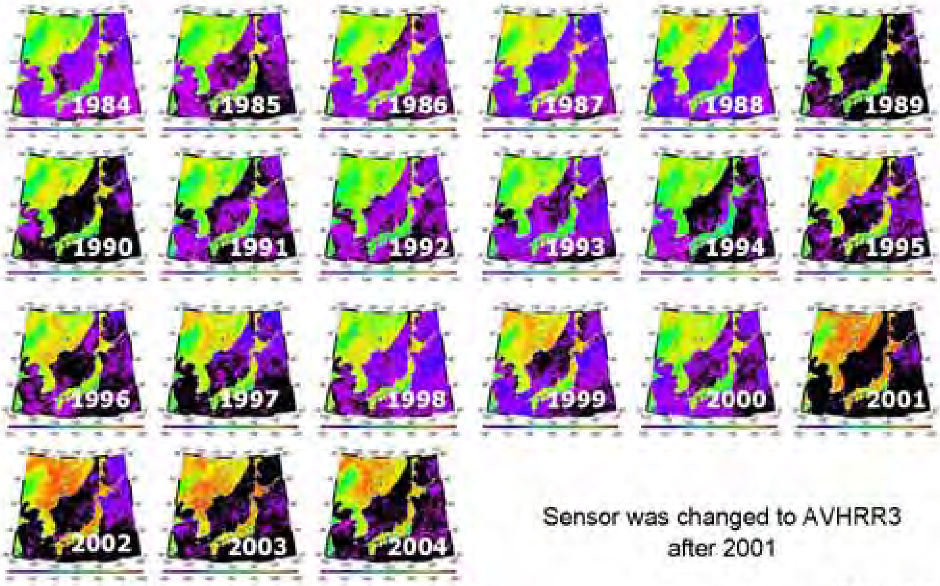


Time series NDVI and SST

IIS/UT

Time Series NDVI Pattern from 1984-2004 (August 1 to August 10)

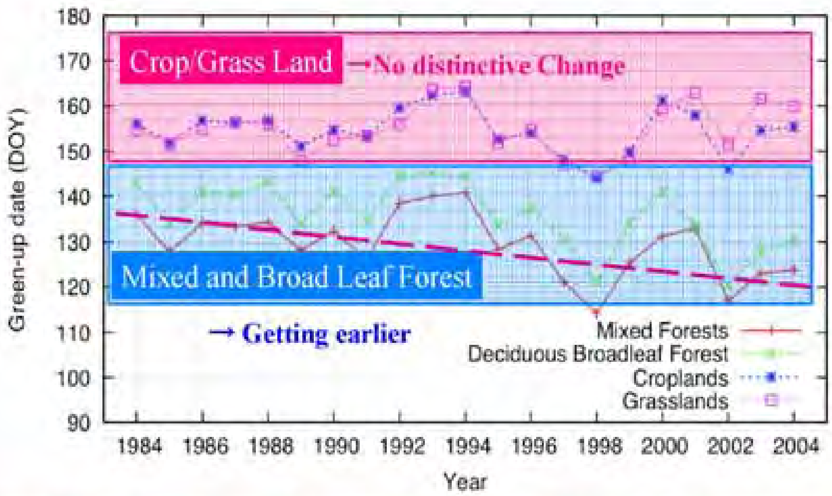


Sensor was changed to AVHRR3
after 2001

IIS/UT

Leaf development is getting earlier for some biome types

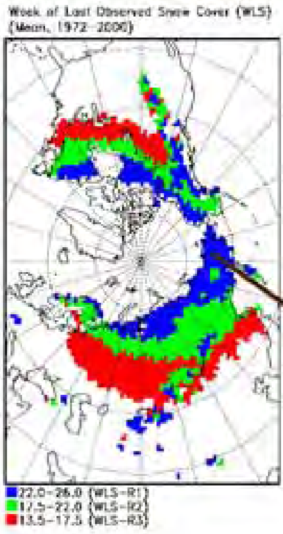
（開葉日早期化）



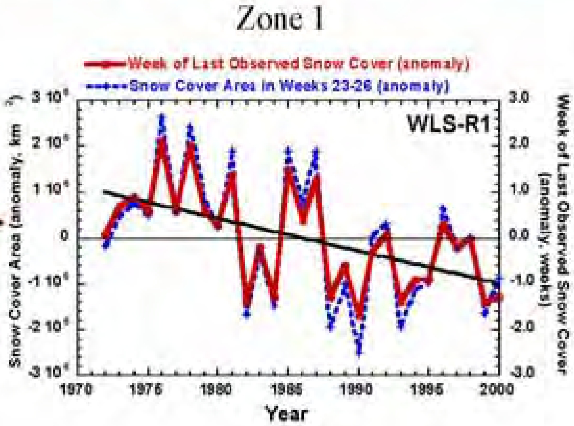
Mixed forest:12 days, Deciduous broad leaf forst:14days in 21years

Dr. Ooyoshi, IIS/UT

Spring Snow Cover Area & Snowmelt, 1972-2000
(from visible-band satellite images)



Snowmelt in N. Hemisphere has shifted earlier by 3-5 days/decade since 1972



Dr. D. Dye of FRCGC

Questions on our earth

Is our earth really changing?

How is the condition of our earth ?

How is the future of our earth ?

How can we improve our world ?

Top-down and bottom-up approach for observing carbon exchange

Remote Sensing

(GHG concentration)

Top-down

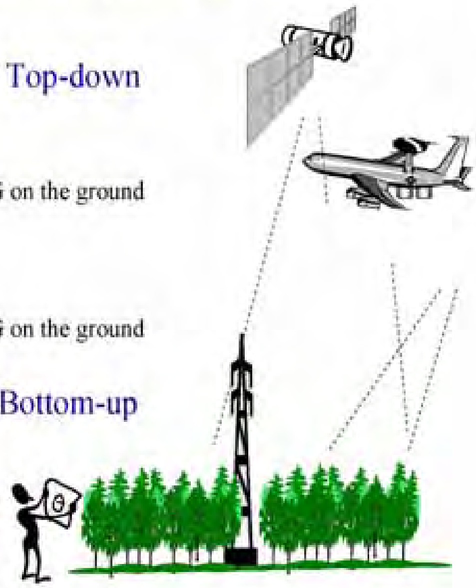
Estimate GHG on the ground

Estimate GHG on the ground

Bottom-up

(Ecosystem parameters)

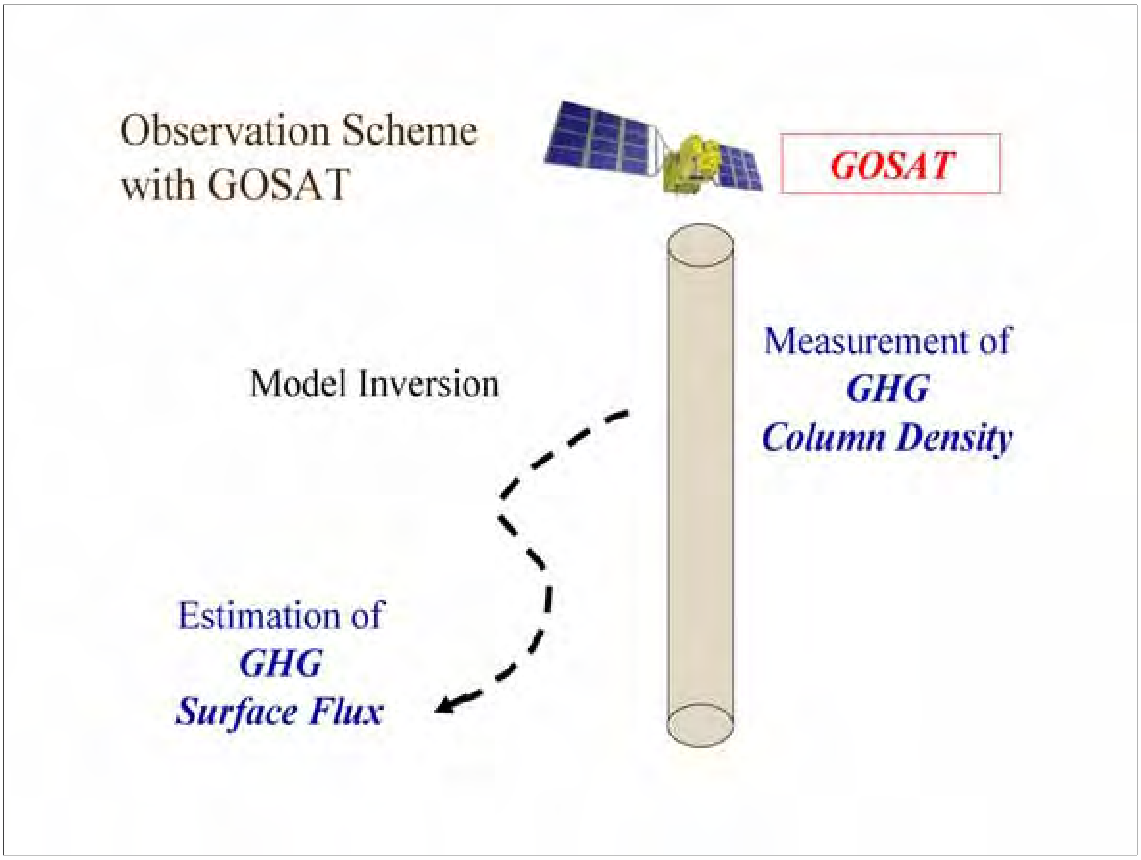
Ground Observation

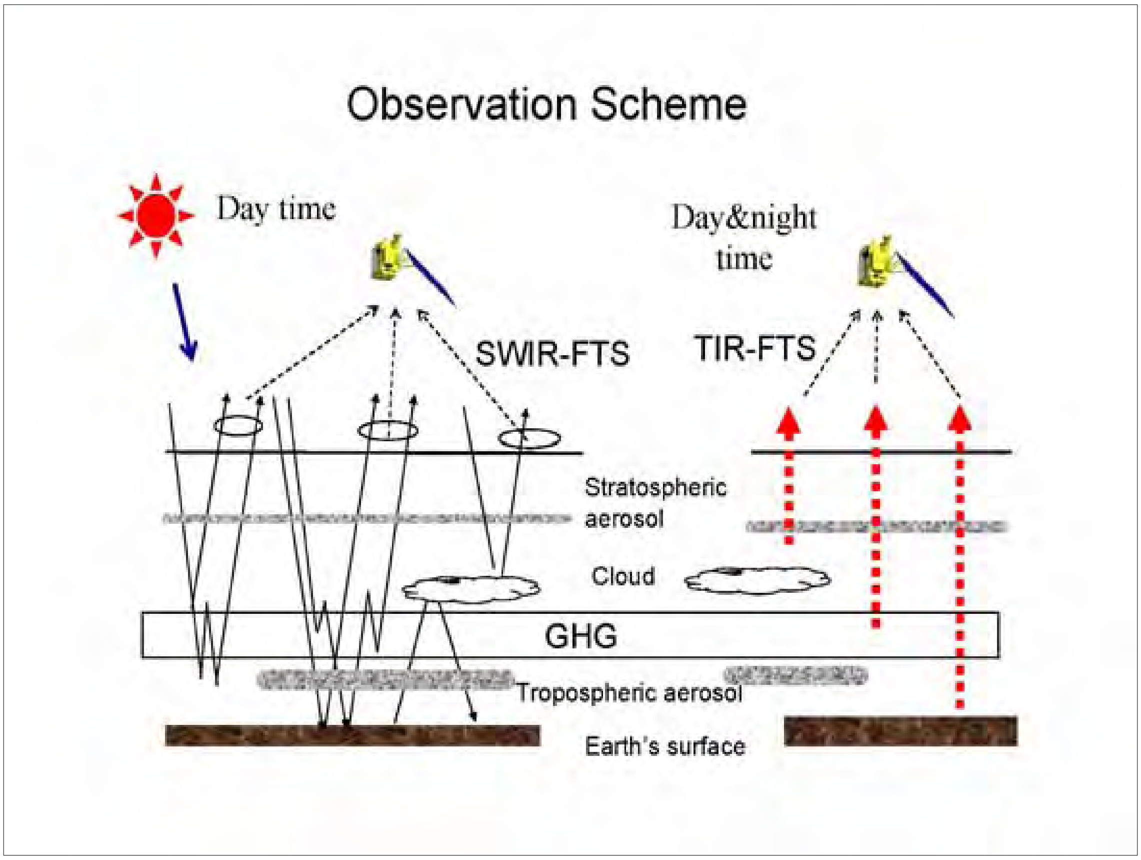


Successful Launch of GOSAT("IBUKI") for GHG Monitoring

NIES-MoE-JAXA

January, 23, 2009


Observation Scheme
with GOSAT
GOSAT
Measurement of
GHG
Column Density
Model Inversion
Estimation of
GHG
Surface Flux


Observation Scheme
Day time
Day&night
time
SWIR-FTS
TIR-FTS
Stratospheric
aerosol
Cloud
GHG
Tropospheric aerosol
Earth's surface

GOSAT (“IBUKI”)

Green House Gases Observing Satellite

Fourier Transform Spectrometer

SWIR-FTS

TIR-FTS

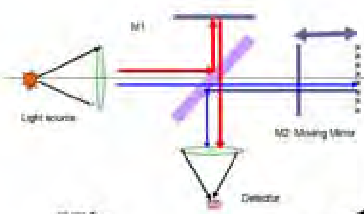
Launched successfully on Jan. 23, 2009, and named as “IBUKI”

MoE, JAXA, NIES

$CO2$, $CH4$

Cloud & Aerosol Imager

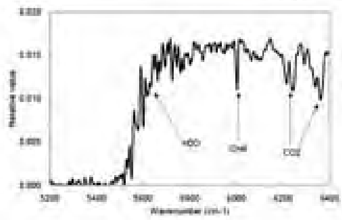
Data Processing Flow for GOST Products



FTS

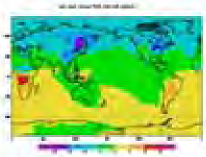
Interferogram

Inverse FFT



CO_2 and CH_4 absorption spectra

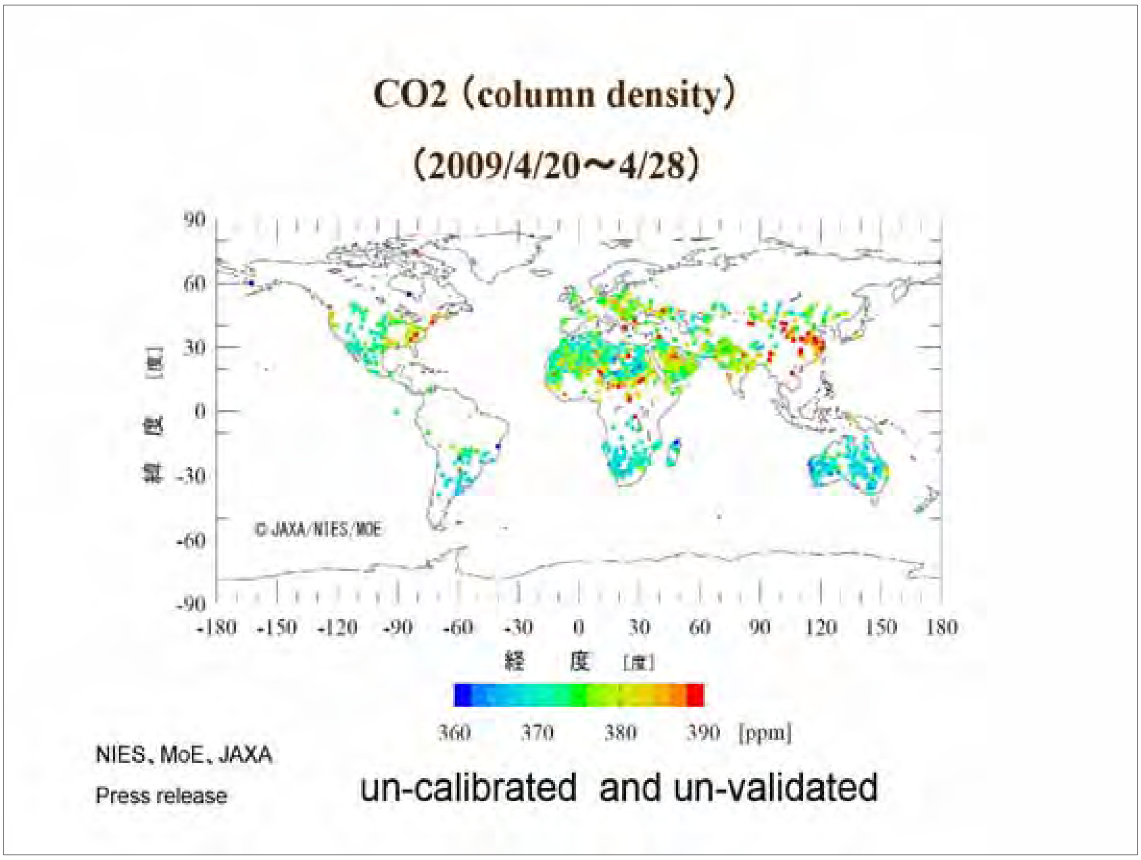
(L1)

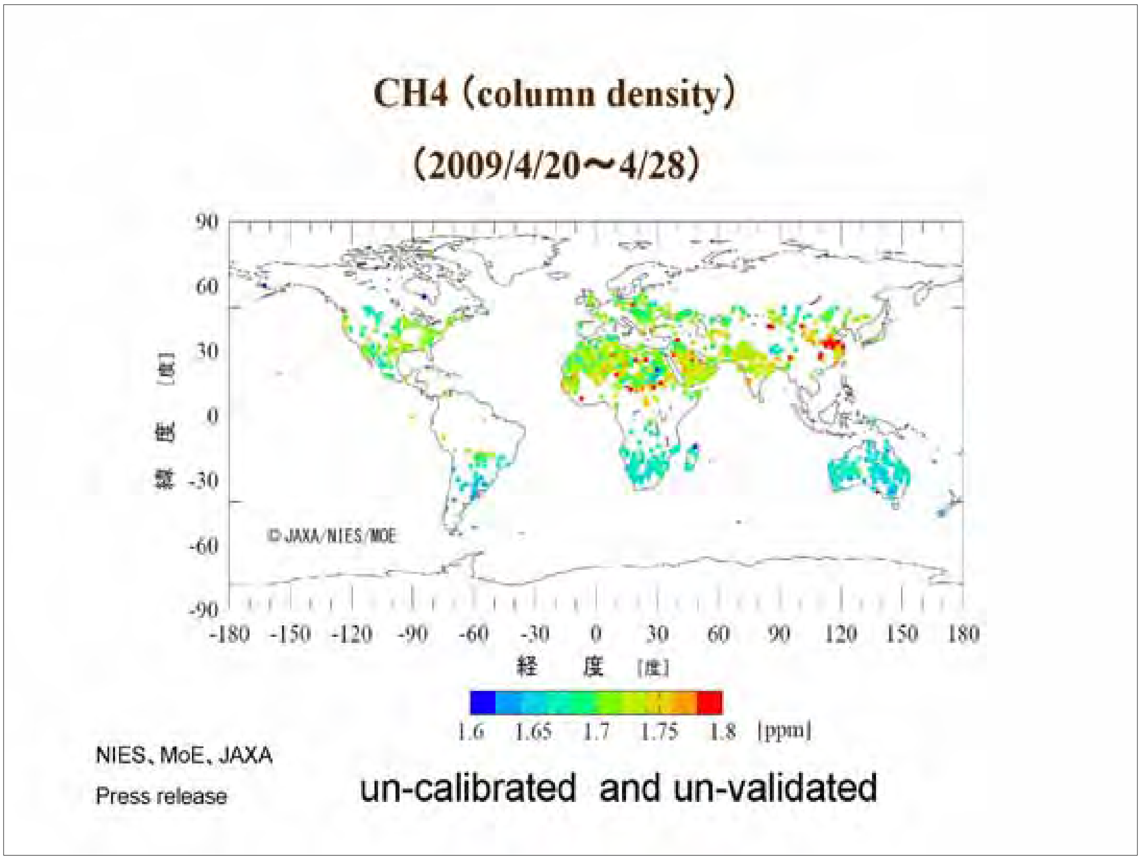


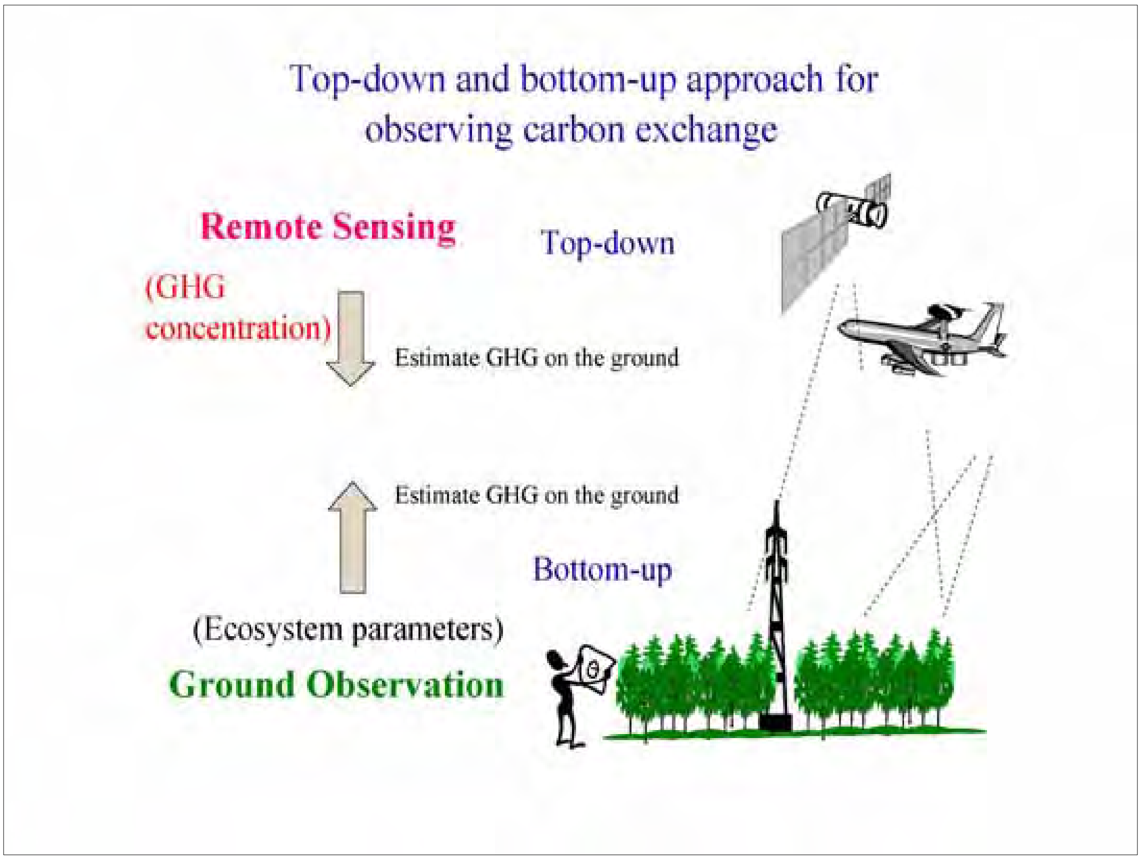
Global distribution (CO_2)

Source and sink of 22 area

(L2 and higher order products)


CO2（column density）
（2009/4/20～4/28）
90
60
30
0
-30
-60
-90
緯度 [度]
© JAXA/NIES/MOE
-180 -150 -120 -90 -60 -30 0 30 60 90 120 150 180
経度 [度]
360 370 380 390 [ppm]
NIES、MoE、JAXA
Press release
un-calibrated and un-validated


CH4（column density）
（2009/4/20～4/28）
90
60
30
0
-30
-60
-90
緯度 [度]
© JAXA/NIES/MOE
-180 -150 -120 -90 -60 -30 0 30 60 90 120 150 180
経度 [度]
1.6 1.65 1.7 1.75 1.8 [ppm]
NIES、MoE、JAXA
Press release
un-calibrated and un-validated


Top-down and bottom-up approach for
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(GHG
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Estimate GHG on the ground
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(Ecosystem parameters)
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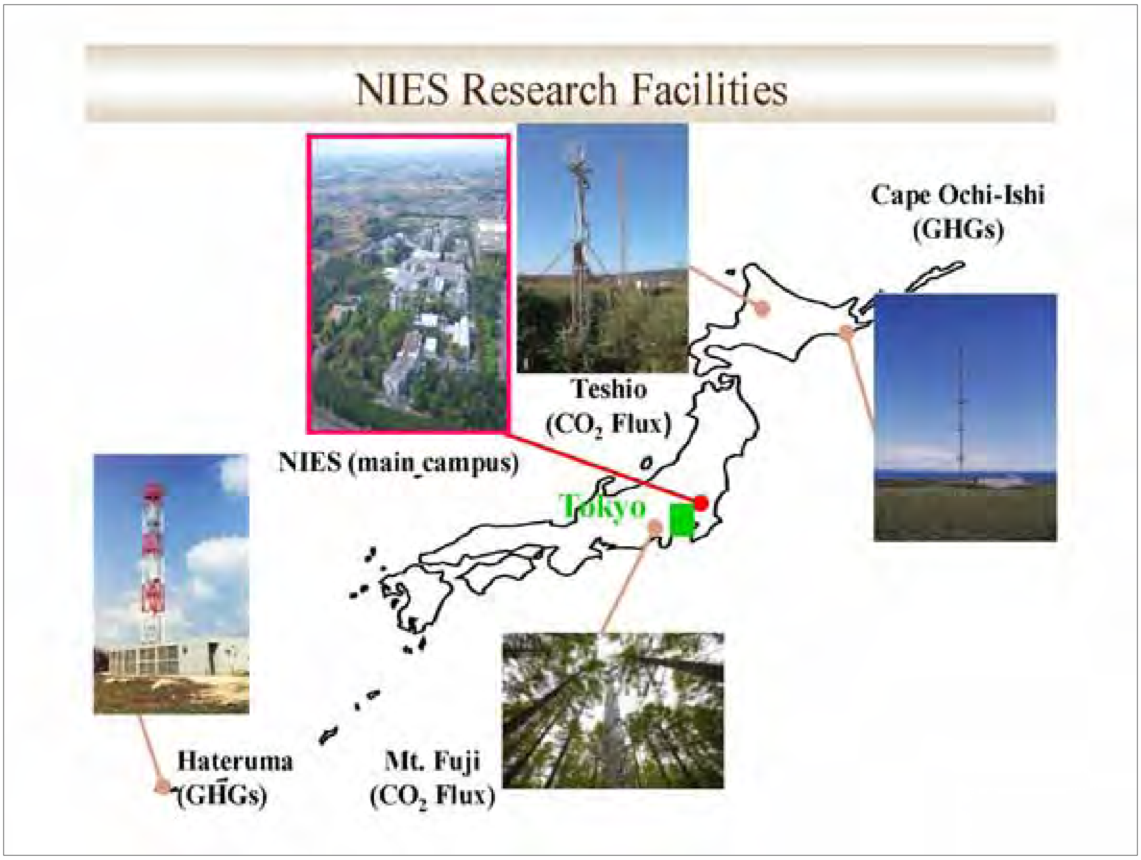
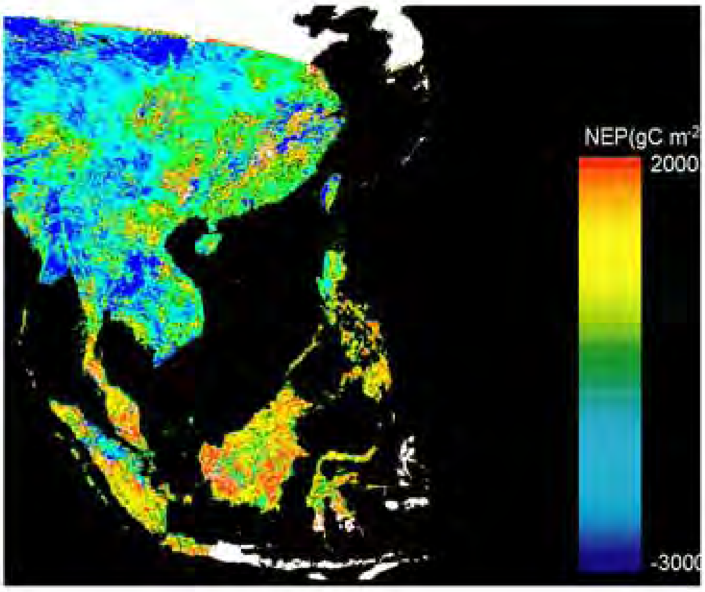

NIES Research Facilities
Cape Ochi-Ishi
(GHGs)
Teshio
(CO_2 Flux)
NIES (main campus)
Tokyo
Hateruma
(GHGs)
Mt. Fuji
(CO_2 Flux)

NEP Distribution in South-East Asia



Questions on our earth

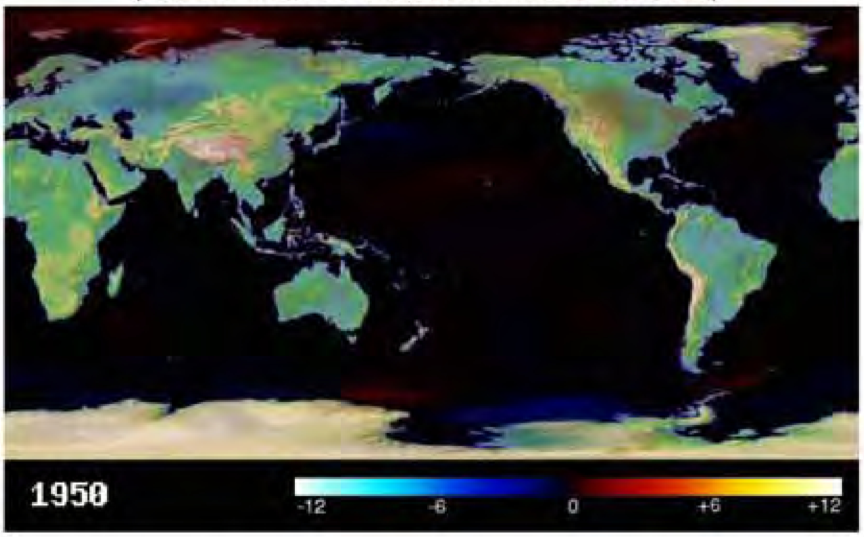
Is our earth really changing?

How is the condition of our earth ?

How is the future of our earth ?

How can we improve our world ?

Prediction and Assessment of Climate Change (NIES-CCSR-FRCGC GCM Model)



Prediction of Temperature up to 2100 with Earth Simulator

(RR2002 Project sponsored by MEXT; contributed to IPCC AR4)

Questions on our earth

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PM Hatoyama pledged emissions cut of 25% by 2020

Japan will try to cut greenhouse gas emissions by 25 percent from 1990 levels as its midterm target for 2020, Prime Minister Yukio Hatoyama announced.

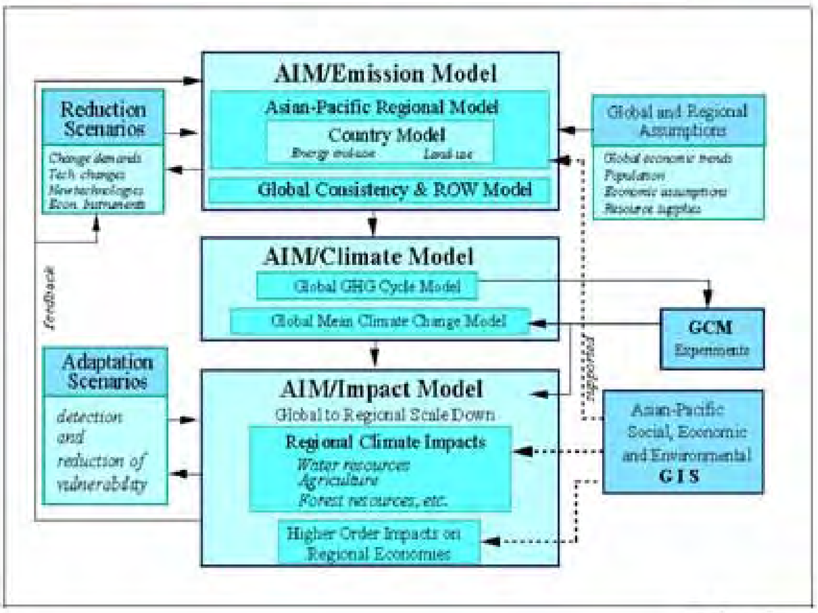
Japan Times, 2009/9

Reduction of 50% of current GHG by 2050

in the world (Cool Earth 50)

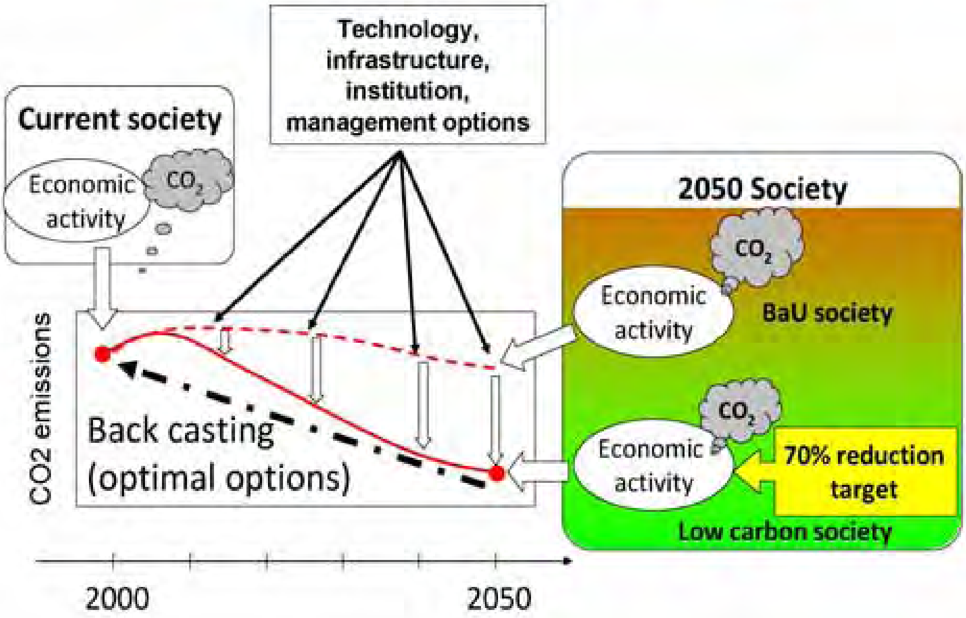
2007/5 PM Abe, G-8 approved

Asian-Pacific Integrated Model (AIM)



Masui, et.al.

Back casting approach for LCS



Questions on climate change

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Can we answer to these questions ?

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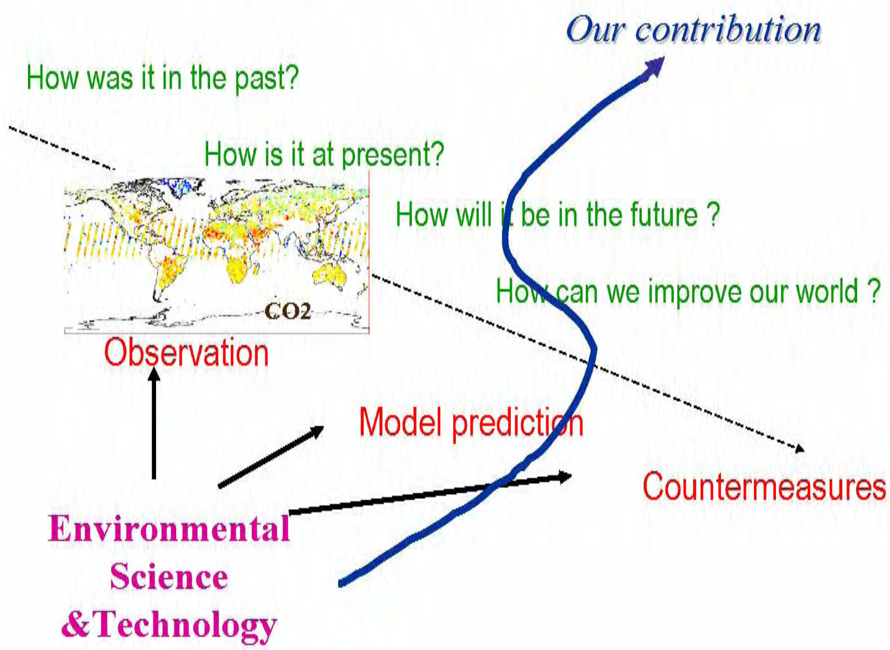
Tackling with Climate Change



2-3 Climate change: its impacts and adaptation

- Dr. Chang-Geun SONG, Climate Change Research Division, NIER, Korea


Climate Change: Its Impact and Adaptation
Song, Chang-Keun
National Institute of Environmental Research, Korea

Contents

2

Climate Change Adaptation and Its Urgency

3

Climate Change : Key issue and question in 21st century

4

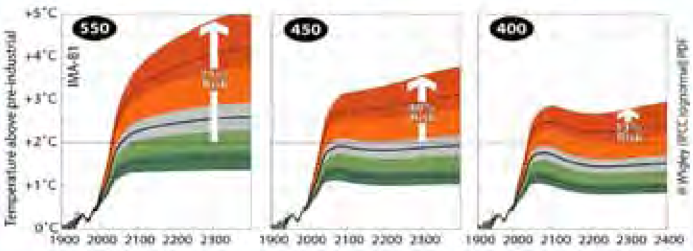
Ⅰ. Climate Change Adaptation and Its Urgency

Mitigation and Adaptation

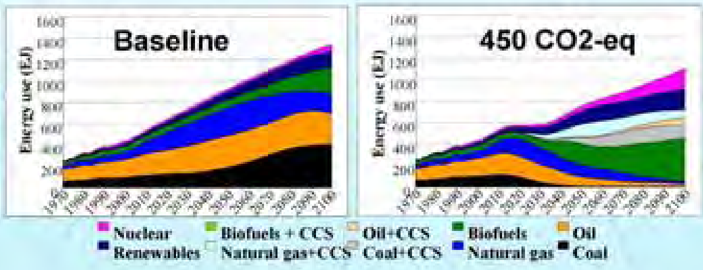
Mitigation : 2 ℃ game in future

– How to stabilize GHG level by international negotiation ?

Michel den Elzen, *Countries' emission allowances under the "South-North dialogue" proposal, SBSTA-22, Bonn*



Van Vuuren et al. *Stabilising GHG emissions.*



5

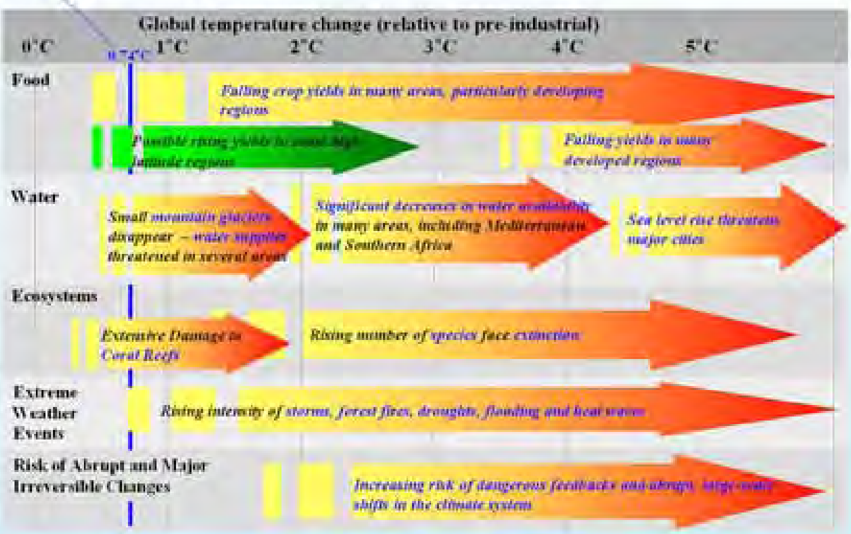
Ⅰ. Climate Change Adaptation and Its Urgency

Mitigation and Adaptation

Adaptation : 0.74 ℃ game at current and in future

– How to reduce adverse effects on all sectors ?

We are here !!



6

Mitigation and Adaptation

	Mitigation of climate change	Adaptation to climate change
Target systems	All systems	Selected systems
Scale of effect	Global	Local to regional
Lifetime	Centuries	Years to centuries
Lead time	Decades	Immediate to decades
Effectiveness	Certain	Generally less certain
Ancillary benefits	Sometimes	Often
Polluter pays	Typically	Not necessarily
Actor benefits	Only little	Almost fully
Monitoring	Relatively easy	More difficult

7

Ⅰ. Climate Change Adaptation and Its Urgency

Global request for adaptation action,

'Adaptation under the convention'

- All Parties, ..., shall: formulate, implement, publish and regularly update, ... measures to facilitate adequate adaptation to climate change [Article 4.1 (b)/UNFCCC], [Article 4.1 (e)/UNFCCC], [Article 4.4 (e)/UNFCCC]

Decision 1/CP.10
Buenos Aires programme of work;
National Adaptation Programmes of Action (NAPAs)
39 NAPAs submitted to the convencion

Nairobi work programme (COP12)
Impacts, vulnerability and adaptation
5 year *programme* (2005-2010)

Bali Action Plan (2007-2009)
Post-2012 international climate policy regime:
includes agreement to enhance actions on adaptation & calls

8

Ⅰ. Climate Change Adaptation and Its Urgency

Importance : National implementation

Global request is the mandate and guideline for national implementation.
National implementation is only a way to solve the problem.

Climate Impact and Sensitivity

- Agriculture
- Ecosystem
- Water
- Health
- Etc. .....

Each Regional / Sectoral Assessment

Adaptation Capacity and Resilience

- Economics
- Human Resource
- Environment
- Etc. .....

Each Nation's Capacity

Each Nation's Vulnerability

National Adaptation Policy-Setting, Planning and Implementation

9

Ⅰ. Climate Change Adaptation and Its Urgency

One more thing : Timing issue for adaptation

Adaptation Measures

Necessity

- Despite of international efforts to mitigate GHGs,
  - The residence time of CO2 in the atmosphere : 50 ~ 200 years →Climate change is unavoidable!
  - Something against adverse impacts of climate change : required.
  - Adaptation measures are keenly needed

Urgency

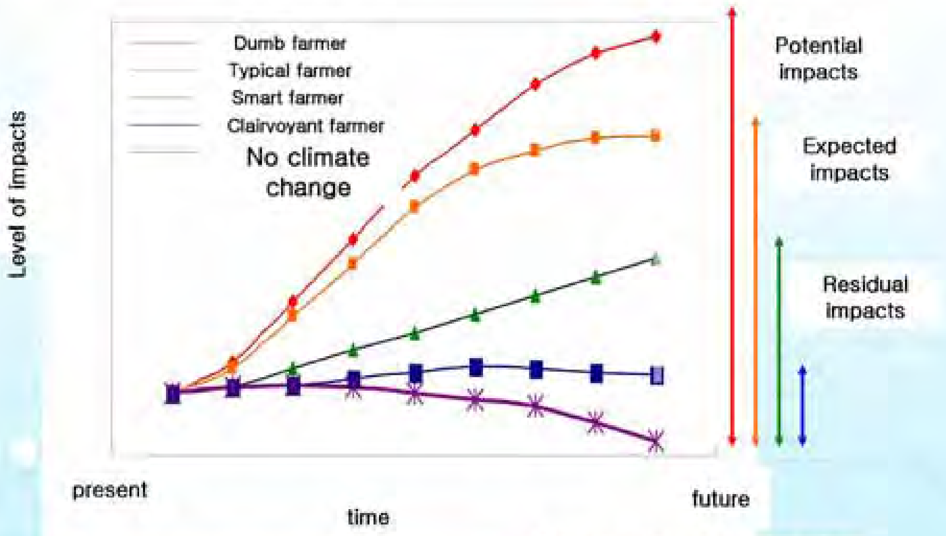
- Time lags : [speed of Climate Change, adaptation measures]
  - The prediction → impact and vulnerability assessment → adaptation measures : At least 5~10 years.
  - Climate change is accelerating : Current problem not future one

➡ A big risk, without taking immediate adaptation measures

10

Ⅰ. Climate Change Adaptation and Its Urgency

Evolution of Vulnerability Assessment

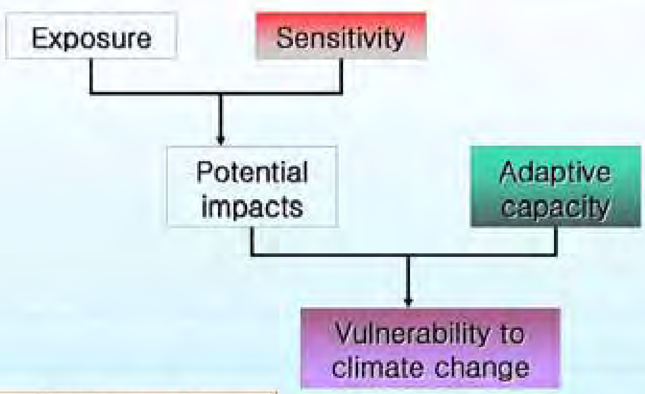


출처: Fussel and Klein (2002)

11

Ⅰ. Climate Change Adaptation and Its Urgency

Evolution of Vulnerability Assessment
– Method to develop an indicator to assess vulnerability



	Adaptive capacity	
Impacts	*Low*	*High*
High	Vulnerable	Development opportunities
Low	Residual risks	Sustainability

Source: UNEP (2002)

Conceptual framework

Vulnerability = *f* (Impacts, Adaptive Capacity)

12

Ⅰ. Climate Change Adaptation and Its Urgency

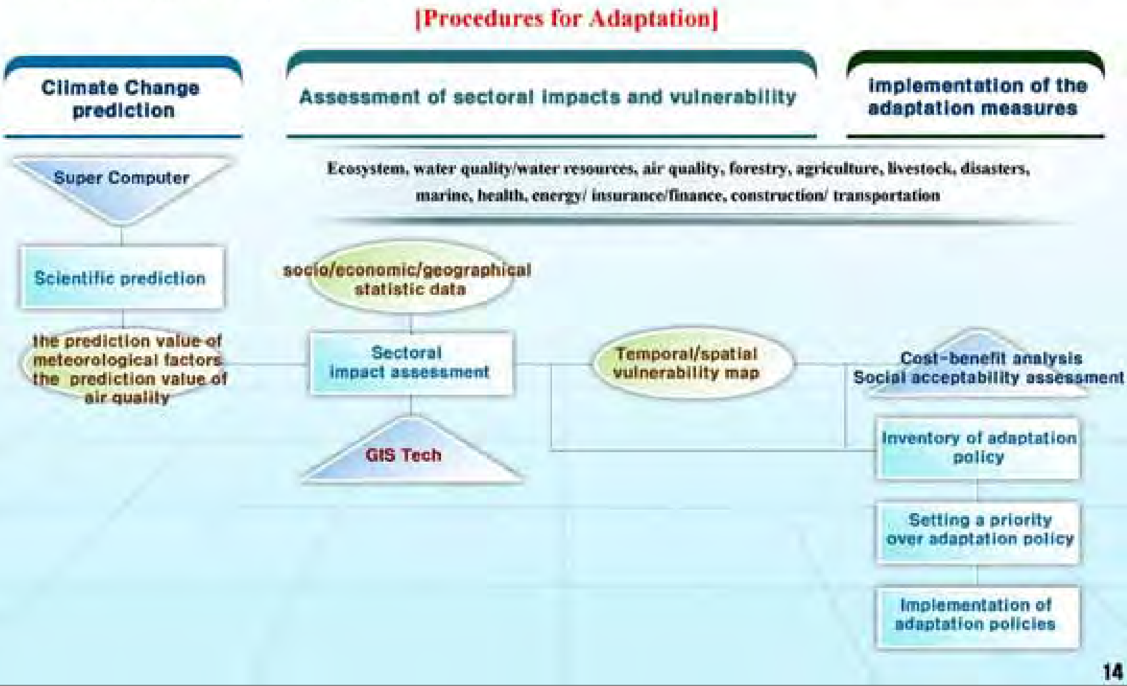
Evolution of Vulnerability Assessment
– Example : Variables for Impact and Capability

Sensitivity		Adaptive Capacity	
Subsector	Proxy variables	Subsector	Proxy variables
Settlement	Population at flood risk from SLR Population w/o access to clean water	Economics	GDP/capita Gini index
Food	Cereal production/area Animal protein consumption/capita	Human resources	Literacy Dependency ratio
Health	Fertility Life expectancy	Environment	Population density SO2 emission/area % land unmanaged
Ecosystem	% land managed Fertilizer use rate		
Water	Renewable supply and inflow Water use		

13

Ⅰ. Climate Change Adaptation and Its Urgency

Evolution of Vulnerability Assessment



14

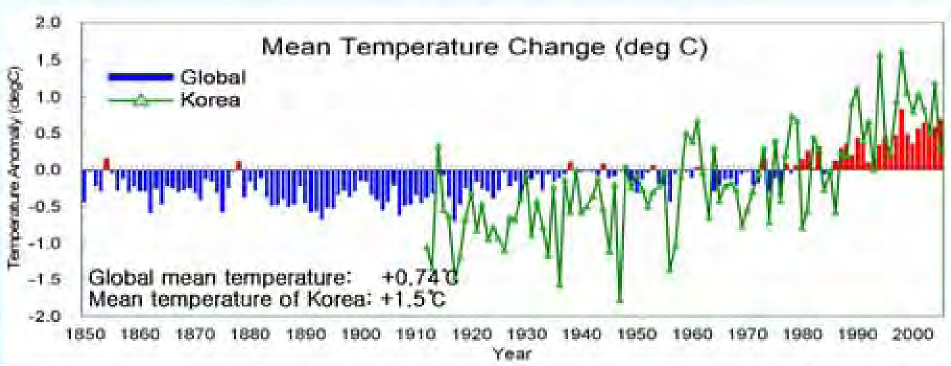
Climate Change on Korea

15

II. Climate Change on Korea

Observed Climate Change on the Korean Peninsula

- Temperature rise: twice as the global mean temperature rise (1.5℃ up in the past 100 years)
- Sea level rise (Jeju Island) : Three times as the global mean sea level rise (22cm increase in the past 40 years)



(METRI, 2005; NORI, 2006)

16

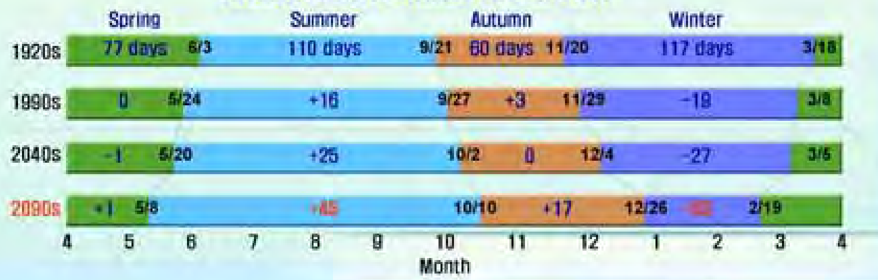
II. Climate Change on Korea

Projected Climate Change on the Korean Peninsula

[Based on IPCC A2 SRES, compare to 1971~2000 yr]

	2020s	2050s	2080s
Temp. Increase (℃)	+1.5	+3.0	+5.0
Precipitation Change (%)	+5.0	+7.0	+15.0
Sea Level Rise	2100s : more than 50 cm		

< Season Length Change : Seoul City >



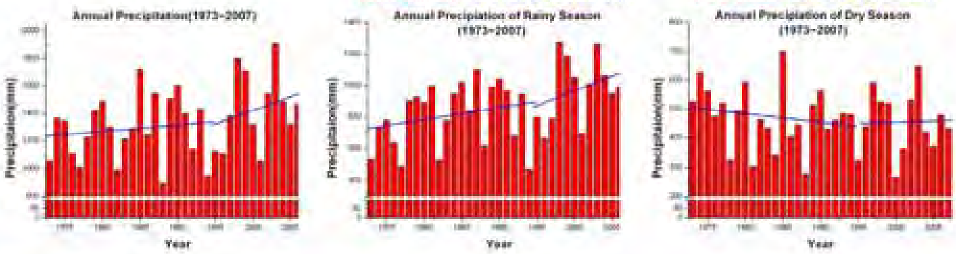
II. Climate Change on Korea

Water Problem

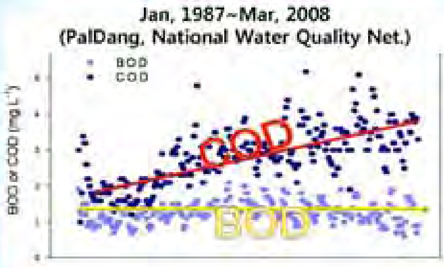
Three Water Problems in Korea by Climate Change

Too much in rainy season

Too little in dry season



Too dirty



II. Climate Change on Korea

Weather Extreme and Aftermath

Typhoon Russa (2002)

Typhoon Maemi (2003)

19

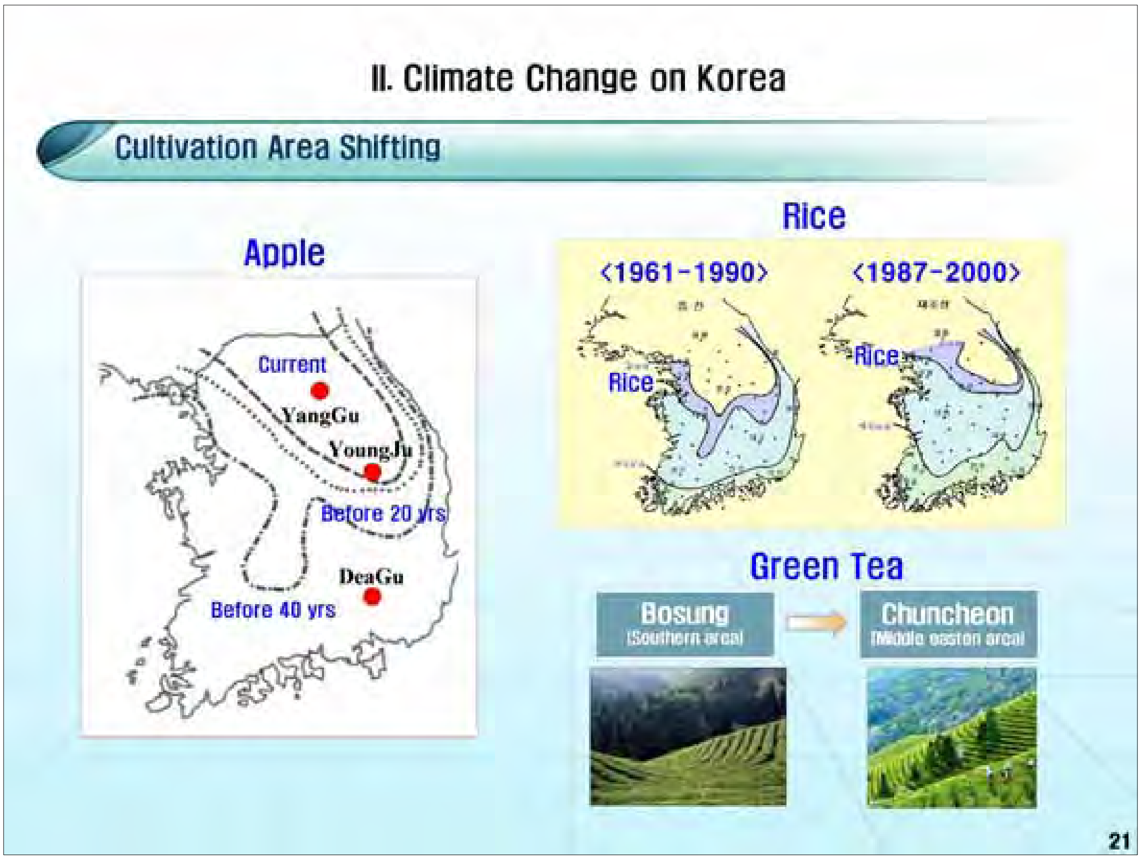
II. Climate Change on Korea

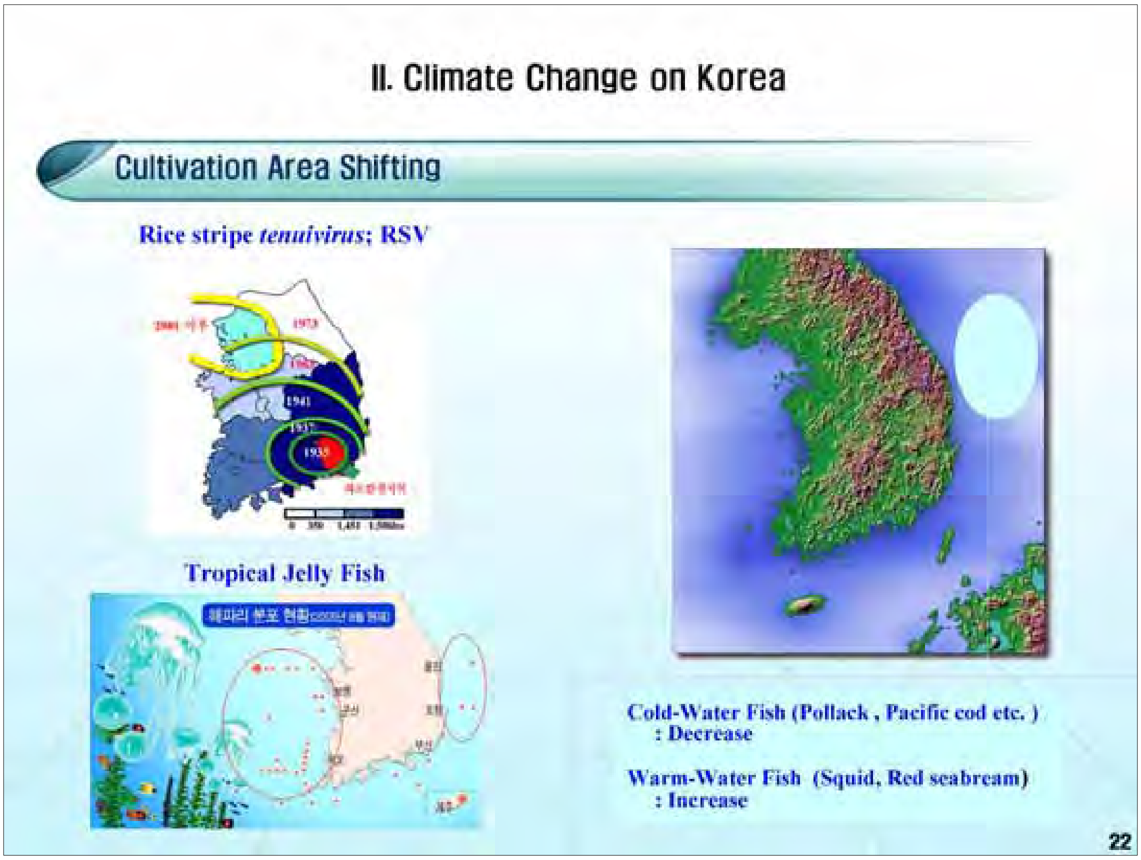
Weather Extreme (Severe drought at current)

Emergency Water Supply

Water Quality Event

20


II. Climate Change on Korea
Cultivation Area Shifting
Apple
Current
YangGu
YoungJu
Before 20 yrs
DeaGu
Before 40 yrs
Rice
<1961-1990>
<1987-2000>
Rice
Rice
Green Tea
Bosung
(Southern area)
Chuncheon
(Middle easten area)
21


II. Climate Change on Korea
Cultivation Area Shifting
Rice stripe *tenuivirus*; RSV
Tropical Jelly Fish
Cold-Water Fish (Pollack , Pacific cod etc.)
: Decrease
Warm-Water Fish (Squid, Red seabream)
: Increase
22

Ⅱ. Climate Change on Korea

Health : Premature Deaths

by Malaria

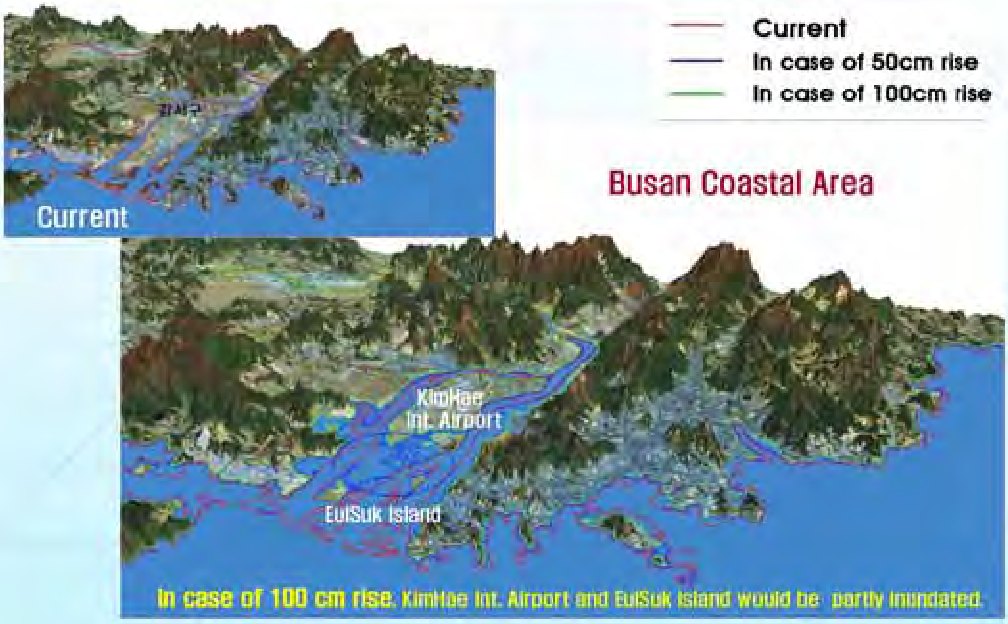
by Dengue

by Heat Wave

- 2,127 persons over last 10 yrs

Ⅱ. Climate Change on Korea

Coastal Area by Sea Level Rise

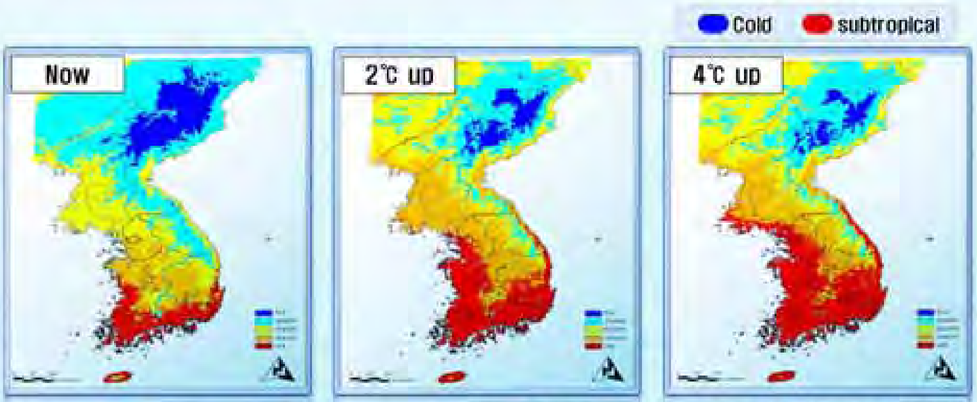


II. Climate Change on Korea

Climate zones shift in future

Climate zone shift

- In 2030 (2℃ rise) : shift of subtropical zone to northward
- In 2065 (4℃ rise) : changes of the most residential area into the subtropical zone

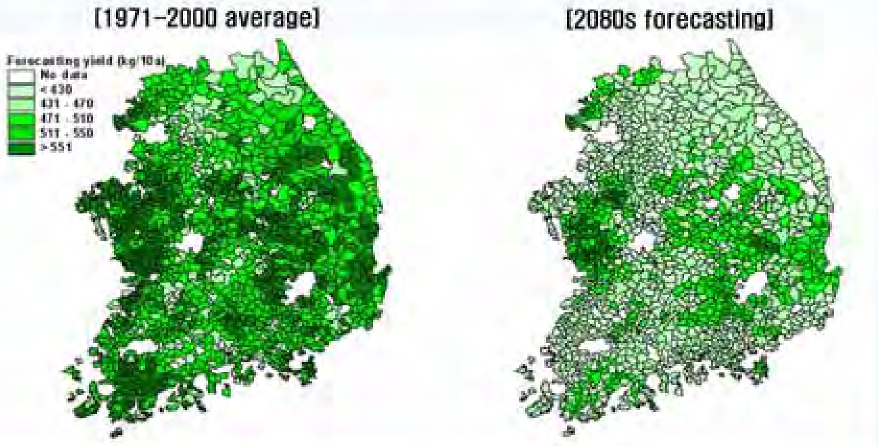


(Korea Forestry Research Industry, 2005)

25

II. Climate Change on Korea

Change of rice yield in future



Overall yield of rice : 14.9% (802 kg/ha) will decrease !!

(Source: Korea Environment Institute, 2006)

26

Strategies on Climate Change Adaptation

27

Ⅲ. Strategies on Climate Change Adaptation

National Adaption Policy-Setting of Korea

"National Comprehensive (Master) Plan for Climate Change Adaptation"

VISION : Establishment of Safe Society, and Support to Green Growth through Climate Change Adaptation

- In May 2007, the National Committee on Climate Change Response chaired by Prime Minister decided to develop a 'National Comprehensive (master) Plan for Climate Change Adaptation'.
- With the numerous efforts including research and reviewing processes by experts of climate change, the government of Korea (Ministry of Environment) set up the plan and officially announced to the public on December 24th, 2008.
- 14 Ministries Participating
  - Leading by Ministry of Environment

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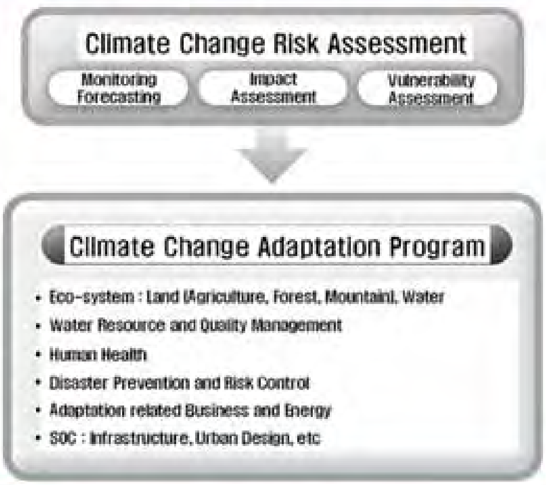
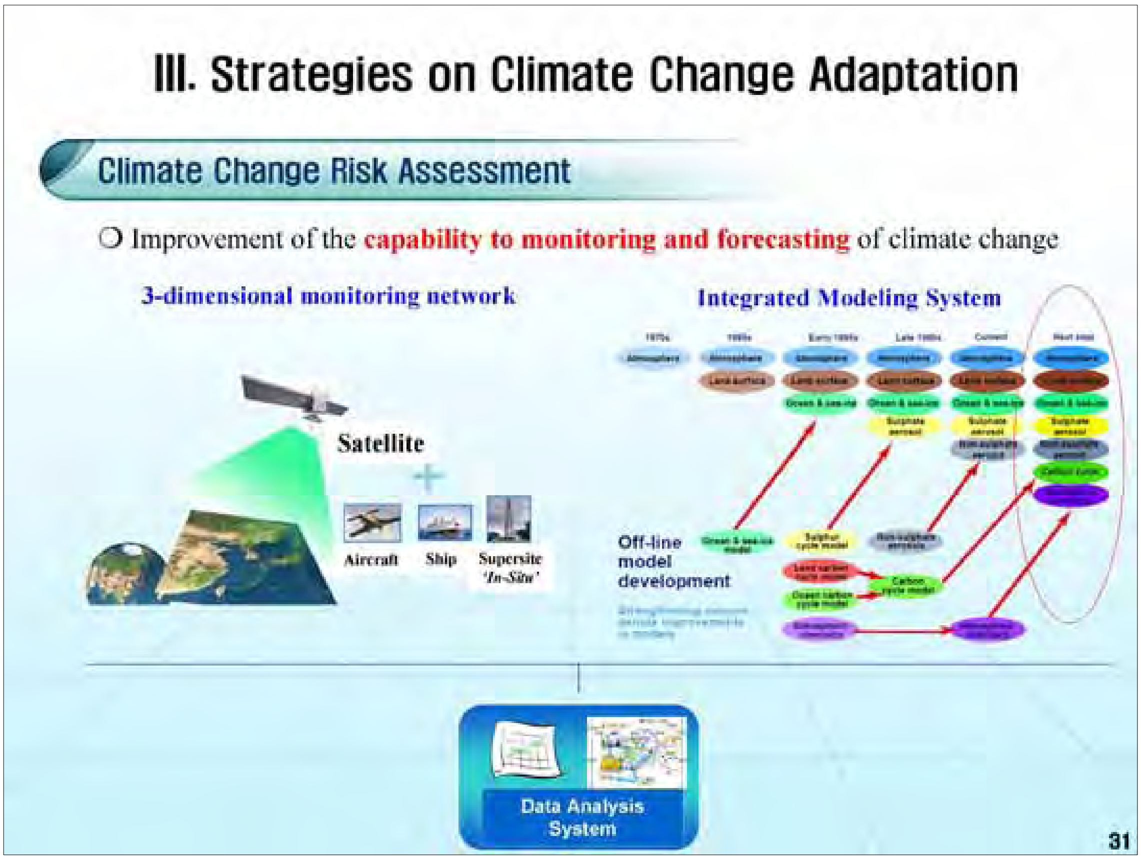
Ⅲ. Strategies on Climate Change Adaptation

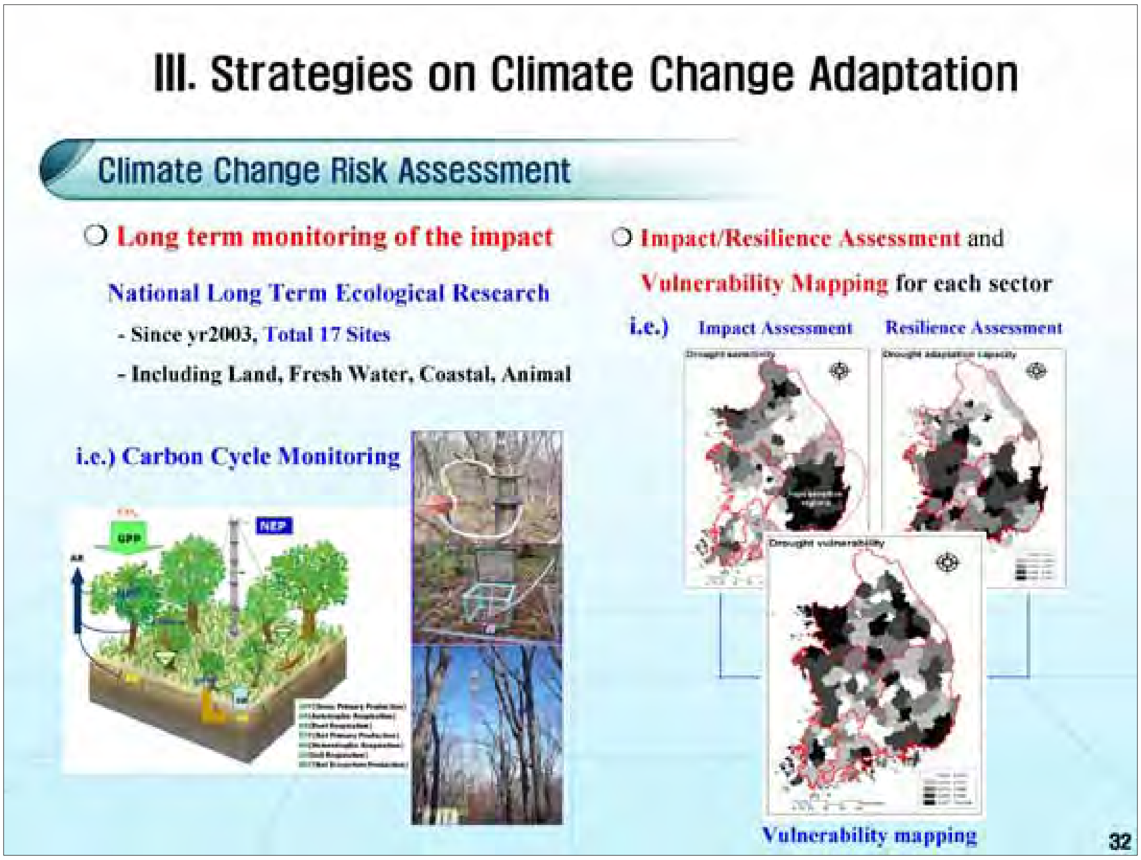
Strategy

National Comprehensive Plan for Climate Change Adaptation
: consist of total 183 projects



30


III. Strategies on Climate Change Adaptation
Climate Change Risk Assessment
❍ Improvement of the capability to monitoring and forecasting of climate change
3-dimensional monitoring network
Satellite
Aircraft
Ship
Supersite 'In-Situ'
Integrated Modeling System
Off-line model development
Data Analysis System
31


III. Strategies on Climate Change Adaptation
Climate Change Risk Assessment
❍ Long term monitoring of the impact
National Long Term Ecological Research
- Since yr2003, Total 17 Sites
- Including Land, Fresh Water, Coastal, Animal
i.e.) Carbon Cycle Monitoring
GPP
NEP
❍ Impact/Resilience Assessment and
Vulnerability Mapping for each sector
i.e.) Impact Assessment Resilience Assessment
Drought sensitivity
Drought adaptation capacity
Drought vulnerability
Vulnerability mapping
32

III. Strategies on Climate Change Adaptation

Climate Change Adaptation Program

❍ **Ecosystem** adaptation program

- Protecting **the flora and fauna species and biological resources**
  . Plan to **build 'National Institute of Ecology'**

- Preventing the increase of introduced species

Construction of 'Eco-Bridge' (350 ha)

Recovery of alpine plants (217 species)

33

III. Strategies on Climate Change Adaptation

Climate Change Adaptation Program

❍ **Water resource and quality** management program

- Renewing the **Mid/Long term National Water Resource Management Plan**
- Developing environment-friendly **Stable Water Supply System**

'The Four Major Rivers Restoration Project (14 billion $ / 4 yrs)'

- The Balanced National Development committee on December 15th 2008, **led by President Lee**
- Preparing **fundamental measures to respond water problems** due to Climate Change
- Revitalize stagnant regional economy by **creating new jobs as part of Green New Deal**

Current Status **i.e.) Nakdong River** **Anticipating Changes**

34

Ⅲ. Strategies on Climate Change Adaptation

Climate Change Adaptation Program

❍ **Human health** management program

- Developing the **surveillance and control systems** for vector-borne diseases
- Launching the **national research project for environmental health (10 Mil. $ / yr)**

'Heat/Health Watch-Warning System (HHWWS)', Seoul

35

Ⅲ. Strategies on Climate Change Adaptation

Climate Change Adaptation Program

❍ **Disaster control** program

- **Linkage between national development plan and the disaster control plan**
- Preparation of the standardized manual and guideline for disaster response
- Introduction of a **disaster insurance program**

'Forest Fire Danger Forecasting WEB'

'Guideline : For Safety Life'

36

Ⅲ. Strategies on Climate Change Adaptation

Climate Change Adaptation Program

❍ **Social infrastructure** protection program

- Planning **disaster control and response system** to minimize the impact of climate change **on the social infrastructure**
- Construction of **'Green Zone'** in the residential area like apartment complexes
- **'Roof Garden'** to mitigate global warming

'Green Daegu Project'

- 2007~2011 (5 yrs / 400 Mil. $)
- **Green Park, Green Zone, Green roof**

37

Ⅲ. Strategies on Climate Change Adaptation

Domestic and International Cooperation

❍ **National level capacity building** for adaptation

- Enhancing the legal and administrative framework for climate change response
  . Incorporation of the climate change risk into national long-term plans and policies
  . **National Climate Change Adaptation Center**
- Supporting the **local government** to get the relevant adaptation option
  . Provision with **'Guideline and tools'** for climate change adaptation

❍ **Domestic and International cooperation**

- Establishing **the partnership with various stake-holders**
- Promote the **'Green Start Campaign'** to enhance public awareness
- Enhancing **the international cooperation with UNEP, WMO, IPCC and etc**

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Thank you.

Session Ⅲ	**Toward the Low Carbon Society (LCS)** (Moderator: Mr. Makoto SAITO, NIES, Japan)

3-1 A voyage towards a low carbon society of Korea

- Dr. You-Deug HONG, Climate Change Research Division, NIER, KOREA

3-2 Establishment of indicator system and scenarios of low carbon economy

- Dr. Jiafeng FU, Climate Change Center, CRAES, China

3-3 Introduction of climate policy assessment and 2050 Japan and Asia low carbon society studies

- Dr. Tatsuya HANAOKA, Climate Policy Assessment Research Section, NIES, Japan

Coffee Break

General Discussion

Closing Remarks by Presidents of CRAES and NIES

Commemorative Photograp

Workshop adjourne

Signing ceremony of the 6th TPM Joint Communiqué (by three presidents)

Official Dinner hosted by NIES presiden

3-1 A voyage towards a low carbon society of Korea

- Dr. You-Deug HONG, Climate Change Research Division, NIER, KOREA

A Voyage towards Low Carbon Society of Korea

2009. 11.

Director You-Deug HONG

National Institute of Environemntal Research

국립환경과학원

Contents

국립환경과학원

I Low Carbon Green Growth

국립환경과학원

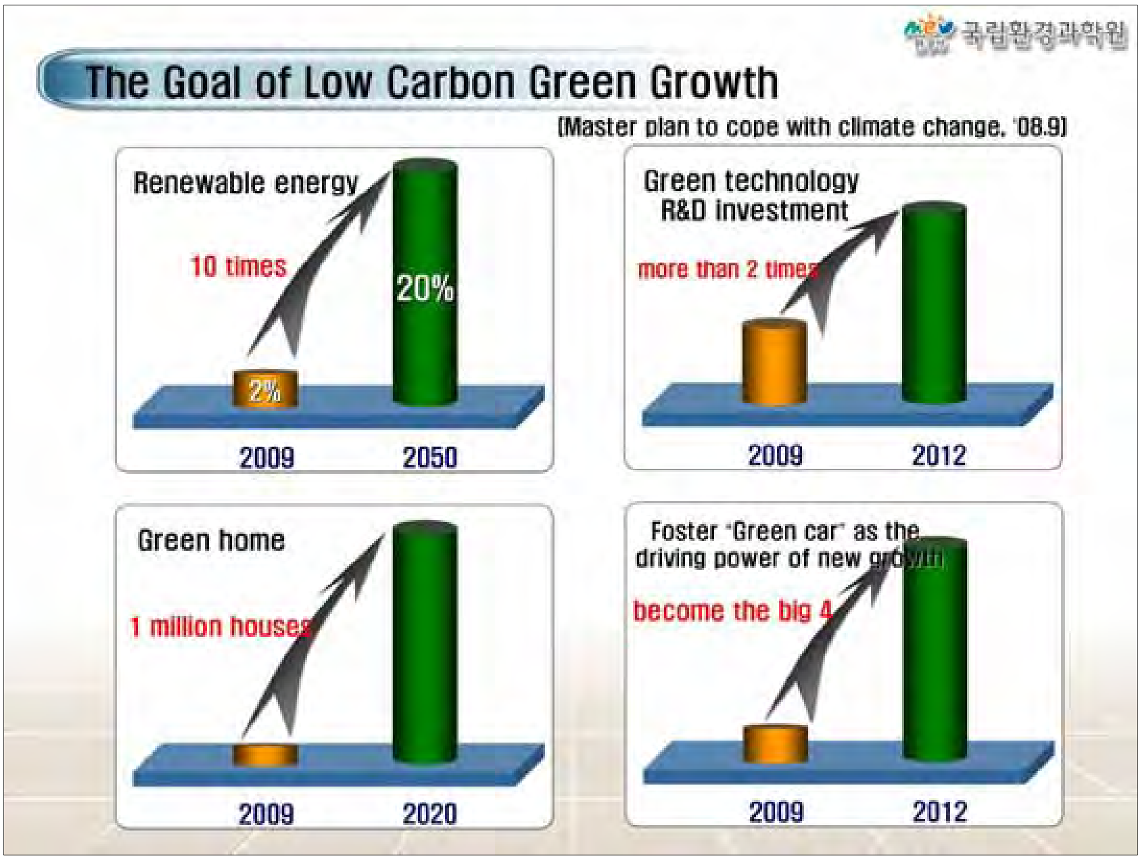
A declaration of LCGG vision

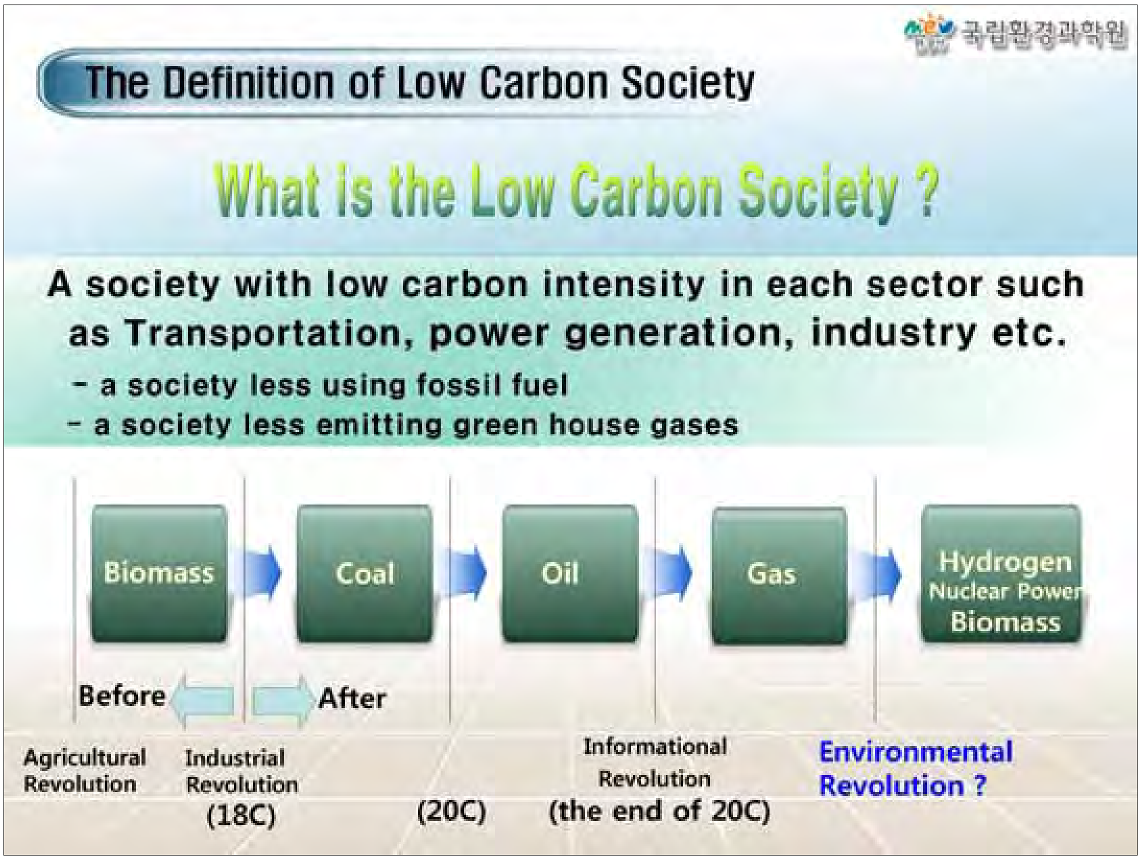
"Green Growth means sustainable growth reducing GHG and air pollution.

A new national growth paradigm producing new growth driving power and jobs with green technology and clean energy"

(The President Lee, 2008. 8·15, A congratulatory address on the Independence Day)

Bringing up Low Carbon Green Growth as the core of new vision for 60 years ahead


국립환경과학원
The Goal of Low Carbon Green Growth
[Master plan to cope with climate change, '08.9]
Renewable energy
10 times
20%
2%
2009
2050
Green technology
R&D investment
more than 2 times
2009
2012
Green home
1 million houses
2009
2020
Foster "Green car" as the
driving power of new growth
become the big 4
2009
2012


국립환경과학원
The Definition of Low Carbon Society
What is the Low Carbon Society ?
A society with low carbon intensity in each sector such as Transportation, power generation, industry etc.
- a society less using fossil fuel
- a society less emitting green house gases
Biomass
Coal
Oil
Gas
Hydrogen
Nuclear Power
Biomass
Before
After
Agricultural Revolution
Industrial Revolution
(18C)
(20C)
Informational Revolution
(the end of 20C)
Environmental Revolution ?

국립환경과학원

The Definition of Green Growth

- Green + Growth
- Economic growth with reducing GHG

1. (Economy⇒Environment) : Green growth improve environment
   - Decoupling economic growth and environmental destroy
2. (Environment⇒Economy) : Environment drive economic growth
   - Green tech. and green industry increasing env. friendliness of economic activities

※ GHG reduction cost < Green tech. and Green industry benefit

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국립환경과학원

II The Background of LCGG

1. Pressure on GHG reduction
2. Global and Korean economic situation

국립환경과학원

Efforts for GHG Reduction

2008. 7 [Hokkaido, Japan]	2008. 10 [Beijing, China]	2008. 11 [Lima, Peru]	2008. 12 [Potsnan, Poland]	2009. 6~7 [Italy]	2009. 12 [Copenhagen, Denmark]
G8 summit	ASEM summit	APEC summit	UNFCCC COP14	G8 summit	UNFCCC COP 15

Declaration on GHG reduction [50% reduction by '50]

GHG reduction target setting

Announce GHG reduction target for 2020 in 2009

Set up reduction target

Announce target

국립환경과학원

Increased pressure on GHG reduction

The most urgent global issue ⇒ Climate Change

- Davos Furum('07.1) : **38% of participant CEO agree**
- **APEC** summit('07.9) : **adoption of** 「the summit declaration on Climate Change」
- **G8** larger summit('08.7) : emphasize time-urgency of climate change response

'Bali Roadmap' ('07.12) ⇒ Set the time limit for Post-2012 agreement

- New UNFCCC for post- 2012 in Copenhagen at the end of '09
- The increased possibility for Korea to be included in Annex-1 countries

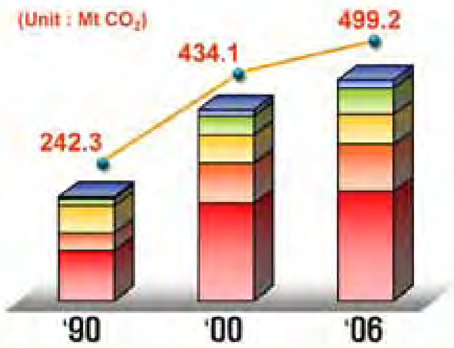
U.S.A. the possibility to join post-Koyto agreement by Obama administration

domestic **Long-term target as 80% of 1990 GHG emissions by '50**
Adoption of total amount limiting **Cap-and-Trade**

external An Active participation in UN's climate change discussion
Organize **"Global Energy Forum"**

국립환경과학원

CO_2 Emission in Korea (Energy)



An enconomic sturcture not easy to reduce GHG

- Industry contribute almost 47.8% of total GHG emission
  - → mass reduction can cause industry to be weaken competitiveness
- Not enough efforts for high energy efficiency by supply-based strategies
- Weak base for green technology/green energy industry

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II The Background of LCGG

1. Pressure on GHG reduction
2. Global and Korean economic situation

국립환경과학원

The World Economic Trend

Facing global limitation of growth

- Climate change and environmental crisis
  - Survival of mankind threatened by weather disasters and destruction of ecosystems
  - If energy consuming system continues, economic loss caused by climate change
    : 5~20% of World GDP ('06, Stern report)
- Shortage of energy · resources and price increasing
  - economic growth of new developing countries and world population growth

3 big threats for future(2008.9, Thomas Freidman)

- Hot(Global warming)
- Flat(Globalization)
- Crowded(Population growth)

- Climate change
- Resource demand increasing
- Wealth shift to oil-producing countries
- Energy polarization
- Biological diversity decreasing

국립환경과학원

Economic Crisis in Korea

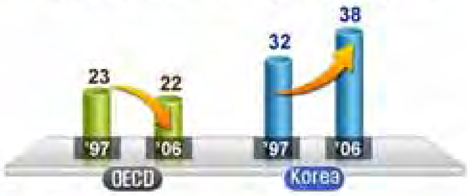
An economy sturucture vulnerable to energy crisis

Low energy efficiency

· Unit energy consumption(TOE/GDP, '07 IEA)

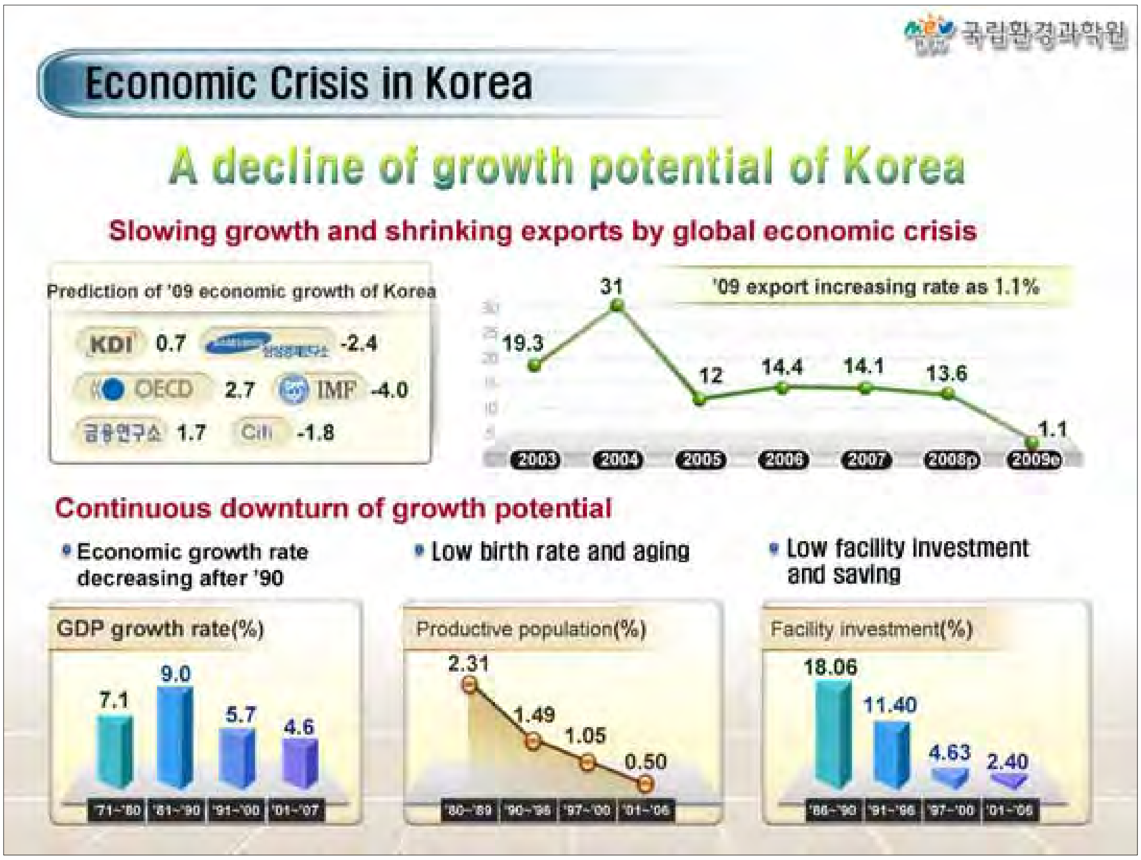
Energy guzzling industry

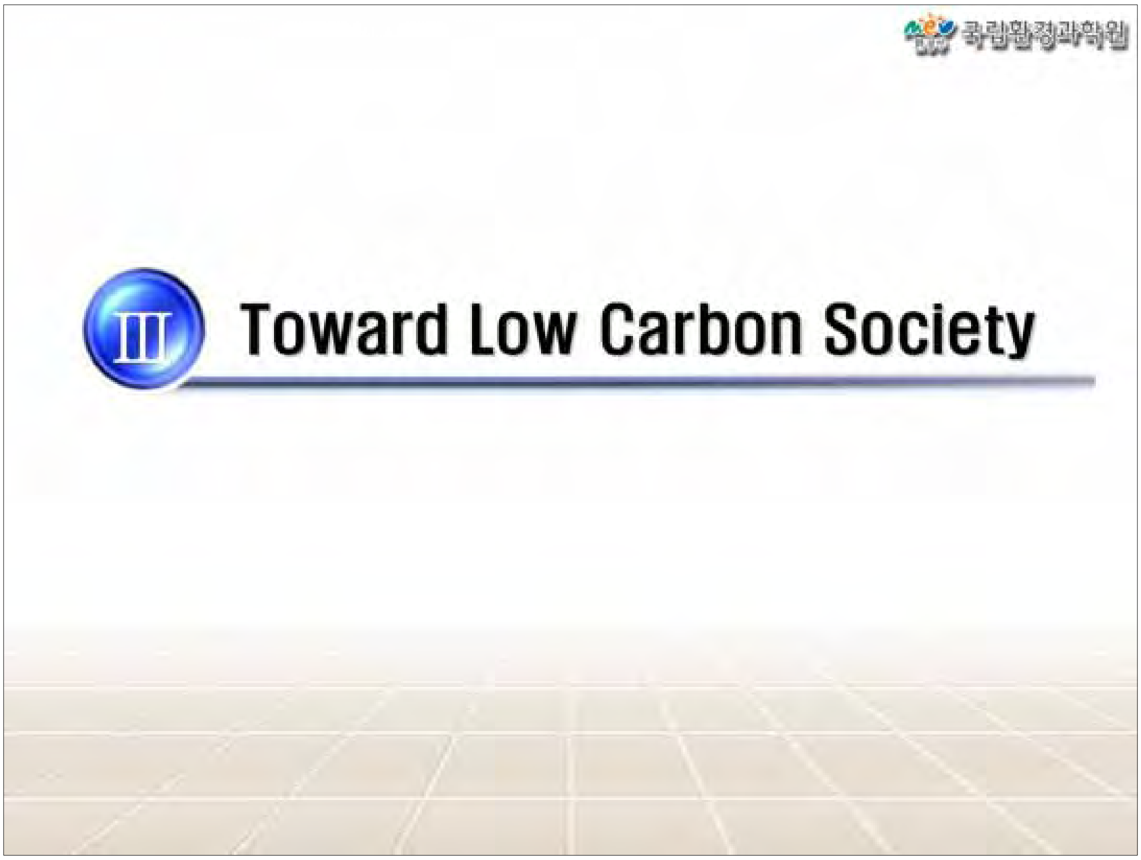
· 38% of national energy consumption

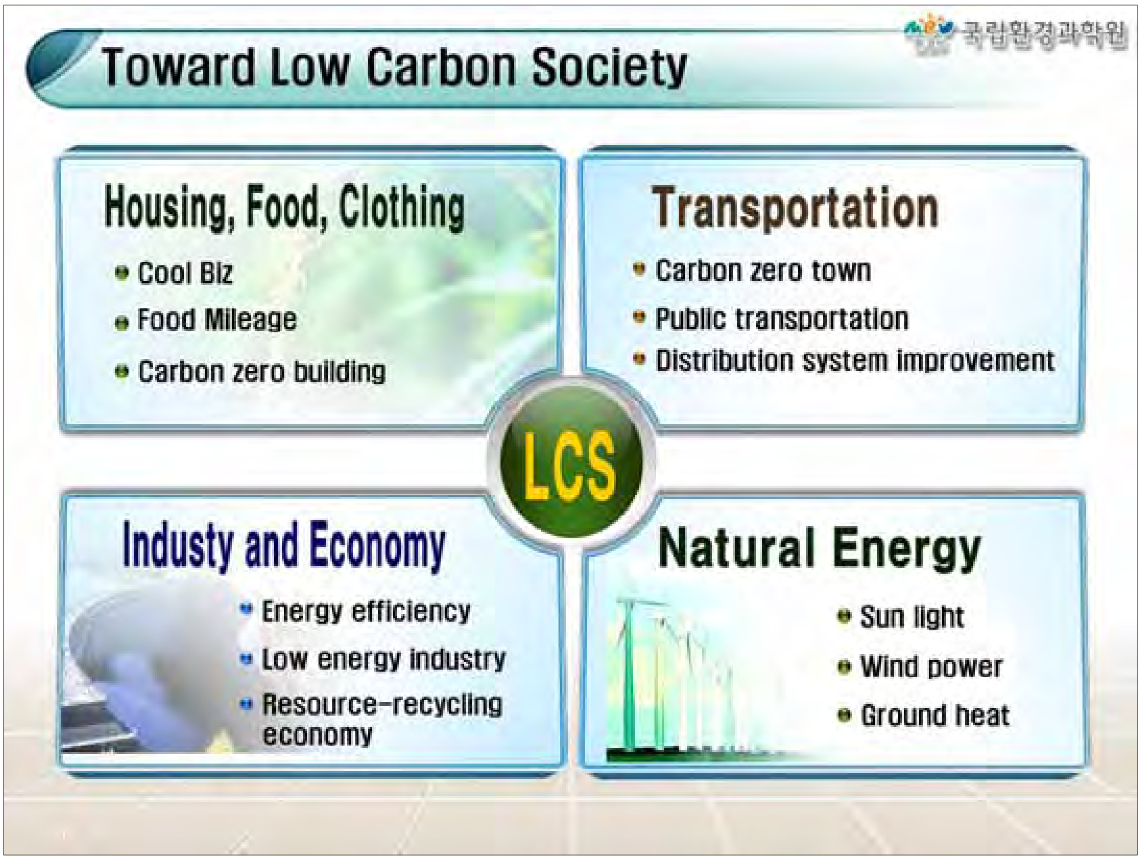


97% dependent on imports, 83% fossil fure

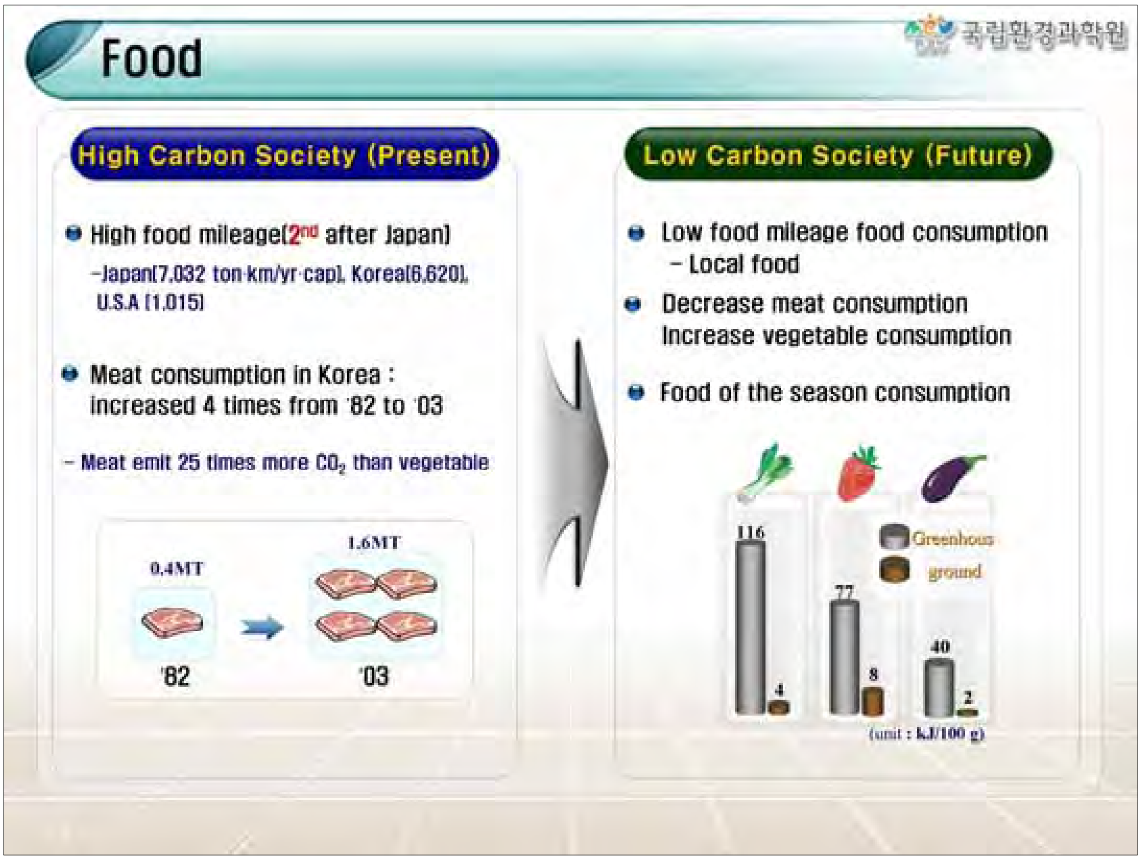
oil price 10% increased

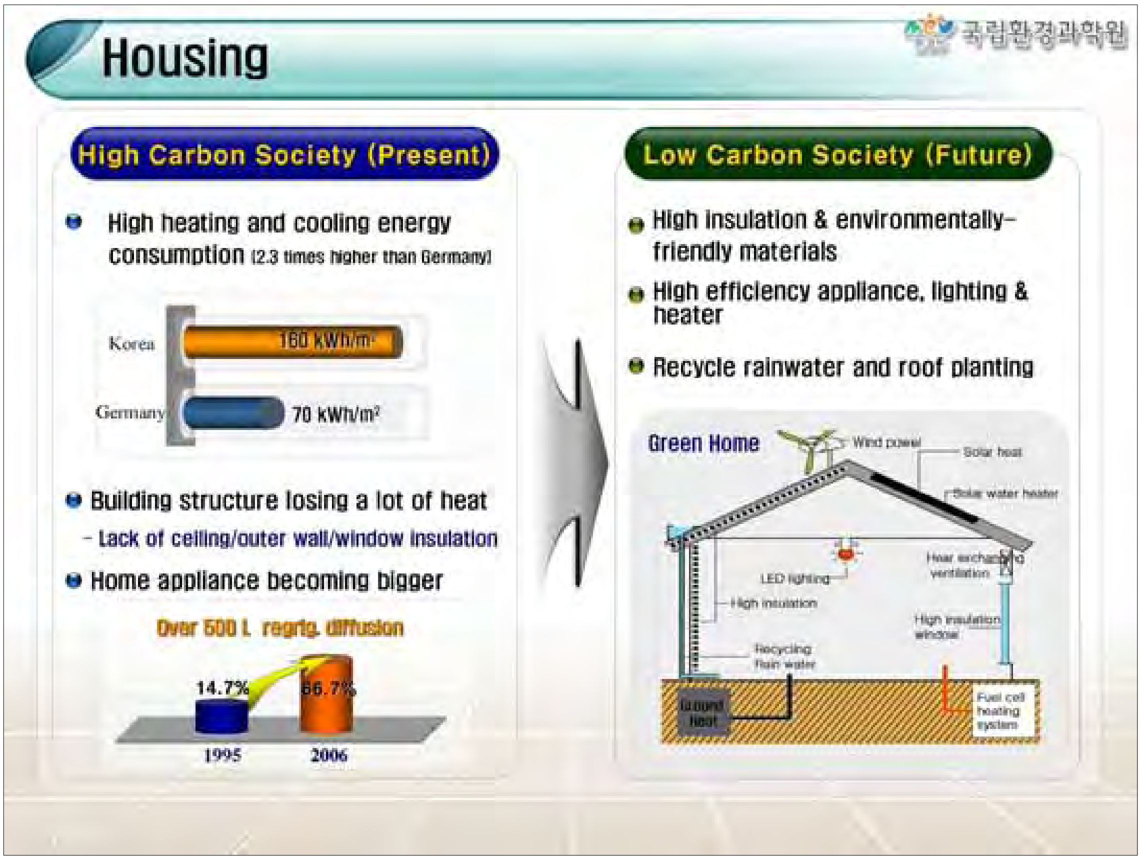

국립환경과학원
Economic Crisis in Korea
A decline of growth potential of Korea
Slowing growth and shrinking exports by global economic crisis
Prediction of '09 economic growth of Korea
KDI 0.7
-2.4
OECD 2.7
IMF -4.0
금융연구소 1.7
Citi -1.8
'09 export increasing rate as 1.1%
19.3
31
12
14.4
14.1
13.6
1.1
2003
2004
2005
2006
2007
2008p
2009e
Continuous downturn of growth potential
Economic growth rate decreasing after '90
Low birth rate and aging
Low facility investment and saving
GDP growth rate(%)
7.1
9.0
5.7
4.6
'71~'80
'81~'90
'91~'00
'01~'07
Productive population(%)
2.31
1.49
1.05
0.50
'80~'89
'90~'96
'97~'00
'01~'06
Facility investment(%)
18.06
11.40
4.63
2.40
'86~'90
'91~'96
'97~'00
'01~'06

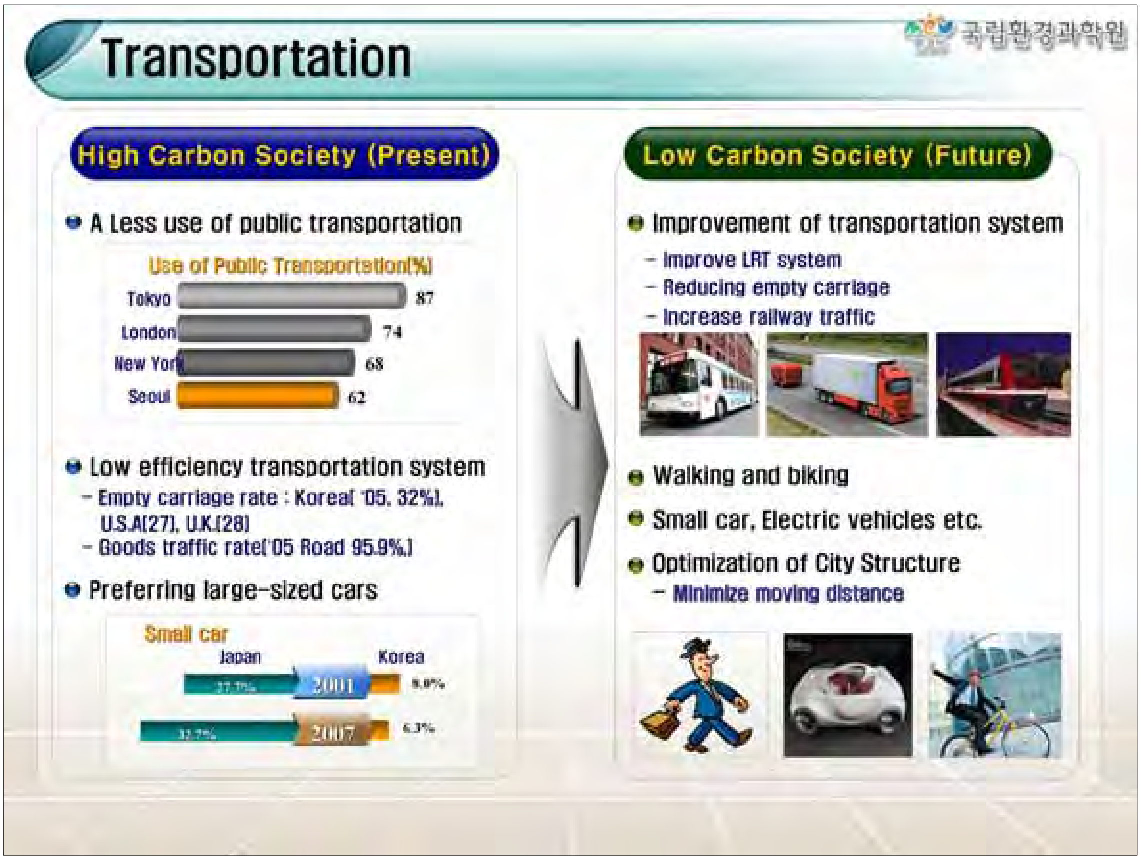

국립환경과학원
III
Toward Low Carbon Society

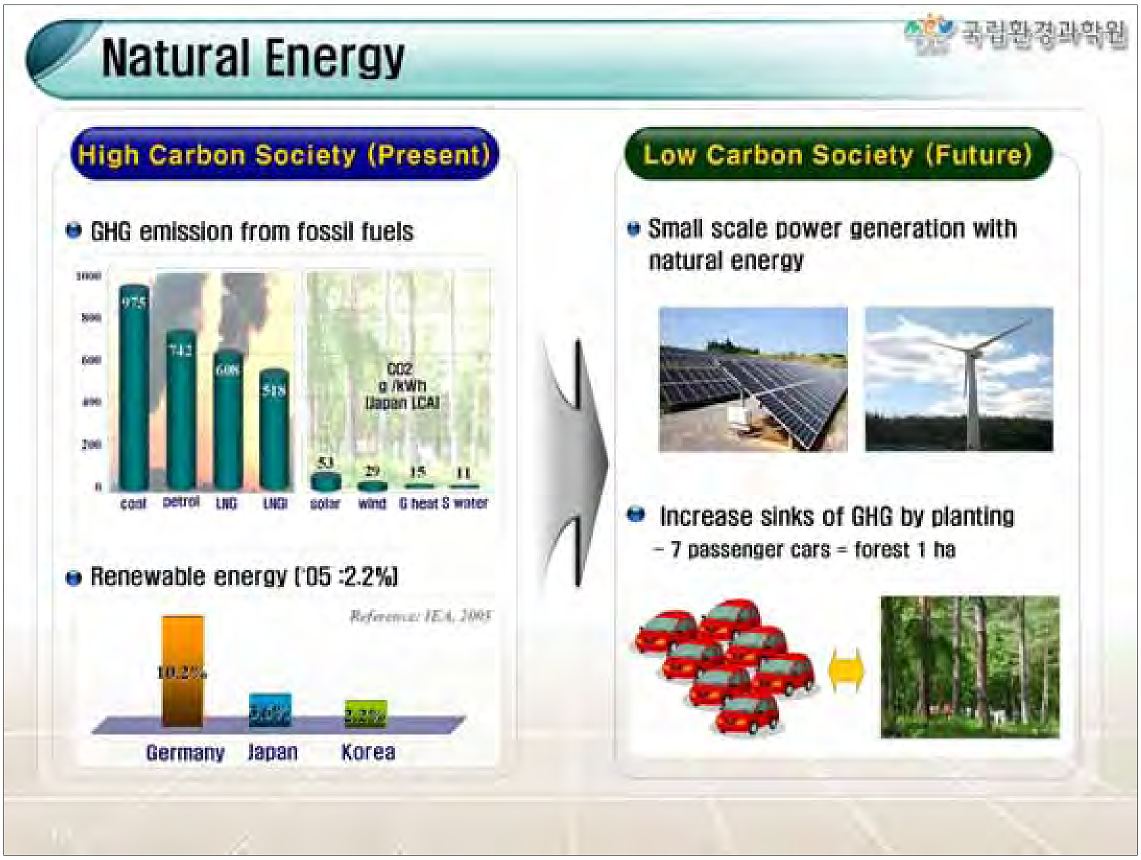

국립환경과학원
Toward Low Carbon Society
Housing, Food, Clothing
Cool Biz
Food Mileage
Carbon zero building
Transportation
Carbon zero town
Public transportation
Distribution system improvement
LCS
Industy and Economy
Energy efficiency
Low energy industry
Resource-recycling economy
Natural Energy
Sun light
Wind power
Ground heat

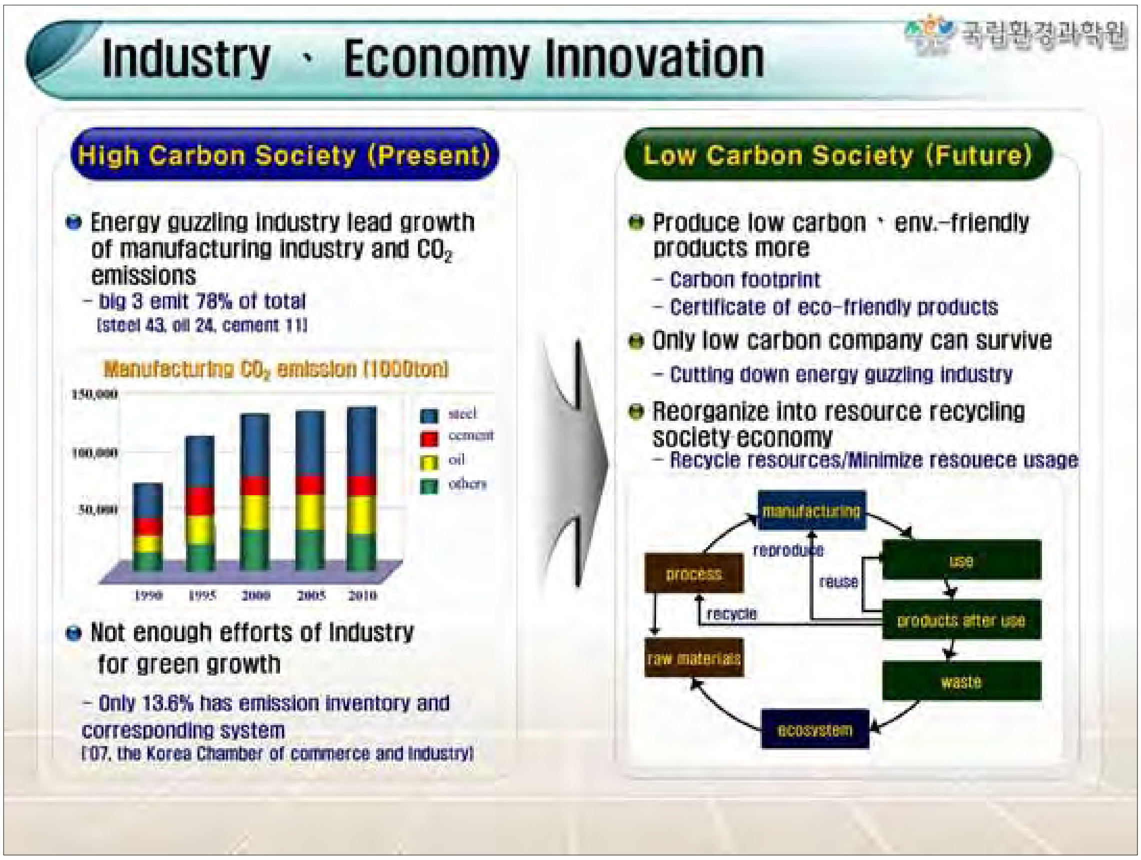

국립환경과학원
Clothing
High Carbon Society (Present)
Fast clothing
- CO_2 emissions : producing 56%, laundry 33%
Fully dressed up at work in summer??
Short pants at home in winter??
- To raise 1℃ , energy consumption increase 5%
Low Carbon Society (Future)
Slow clothing
Cool Biz and Warm Biz
- without a tie : wind-chill 2℃ ↓
- with a blanket : wind-chill 2.5 ℃ ↑
0.6 ℃
2.2 ℃
2.5 ℃
Purchasing low CO_2 clothing
Synthetic fiber
Natural fiber
100
56
GhG emission comparison


Food
국립환경과학원
High Carbon Society (Present)
High food mileage(2nd after Japan)
-Japan(7,032 ton·km/yr·cap), Korea(6,620), U.S.A (1,015)
Meat consumption in Korea : increased 4 times from '82 to '03
- Meat emit 25 times more CO_2 than vegetable
0.4MT
1.6MT
'82
'03
Low Carbon Society (Future)
Low food mileage food consumption
- Local food
Decrease meat consumption
Increase vegetable consumption
Food of the season consumption
116
4
77
8
40
2
Greenhous
ground
(unit : kJ/100 g)


Housing
국립환경과학원
High Carbon Society (Present)
High heating and cooling energy consumption (2.3 times higher than Germany)
Korea
160 kWh/m²
Germany
70 kWh/m²
Building structure losing a lot of heat
- Lack of ceiling/outer wall/window insulation
Home appliance becoming bigger
Over 500 L regrig. diffusion
14.7%
66.7%
1995
2006
Low Carbon Society (Future)
High insulation & environmentally-friendly materials
High efficiency appliance, lighting & heater
Recycle rainwater and roof planting
Green Home
Wind power
Solar heat
Solar water heater
LED lighting
Heat exchanging ventilation
High insulation
High insulation window
Recycling Rain water
Ground heat
Fuel cell heating system


Transportation
국립환경과학원
High Carbon Society (Present)
A Less use of public transportation
Use of Public Transportation(%)
Tokyo 87
London 74
New York 68
Seoul 62
Low efficiency transportation system
- Empty carriage rate : Korea('05, 32%), U.S.A(27), U.K.(28)
- Goods traffic rate('05 Road 95.9%,)
Preferring large-sized cars
Small car
Japan
Korea
2001
2007
Low Carbon Society (Future)
Improvement of transportation system
- Improve LRT system
- Reducing empty carriage
- Increase railway traffic
Walking and biking
Small car, Electric vehicles etc.
Optimization of City Structure
- Minimize moving distance


Natural Energy
국립환경과학원
High Carbon Society (Present)
GHG emission from fossil fuels
975
742
608
518
CO2 g /kWh (Japan LCA)
53
29
15
11
coal
petrol
LNG
LNG
solar
wind
G heat
S water
Renewable energy ('05 :2.2%)
Germany
Japan
Korea
Low Carbon Society (Future)
Small scale power generation with natural energy
Increase sinks of GHG by planting
- 7 passenger cars = forest 1 ha


Industry · Economy Innovation
국립환경과학원
High Carbon Society (Present)
Energy guzzling industry lead growth of manufacturing industry and CO_2 emissions
- big 3 emit 78% of total
[steel 43, oil 24, cement 11]
Manufacturing CO_2 emission (1000ton)
150,000
100,000
50,000
1990
1995
2000
2005
2010
steel
cement
oil
others
Not enough efforts of industry for green growth
- Only 13.6% has emission inventory and corresponding system
['07, the Korea Chamber of commerce and Industry]
Low Carbon Society (Future)
Produce low carbon · env.-friendly products more
- Carbon footprint
- Certificate of eco-friendly products
Only low carbon company can survive
- Cutting down energy guzzling industry
Reorganize into resource recycling society·economy
- Recycle resources/Minimize resouece usage
manufacturing
use
reproduce
reuse
process
recycle
products after use
raw materials
waste
ecosystem


국립환경과학원
IV
Major Research Projects of NIER

국립환경과학원

Major research fields of NIER

Leading research activities
for building LCS and GHG reduction

Goal

Climate Change Adaptation

GHG Mitigation

LCS Scenarioes

Major Fields

- CC monitoring and prediction
- Impact and vulnerability assessment
- Set up adaptation master plans

- Build up GHG emission inventory
- Build up GHG reduction technologies DB
- Emission prediction and reduction potential assessment

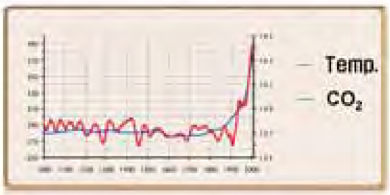
- LCA for daily necessities
- Daily life pattern assessment
- LCS scenarios
- Zero-carbon building

국립환경과학원

Climate Change Monitoring and Adaptation

- Long-term monitoring of climate change and risk assessment
  - ➡ Minimize the impact and risk of climate change

- Long term monitoring of climate change
  - Develop integrated modeling system
  - Monitor CO_2, Ozone, Aerosol by a satellite
- National Comprehensive Plan for Climate Change Adaptation
  - Ecosystem adaptation program



GHG Emission Inventory

- GHG emission inventory development
  - ➡ Prospect future GHG emission and reduction potential assessment

- Establish GHG emission Data base (GHG-CAPSS)
  - Developing Country specific emission factor

- Develop GHG prospect & reduction potential assessment model (modifying AIM, MARKAL etc)

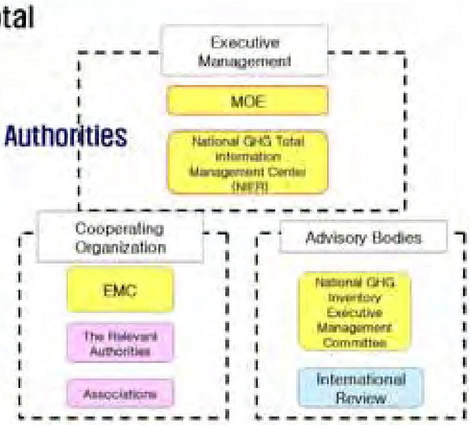
- Assess GHG reduction technologies and policies

GHG emission statistics executive management

- Set up national GHG statistics general management plan
  - ➡ Prepare NIR and CRF, build statistics for GHG reduction

- Organize and operate 'National GHG Total Information Management Center'
  - Executive management : MOE, NIER
  - Cooperating organization: EMC, Relevant Authorities
  - Advisory bodies : National inventory executive management committee

- Role of NGTIMC
  - Develop emission factors by sector
  - Build national GHG statistics
  - Set up the process for NIR and CRF

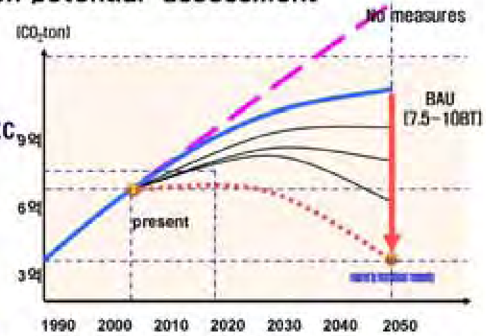


국립환경과학원

GHG Emission prediction and reduction potential assessment

- GHG emission prediction and reduction potential assessment
  - ➡ Provide data to support policy and assess the results of reduction policies

- Set up the methodology for reduction potential assessment
- Build database of reduction technologies and policies
  - Residential, commercial, transportation etc.
- Predict GHG emission and assess reduction potential
  (AIM, MARKAL, LEAP Models)
  - use economic and social indicators
  - consider future technologies ('10-'50)

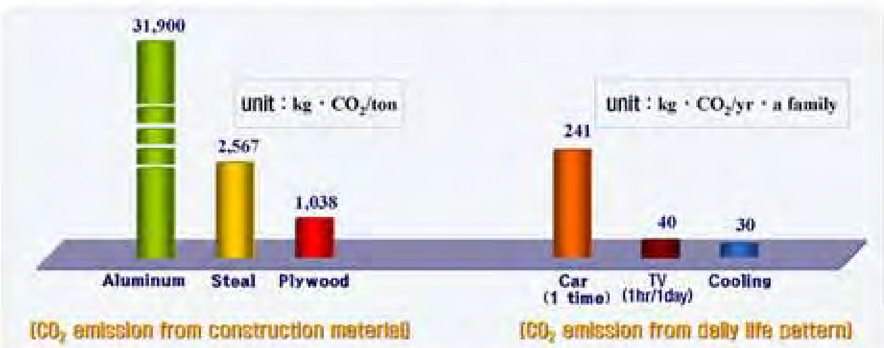


국립환경과학원

Establishing low carbon society

- Basic CO_2 emission factor calculation for products, daily life pattern
  - ➡ To guide people to practice saving energy

- Food mileage calculation
- Life cycle assessment (LCA) for major products and establishing D/B
- Investigate CO_2 emission from daily life pattern



국립환경과학원

Carbon Zero Building

- Climate change research building will be constructed as the first carbon zero office building in Korea in '09~'10
- 66 low carbon technologies were adapted to Carbon Zero Building

- Minimizing energy consumption by optimizing insulation (40%)
  - High efficiency window, outer wall, roof planting
- All energy supplied by natural energy (60%)
  - Power generation by Photovoltaic heat, Solar light, geothermal heat

국립환경과학원

Thank you for your attention !!!

3-2 Establishment of indicator system and scenarios of low carbon economy

- Dr. Jiafeng FU, Climate Change Center, CRAES, China

The Sixth Tripartite President meeting among NIER, CRAES and NIES

(Nov. 25th-28th, 2009, Seoul, Korea)

Establishment of index system and scenarios of low carbon economy in China

Fu JiaFeng

Center for Climate Impact Research (CCIR),

Chinese Research Academy of Environmental Sciences (CRAES)

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CONTENTS

- Conceptual Identification
- Index System and Its Practice
- LCE Scenarios Methodology
- LCE Scenarios in China

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1 Conceptual Identification

LCE (LOW CARBON ECONOMY) firstly appeared in the official document on Feb 24, 2003, a White Paper "Our Future Energy – Creating Low Carbon Economy" delivered by Blair, former prime minister of UK.

It's pointed out in the Energy White Paper, by 2050; UK will reduce its greenhouse gas emission by 60% from the level in 1990, and fundamentally change UK into a LCE country.

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1 Conceptual Identification

Climate Change Strategic Framework published by UK government in 2007 further put forward the outlook of global low carbon economy development, and it's pointed out that low carbon economy is as influential as the first industrial revolution.

This document explains our strategy for achieving the ambitious objectives within our Bill, and how our domestic policy is part of a wider international strategy to create a global low carbon economy.

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Five point plan

Publised on July,2009

The transition to a low-carbon economy will be one of the defining issues of the 21st century. This plan sets out a route-map for the UK's transition from here to 2020.

The UK Government has a five point plan to tackle climate change.

1. Protecting the public from immediate risk

Climate change is already happening in the UK – the ten hottest years on record have all been since 1990. The Government has more than doubled spending on flood protection since 1997, developed a heat wave plan in the NHS and is helping communities affected by coastal erosion.

2. Preparing for the future

Whatever is done to reduce emissions in the future, past emissions mean that some climate change is already inevitable. The UK Climate Projections will be used to help plan for a future with a changing climate. Factoring climate risk into decision making means, for example, changing the way we build our houses and infrastructure, managing water better and adjusting farming practices.

3. Limiting the severity of future climate change through a new international climate agreement

To limit global temperature increases to no more than two degrees and avoid the most dangerous effects of climate change, the Government is leading international efforts to achieve a new international climate agreement at Copenhagen in December. The deal needs to ensure global emissions start to fall within the next decade and be at least 50% below 1990 levels by 2050.

4. Building a low carbon UK

To play our part in reducing global emissions, Britain needs to become a low carbon country. The 2008 Climate Change Act made Britain the first country in the world to set legally binding 'carbon budgets', aiming to cut UK emissions by 34% by 2020 and at least 80% by 2050 through investment in energy efficiency and clean energy technologies such as renewables, nuclear and carbon capture and storage.

This White Paper sets out the UK's transition plan for building a low carbon UK: cutting emissions, maintaining secure energy supplies, maximising economic opportunities and protecting the most vulnerable.

5. Supporting individuals, communities and businesses to play their part

Everyone has a role to play in tackling climate change, from reducing their own emissions to planning for adaptation. Building on our 'Act on CO2' information campaign, the Government is providing a range of support for individuals, communities and businesses, including a major programme of financial help for home insulation and energy efficiency.

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1 Conceptual Identification

Japan put forward that it will take full use of energy and environment related high-technologies to build Japan into the first "low carbon society" in the world.

A Dozen Actions towards Low-Carbon Societies (LCSs)

1. Comfortable and Green Built Environment
Efficiently use of sunlight and energy efficient built environment design. Intelligent buildings

2. Anytime, Anywhere Appropriate Appliances
Use of Top-runner and Appropriate appliances. Initial cost reduction by rent and release system resulting in improved availability.

3. Promoting Seasonal Local Food
Supply of seasonal and safe low carbon local foods for local cuisine

4. Consuming In-Season Local
Using local and renewable buildings materials and products.

5. Environmentally Enlightened Business and Industry
Businesses aiming at creating and operating in LC market. Supplying LC and high value-added goods & services through energy efficient production systems

6. Swift and Smooth Logistics
Networking seamless logistics systems with supply chain management, using both transportation and ICT infrastructure

7. Pedestrian Friendly City Design
City design requiring short trips and pedestrian (and bicycle) friendly transport, augmented by efficent public transport

8. Low-Carbon Electricity
Supplying low carbon electricity by large-scale renewables, nuclear power and CCS-equipped fossil (and biomass) fired plants

9. Local Renewables for Local Demand
Enhancing local renewables use, such as solar, wind, biomass and others.

10. Next Generation Fuels
Development of carbon free hydrogen- and/or biomass-based energy supply system with required infrastructure

11. Labeling to Encourage Smart and rational Choices
Publicizing of energy use and CO_2 costs information for smart choices of LC goods and service by consumers, and public acknowledgement of such consumers

12. Low Carbon Society Leadership
Human resource development for building "Low Carbon Society" and recognizing extraordinary contributions.

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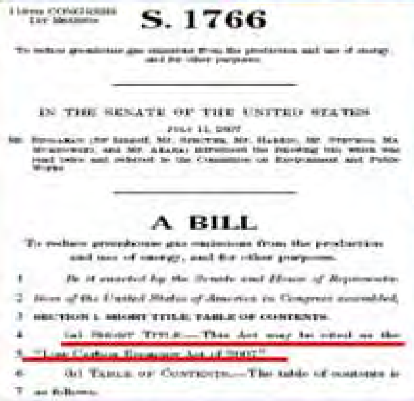
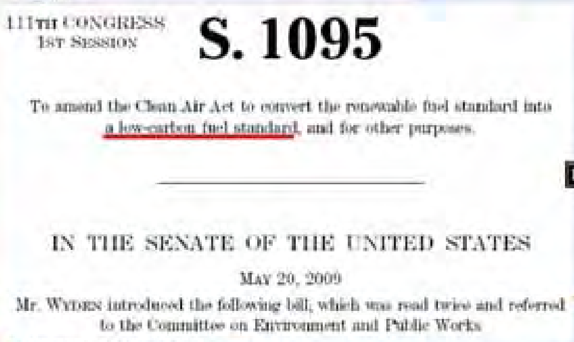
1 Conceptual Identification


S. 1766

IN THE SENATE OF THE UNITED STATES

A BILL


111TH CONGRESS
1ST SESSION

S. 1095

To amend the Clean Air Act to convert the renewable fuel standard into a low-carbon fuel standard, and for other purposes.

IN THE SENATE OF THE UNITED STATES

MAY 20, 2009

Mr. WYDEN introduced the following bill; which was read twice and referred to the Committee on Environment and Public Works

The legislative bill including "Low Carbon Economy Act of 2007" submitted by the senate to the Congress of the USA in July 2007 pointed out that low carbon energy development is expected to become a critical strategic selection of the USA in the future.

This Act may be cited as the "America's Low-Carbon Fuel Standard Act of 2009". To amend the Clean Air Act to convert the renewable fuel standard into a low-carbon fuel standard.

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1 Conceptual Identification

Although UK put forward the concept of low carbon economy, but failed to gave it a specific definition. Low carbon economy is an economic or a development pattern, or the combination of them; academicians and decision makers haven't achieved a definite consensus.

Mr. ShengXian Zhou, Minister of Ministry of Environmental Protection of the People's Republic of China, pointed out: "Low carbon economy is an economic model based on low energy consumption, low emission and low pollution,

It's pointed out in the report of China Council for International Cooperation on Environment and Development that "low carbon economy is an economic pattern appeared in the post-industrial society, it's aimed at reducing greenhouse emission to a certain level, so as to protect each country and its subjects from the adverse impact of climate change, and finally ensure a sustainable global human habitat environment."

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1 Conceptual Identification

We believe, "Low Carbon Economy" is an economic pattern with certain level of carbon productivity and human development in order to control GHG emission. Carbon productivity means the GDP out of unit CO2 emission, the improvement of carbon productivity indicates more social fortunes out of less consumption of materials and energy. Human development means the economic development and social progress realized on the aspects of economic capability, health, education, ecologic protection, social equity and other human dimensions.

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1 Conceptual Identification

The features of this concept lie in, on the one hand, the human development is constrained by carbon emission, and on the other hand, it's emphasized that the carbon emission isn't a handicap against realization of the target of human development.

the solution is to improve carbon productivity by technical improvement, energy saving and other approaches. This concept does not differentiate absolute or relative low carbon emission; however, in a short-term view, the energy efficiency and carbon output efficiency can be improved and relatively low carbon emission can be realized without changing its energy structure and industrial structure; in a long-term view, technical progress can realize absolute decrease of total carbon emission of a nation by substituting traditional energies with clean energies, application of low-carbon technology and other approaches.

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1 Conceptual Identification

Low carbon development has different connotations to different countries. We believe low carbon emission may be in relative significance or absolute significance, the key is to differentiate the development stages and the obligations of emission reduction.

developing countries, the basic needs of human development hasn't been satisfied, therefore, the increase of total economic aggregate accompanied by reduction of low carbon emission can be deemed as low carbon development; [relative reduction]

developed countries who have achieved the high target of human development should undertake the obligation of emission reduction, and realize absolute reduction of carbon emission on the precondition that high human development level is maintained. [absolute reduction]

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2 Index System and Its Practice

The conceptual model of low carbon economy (LCE) is:

LCE = *f* {E, R, T, C}

Here,

E: economic development stage;

R: resource endowment;

T: technical factor;

C: consumption model.

To sum up, whether a country has realized low carbon economy depends on, besides the basic background of development stage, the potential of low carbon development on three key aspects, i.e. resource endowment, technical level and consumption mode, and as well as the efforts made by each country for transformation toward low carbon economy.

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2 Index System and Its Practice

According to the above analysis, the low carbon economy development measurement indicator system raised in this paper needs to be built on five levels: (1) low carbon production index; (2) low carbon consumption index; (3) low carbon resource index; (4) human development index; (5) low carbon policy index.

carbon production index represents low-carbon technology level;

carbon consumption index represents consumption model;

carbon resource index represents low carbon resource endowment and the situation of development and utilization;

human development index represents the development stage;

low carbon policy index represents the effort intensity for transformation toward low carbon economy.

On each level, one or some core indicators are selected and endowed with corresponding thresholds or qualitative descriptions.

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Target level	First-level index	No.	sub-level index	Description
Coping with climate change under the sustainable framework	Low carbon production	(1)	Carbon productivity	confinement index
		(2)	Decline rate of carbon emission intensity	confinement index
		(3)	Unit consumption of key products/industrial carbon productivity	confinement index
	Low carbon consumption	(4)	Carbon emission of per-capita expenditure	confinement index
		(5)	Automobile ownership/1,000 persons	confinement index
		(6)	Per-capita household consumption	confinement index
		(7)	Ratio of modern service industry to GDP	confinement index
		(8)	Per-capita living space	confinement index
	Low carbon resource	(9)	Ratio of renewable energies to primary energy resources	confinement index
		(10)	Forest coverage	confinement index
		(11)	Carbon sequestration reserves	confinement index
		(12)	CO2 emission factor of unit energy consumption	confinement index
	Human development	(13)	Human development indicator	confinement index
	Low carbon policy	(14)	Legislation of low carbon economy and development planning	Guidance index
		(15)	Establish special management department for unified management	confinement index
		(16)	Establish carbon emission monitoring, statistic, supervision and transaction system	confinement index
		(17)	Enterprises' sense of social responsibility	Guidance index
		(18)	Publicity of low carbon economy knowledge of the public and publicity extent	Guidance index
		(19)	Building energy conservation standard	confinement index
		(20)	Automobile fuel economy standard	confinement index

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2 Index System and Its Practice

Jilin practice

As one of the old industrial bases in Northeast China and a strategically important industrial city, Jilin has formed an industrial setup centering on petrochemical, automotive, metallurgy and power generation, and realizing industrial upgrading and modernization .

As an old industrial base, heavy industrial structure persists in the city and pure reliance on traditional linear economic growth pattern becomes no longer feasible .

Only by readjusting development strategy and developing low-carbon economy can Jilin City realize sustainable development. Meanwhile, successful implementation of low-carbon development strategy in the city will also provides a brand-new approach to development for revitalization of the entire old industrial base in Northeast China.

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2 Index System and Its Practice

Jilin practice

The above analysis suggests that Jilin City has a long way to go to meet the target of low-carbon economy with respect to many indicators, except for forest coverage rate and per unit energy consumption CO2 emission factor and particular per unit product energy consumption indicators (see Table). This reflects a fact that Jilin City is currently at the stage of high-carbon economic development.

Fortunately, however, Jilin City is actively adopting measures to move faster towards low-carbon economy, for example, the city will reduce per unit GDP energy consumption by 30% during the 11th five-year plan period, 10% higher than the national average. Jilin City needs to make greater efforts although it has made considerable achievements in developing low-carbon economy.

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Low-carbon economy development level of Jilin City (2007)

First-level indictor	Number	Second-level indicator	Unit	National average	Jilin City	Status
Low-carbon output	(1)	Carbon productivity	RMB 10,000/ton carbon	1.56	0.83	Far behind
	(2)	Per unit product energy consumption in major sectors/ carbon emission per unit of industrial value added in major sectors	Ton standard coal	-	-	Far behind
Low-carbon consumption	(3)	Per capita carbon emission	Ton carbon/person	1.36	2.79	Far behind
	(4)	Per capita carbon emission fro everyday energy consumption	Ton carbon/person	0.05	0.10	Far behind
Low-carbon resources	(5)	Per capita zero carbon energy consumption	Ton standard coal/person	0.14	0.075	Far behind
	(6)	Forest coverage (ecologically preferable city)	%	45	54.90	Met
	(7)	Per unit energy consumption CO2 emission factor	Ton carbon/ton standard coal	0.65	0.61	Met
Low-carbon policy	(8)	Low-carbon economic development program	In place	None	None	Unmet
	(9)	Completeness of carbon emission monitoring, statistical and regulatory system	Complete	Incomplete	Incomplete	Unmet
	(10)	Public awareness of low-carbon economy	Over 80%	Unknown	Unknown	Unknown
	(11)	Compliance with energy-saving building design standard	Over 80%	Below 50%	100%	Met
	(12)	Incentives for development of non-commodity energy	In place and implemented	In place	In place	Met

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3 LCE Scenarios Methodology

Scenarios analysis is an important method for low carbon development in the future.

NEIL STRACHAN etc. (2008) draws out the main policy implication from the findings of the low carbon society scenarios investigated by nine international modeling teams under the Japan-UK research project 'low carbon society scenarios towards 2050'. Each modeling team was asked to run a BASE CASE, a CARBON PRICE CASE, and one or more CARBON PLUS CASES to investigate a LCS scenarios with a 50% reduction in global CO2 emissions by 2050.

Base case	Existing model base cases were used, linked to IPCC scenarios or country-level forecasts.
Carbon price	\$10/TCO2 in 2013 rising exponentially to \$100/TCO2 in 2050.
Carbon-plus	As carbon price plus additional measures to achieve long-term LCS.

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Key characteristics and results of LCS models

NO.	Modeling paper	Model	Global/ National	Top-down/ Bottom- up	Carbon-plus $TCO2 and %change in GDP（2050）	Key characteristic of model and / or analysis of carbon-plus run
1	Barker (UK)	E3MG	G	TD	$100/tCO2 (2030) (+1.1%)	Technological change, emissions revenues
2	Akimoto (Japan)	DNE21	G	BU	Averaged cost of $45.2~49.6/tCO2	International sectoral approach
3	Remme (Germany)	TIMES	G	BU	$330/tCO2 (-1.3%)	Technological change
4	Edmonds (USA)	MiniCam	G	BU	$136/tCO2	technological change, integrated assessment
5	Bataile (Canada)	CIMS	N	Hybrid simulation	$175~200/tCO2	Price vs. non-price measures, emissions trading
6	Fujino (Japan)	Linked models	N	Hybrid	-0.83%~-0.90% (A) -0.96%~-1.06% (B)	Feasibility of long-term stringent CO2 reductions
7	Strachan (UK)	MARKAL－Macro	N	Hybrid	$402~490/tCO2 (-1.64%~-2.21%)	International drivers on UK
8	Shrestha (Thiland)	AIM	N	BU	$100/tCO2	Technological change
9	Shukla (India)	AIM and MARKAL	N	Soft-linked TD/BU	0%~1.35%	Sustainable development

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NEIL STRACHAN etc. (2008)

3 LCE Scenarios Methodology

For low carbon economy development in China, ERI (Energy Research Institute) use three models in IPAC—IPAC-CGE model, IPAC-Emission global model and IPAC-AIM model. Four emission scenarios were designed by ERI.(1) BAU,(2) Low carbon scenario under the high GDP growth rate assumption (LC), (3) Enhanced low carbon scenario under the high GDP growth rate assumption (ELC), (4) Low carbon scenario in low growth rate assumption (LLC).

CO2 emission from the fossil fuel combustion, million tons of carbon

	BAU	LC	ELC	LLC
2010	2134	1943	1943	1869
2020	2779	2262	2194	2086
2030	3179	2345	2228	2033
2040	3525	2398	2014	1902
2050	3465	2406	1395	1387

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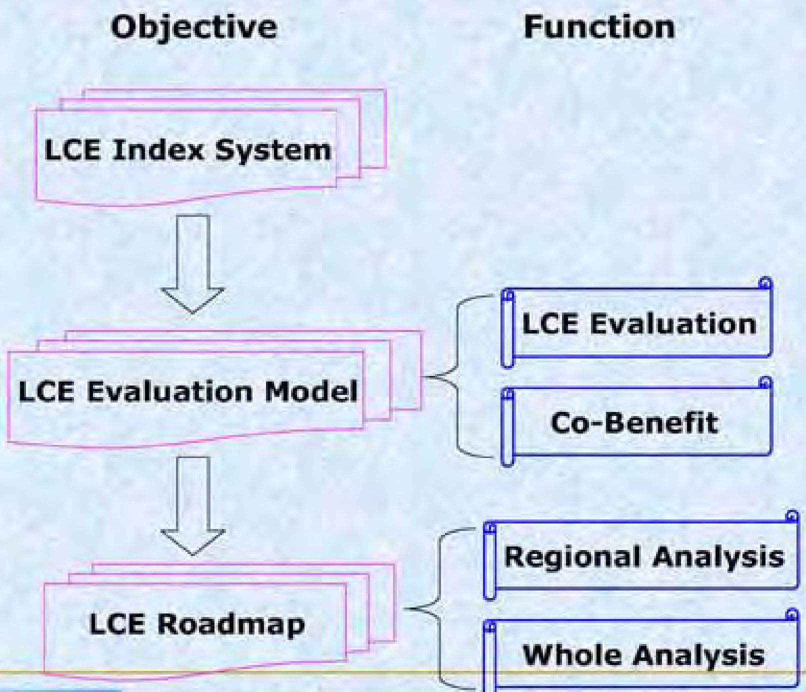
4 LCE Scenarios in our project



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4 LCE Scenarios in our project

In our project, we use similar methodology as done previously, but co-benefit analysis between low carbon development and environmental protect is key. Taking the following steps to analyze China's LCE scenarios in 2050.

- Describe qualitatively the scenario development framework of China's social and economic development, energy development, technology development, consumption style and emission demand in the future.
- Give out data for main development indicators to the scenarios development framework.
- Construct the model, and do quantitative analysis to the scenarios development framework.
- Obtain emission scenarios data including CO2 and key pollutants.
- Scenarios analysis and suggestions.

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thank you

fujf@craes.org.cn

3-3 Introduction of climate policy assessment and 2050 Japan and Asia low carbon society studies

- Dr. Tatsuya HANAOKA, Climate Policy Assessment Research Section, NIES, Japan

Introduction of Climate Policy Assessment and 2050 Japan & Asia Low-Carbon Society Studies

Tatsuya Hanaoka
AIM (Asia-Pacific Integrated Model) Team
Climate Policy Assessment Research Section
National Institute for Environmental Studies, Japan

The Sixth Tripartite President Meeting among NIER, CRAES and NIES
Seoul, Korea
November 25-28, 2009

Climate Change Research Program Core Research Project 4

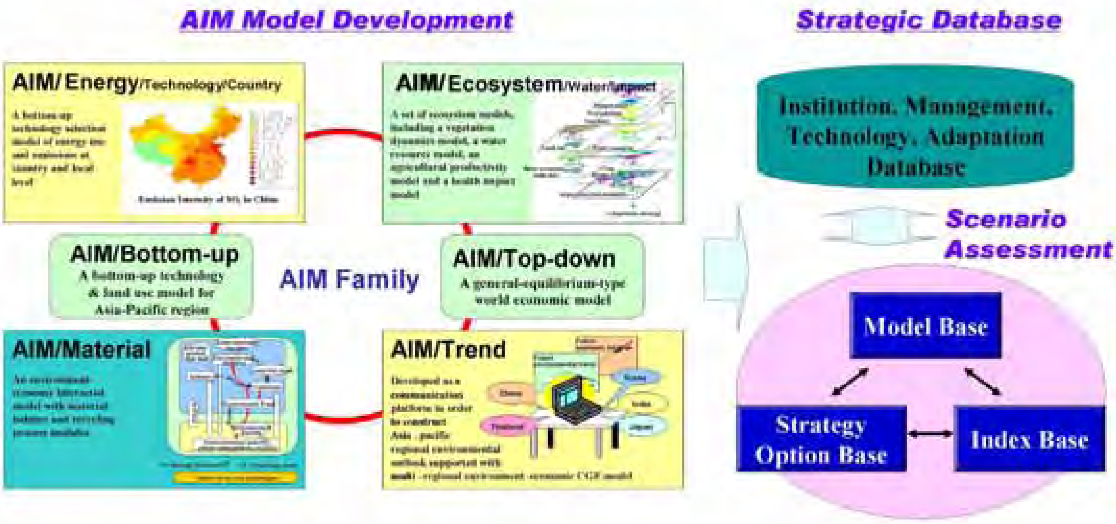
Developing a Vision of a Low-Carbon Society and Identifying Countermeasures through Integrated Assessment

Research targets
Spatial (Japan, Asia, Global)
Temporal (short- to long-term)
Social (technology, economy, institute)

Research fields
① Vision & scenario to achieve a low-carbon society by 2050
② International policy for climate change
③ Quantitative evaluation of mitigation policies and measures

AIM model family

AIM = Asia-Pacific Integrated Model



New Japan's Mid-term Target

Japan's mid-term target was announced by New Prime Minister Hatoyama on September 22nd, 2009. The target is

New Prime Minister Hatoyama

25 percent reduction from the 1990 level by 2020

	New Mid-term target	Old Mid-term target	Kyoto target
Target Year	2020	2020	2008 - 2012
Base Year	1990	2005(1990)	1990
Domestic reduction	Totally 25%	15(8)%	0.6%
Carbon sinks		-	3.8%
Credits		-	1.6%

*Japan's Kyoto target (6% reduction) includes carbon sinks and credits through the Kyoto mechanisms.

Process and contribution of NIES to Japan's Mid-term Target

AIM models in NIES		
AIM/Enduse [Global] Global bottom-up model	GHG mitigation potentials comparisons across Annex I countries	RITE
⇩		
AIM/Enduse [Japan] Japan bottom-up model	Analysis of detailed mitigation options with policies in Japan	IEEJ
⇩		
AIM/CGE [Japan] Japan CGE model	Analysis of economic impact	JCER, KU

AIM models in NIES

Note) Following several slides are example results estimated by AIM models in the process of the former Japan's mid-term target. Now, we have been analyzing the new Japan's mid-term target.

Overview of AIM/Enduse[Global]

Mitigation potentials in this study are defined as follows:

Reduction amounts which are estimated by comparing the effect of introduction of new mitigation technologies in the target year, target region and target sector as compared to the effect of standard technologies fixed at the same level as in the base year

- **Target Regions : 23 geographical world regions**
- **Time Horizon : 2000 – 2020**
- **Target Gas : CO_2, CH_4, N_2O, HFCs, PFCs, SF_6**
- **Target Sectors : multiple sectors**
  (Power generation / Industry / Residential and Commercial / Fugitive/ Transport / Agriculture / Waste / F-gas emissions sector)

Technology database | **Energy Database**

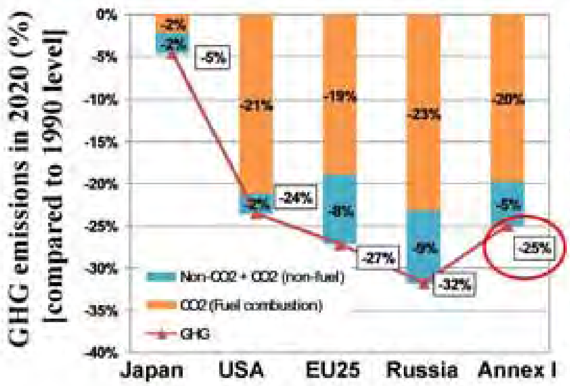
⇩

Mitigation potentials in 2020 are estimated by using MAC tool with detailed mitigation options database

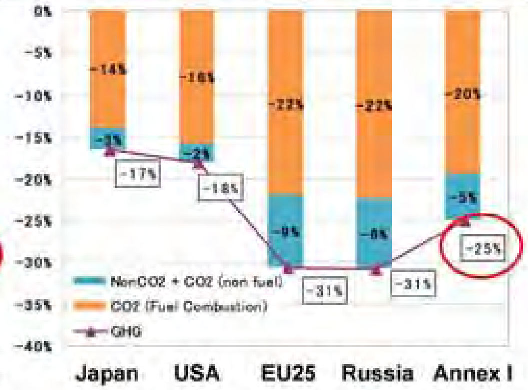
Example of equitable emission allocation to achieve 25% reductions in Annex I

Imposing equal marginal abatement cost (left figure) and equal total abatement costs per GDP (right figure) across Annex I countries to achieve a 25 % reduction target in Annex I countries.

Equal marginal abatement cost
MAC: 166 US$/tCO2 eq



Equal total abatement cost per GDP
Abatement cost per GDP: 1.01%



➢ It is important to compare reduction targets by using different indices.

Criteria for Equitable Emission Allocation

A variety of criteria has been proposed by countries and experts.

- Responsibility of emitting GHG
  - Historical responsibility for temperature rise
  - Emission per capita
  - National emission at absolute level
- Capacity (to pay)
  - GDP or GDP per capita
  - Combination with HDI (human development indicator)and GDP
- Capability (emission reduction potential)
  - Emission per unit of production
  - Emission per GDP
  - Marginal cost of reduction
- Hybrid criteria
  - Triptych
  - Multi-stage Approach
  - Multi-sector Convergence

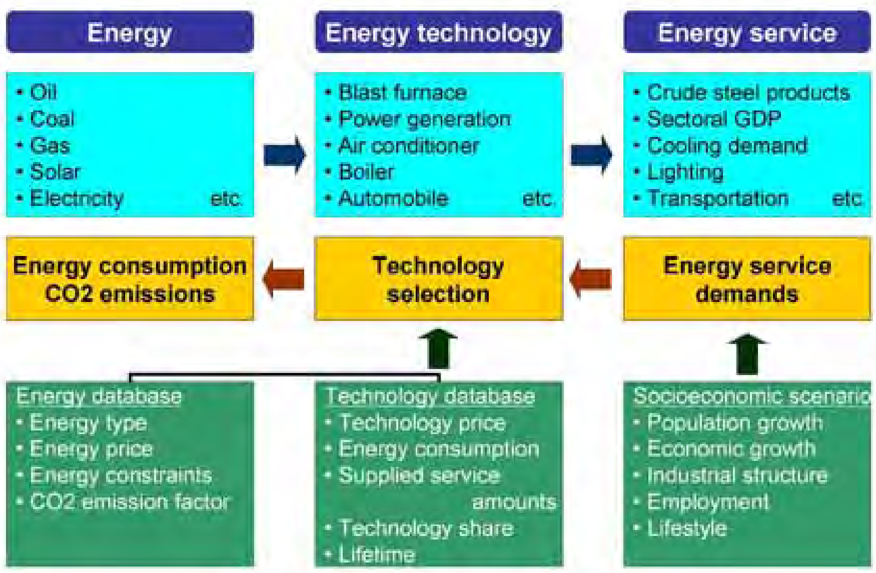
EC Communication 28 Jan 2009 used four criteria to set emission targets for Annex I countries.
- GDP per capita
-Emission per unit of production
-Emission trend between 1990-2005
- Population trend between 1990-2005

Emission reduction target according to a variety of differentiation criteria (target year 2020/ base year 1990)

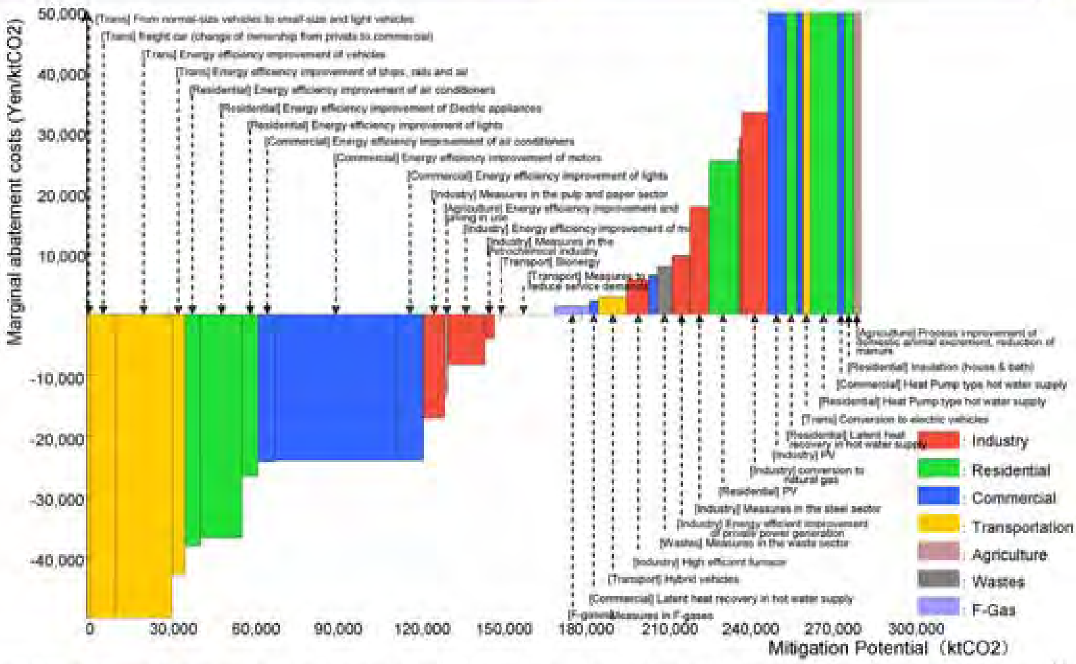
Emission reduction target (from 1990)		Japan	US	EU25	Russia	Annex I	Reference			
							China	India	Non - Annex I	World
Figures from: Höhne, N., D. Phylipsen, Moltmann, S., 2007. Factors underpinning future action 2007 update, For the Department for Environment, Food and Rural Affairs (DEFRA), UK, (450ppmCO2eqstabilization)	Muti-Stage Approach[1]	-31%	-38%	-36%	-52%	-41%	62%	235%	89%	9%
	Contraction and Convergence[2]	-31%	-18%	-34%	-48%	-32%	62%	168%	76%	10%
	Contraction but Differentiated Convergence[3]	-33%	-9%	-35%	-47%	-29%	48%	180%	72%	10%
	Triptych Approach[4]	-29%	-8%	-31%	-45%	-26%	65%	103%	69%	10%
Calculation by AIM World Technology Model	Equal emission reduction cost[5]	-5%	-24%	-27%	-32%	-25%	-	-	-	-
	Equal emission reduction cost per GDP[6]	-17%	-18%	-31%	-31%	-25%	-	-	-	-
Calculation by NIES, Kyoto University, and Tokyo Institute of Technology	Convergence of emission per GDP[7]	- 3%	-10%	-26%	-52%	-25%	114%	65%	74%	14%
	Contraction and Convergence[8]	-16%	-13%	-26%	-46%	-25%	72%	98%	74%	14%
	Equal percentage improvement rage of emission per GDP[9]	-30%	-19%	-33%	-21%	-25%	160%	81%	74%	14%

1) Four groups of countries according to level of economic development, which are committed to differenty ypes of commitments.
2) Equal emission per capita by 2050.
3) Similar with C&C, with additional emission allowances to Non-Annex I countries.
4) Sets emission targets to power, industry, transportation and residential sectors individually.
5) Senario 2 of AIM calculation. Assumes 25% reduction from 1990 by Annex I as a whole.
6) Senario 4 of AIM calculation. Assumes 25% reduction from 1990 by Annex I as a whole.
7) Equal emission per GDP by 2050. Assumes halving global emission from 1990 by 2050.
8) The rule is the same as 3), but assumes halving global emission from 1990 by 2050.
9) Equal rate of improvement in all countries in terms of emission per GDP. Assumes halving global emission from 1990 by 2050.

Structure of AIM/Enduse[Japan]



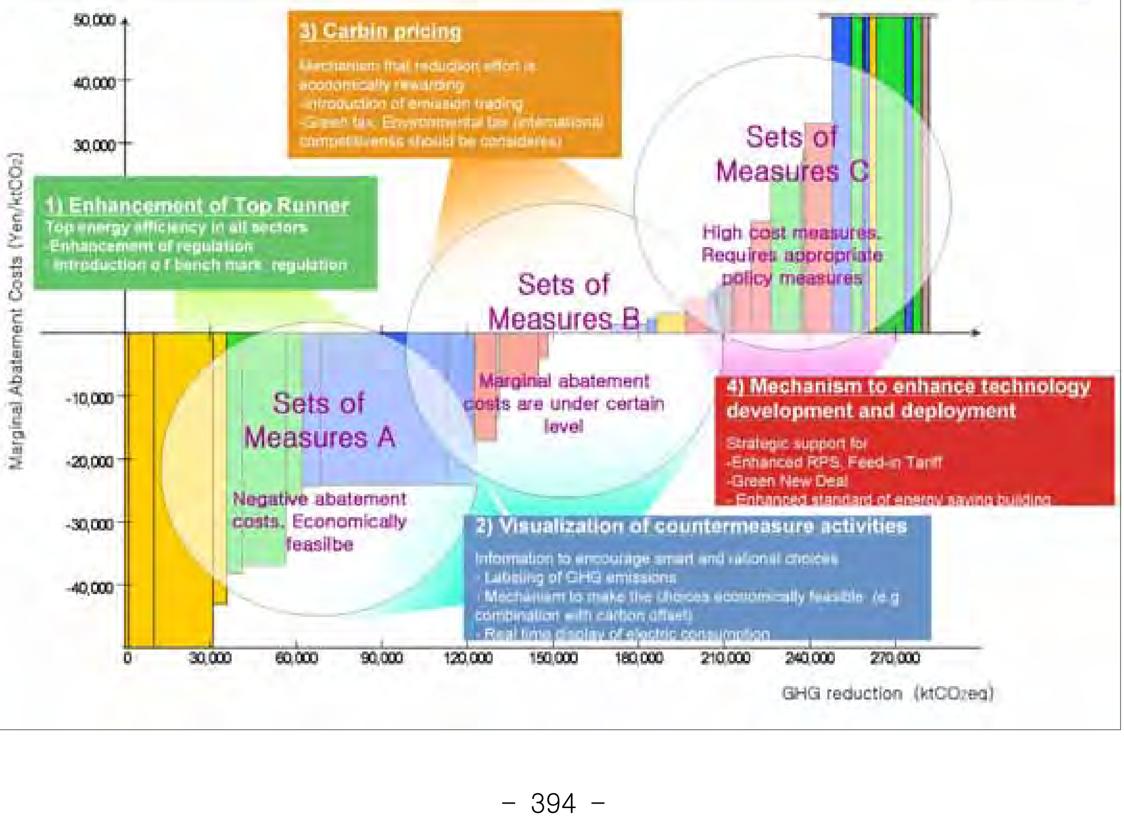
Abatement Cost to Reduce GHG emissions in 2020



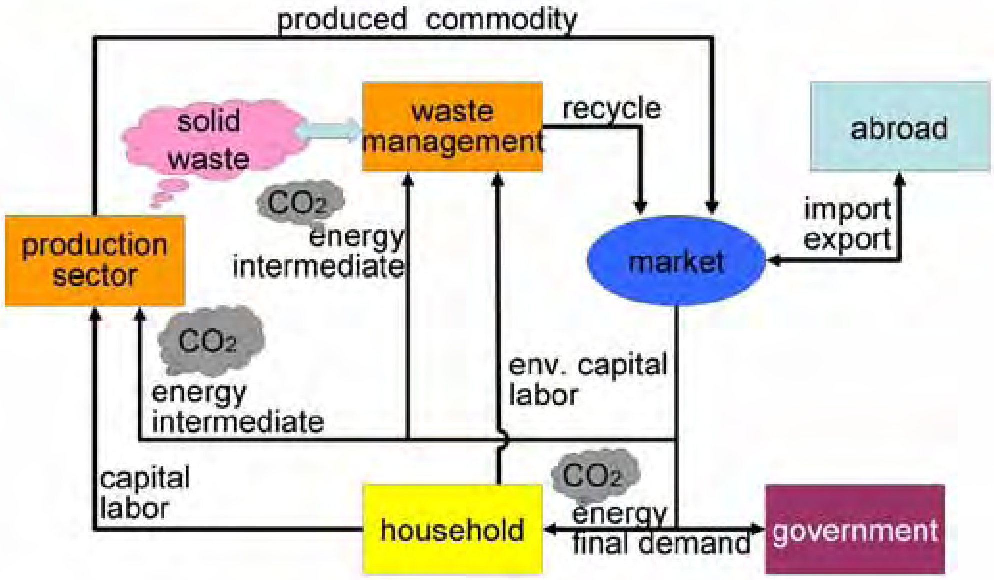
Note: MCII, Payback time is 3 years except 10 years in Insulation and PV. Mitigation potential is compared to the emissions in Frozen Case

11

Four sets of countermeasures to achieve target



Structure of AIM/CGE

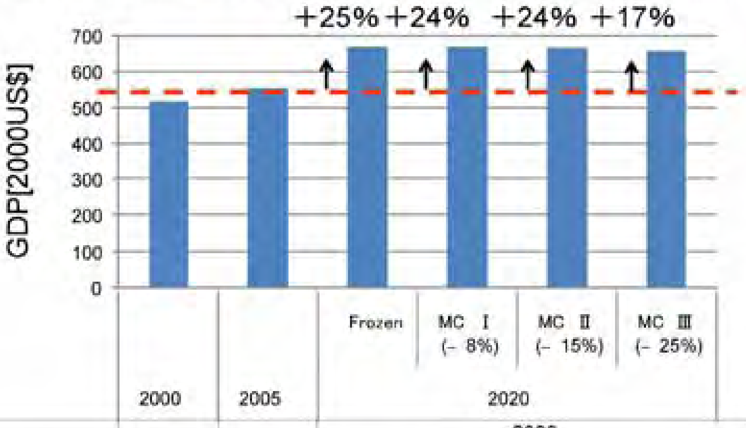


13

Impact on GDP (Japan)

Estimates of economic impacts by AIM/CGE[Japan]

- Little impact in MCI
- There is economic impact in MCIII compared to the Frozen case, keeping economic growth rates of 1%/year.



Item	2000	2005	2020 Frozen	2020 MCI (-8%)	2020 MCII (-15%)	2020 MCIII (-25%)
Real GDP（2000 trillion Japanese yen)	521.9	559.7	697.2	693.9	691.7	655.4
Annual average growth rate between 05-20 (%/year)			1.5	1.4	1.4	1.1
Changes to the fixed year at 2020 (%)				-0.5	-0.8	-6.0

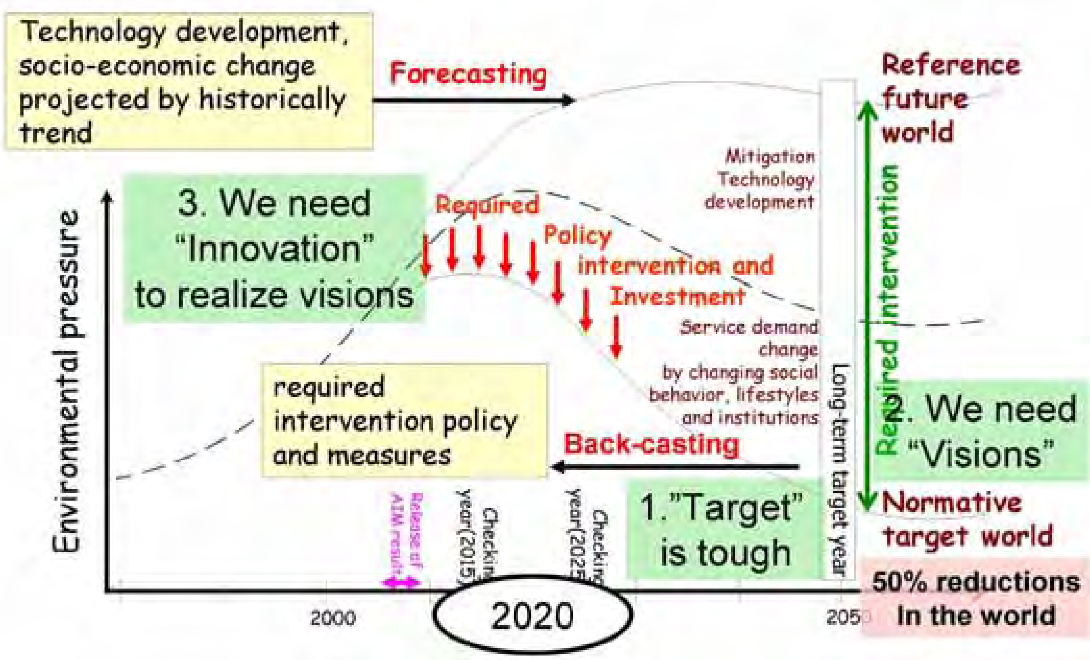
Scenario and Modelling Approaches for 2050 Low Carbon Society Studies in Japan and Asia

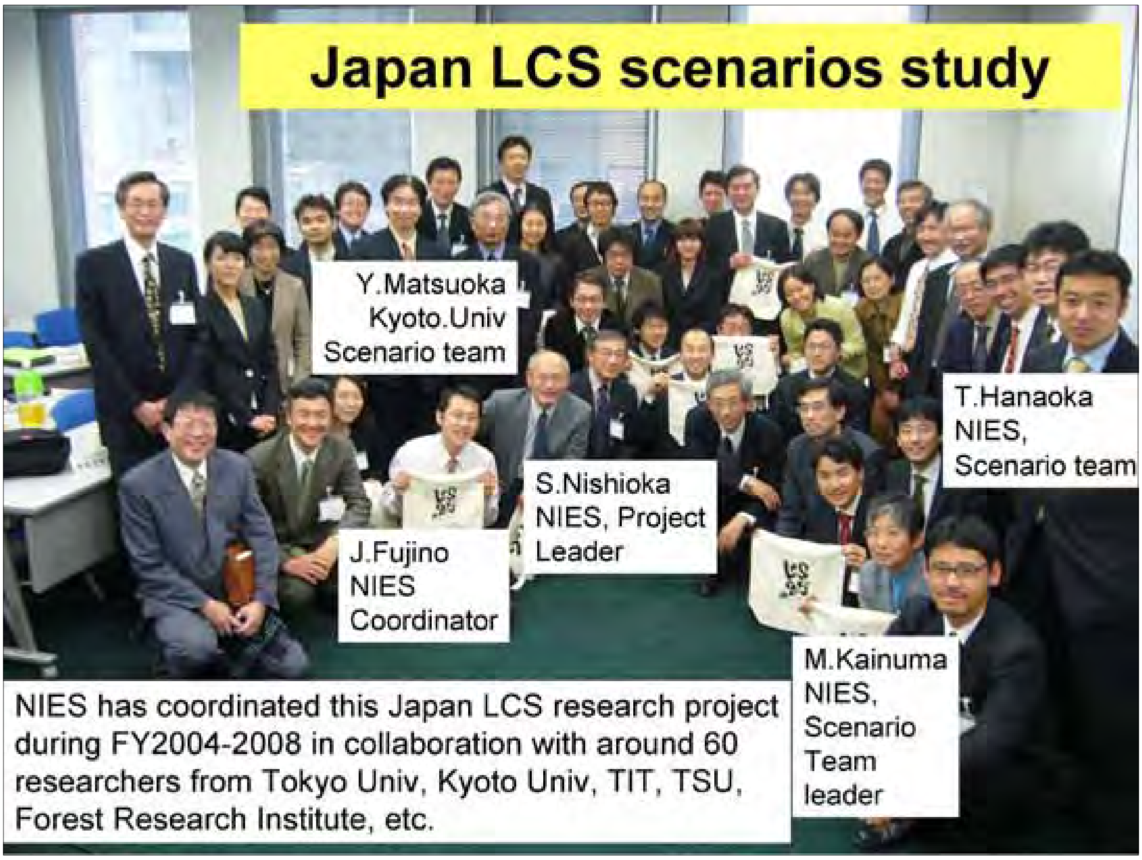
AIM Team

National Institute for Environmental Studies,
Kyoto University,
Mizuho Information & Research Institute

Japan Low Carbon Society Scenarios toward 2050

[FY2004-2008, Global Environmental Research Program, MOEJ]





Steps towards Japan LCS Scenarios

- Depicting socio-economic visions in 2050

Step 2
- Estimating energy service demands

Step 3
- Exploring innovations for energy demands and energy supplies

Step 4
- Quantifying energy demand and supply to estimate CO_2 emissions

Outcome 1) Feasibility study for 70% CO_2 emission reduction by 2050 below 1990 level

Investigating "When and Which options and How much" of each options should be introduced in order to achieve the goal"

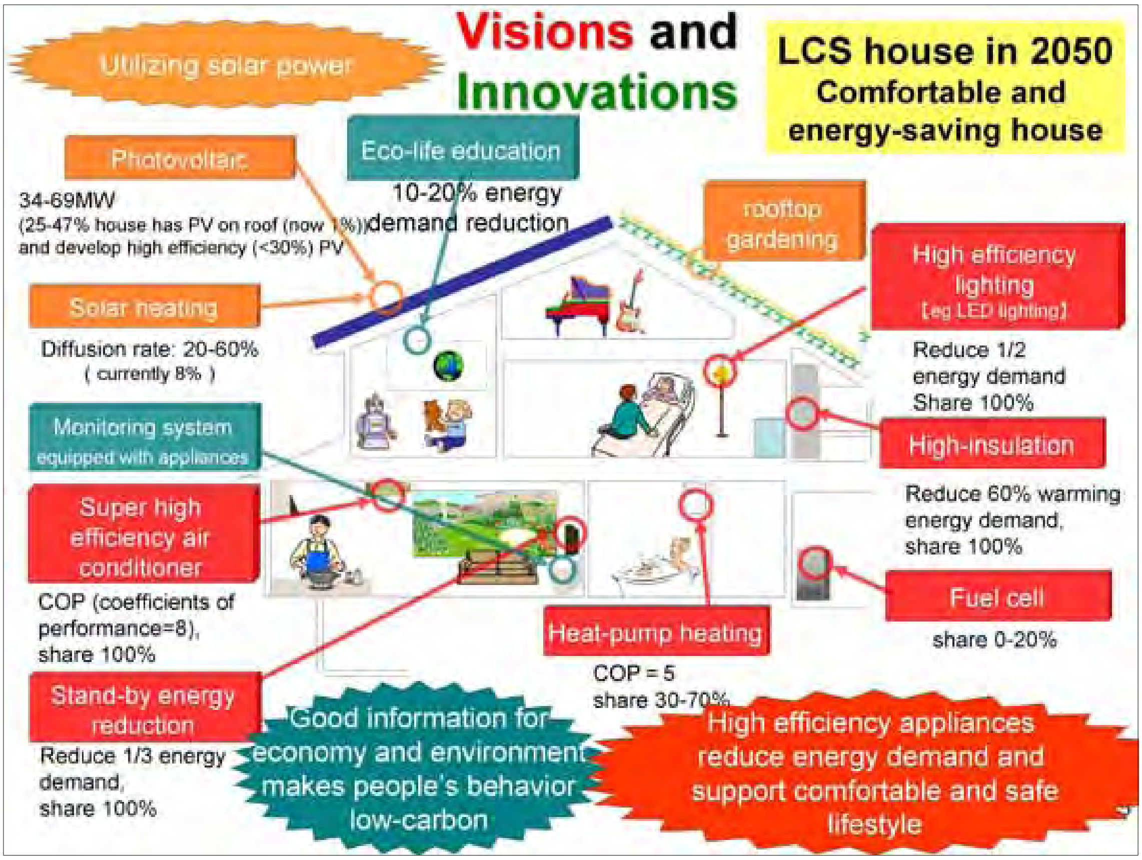
Outcome 2) Roadmap and Dozen Actions toward LCS

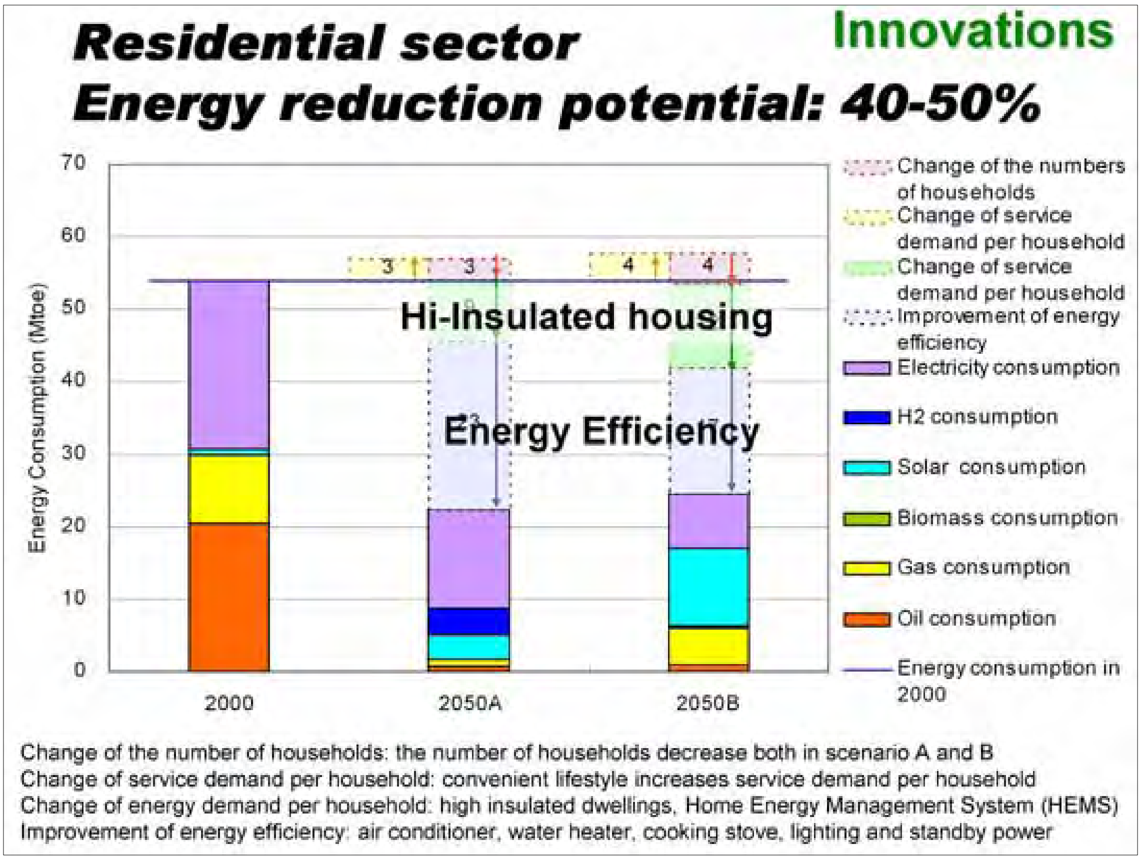
Visions

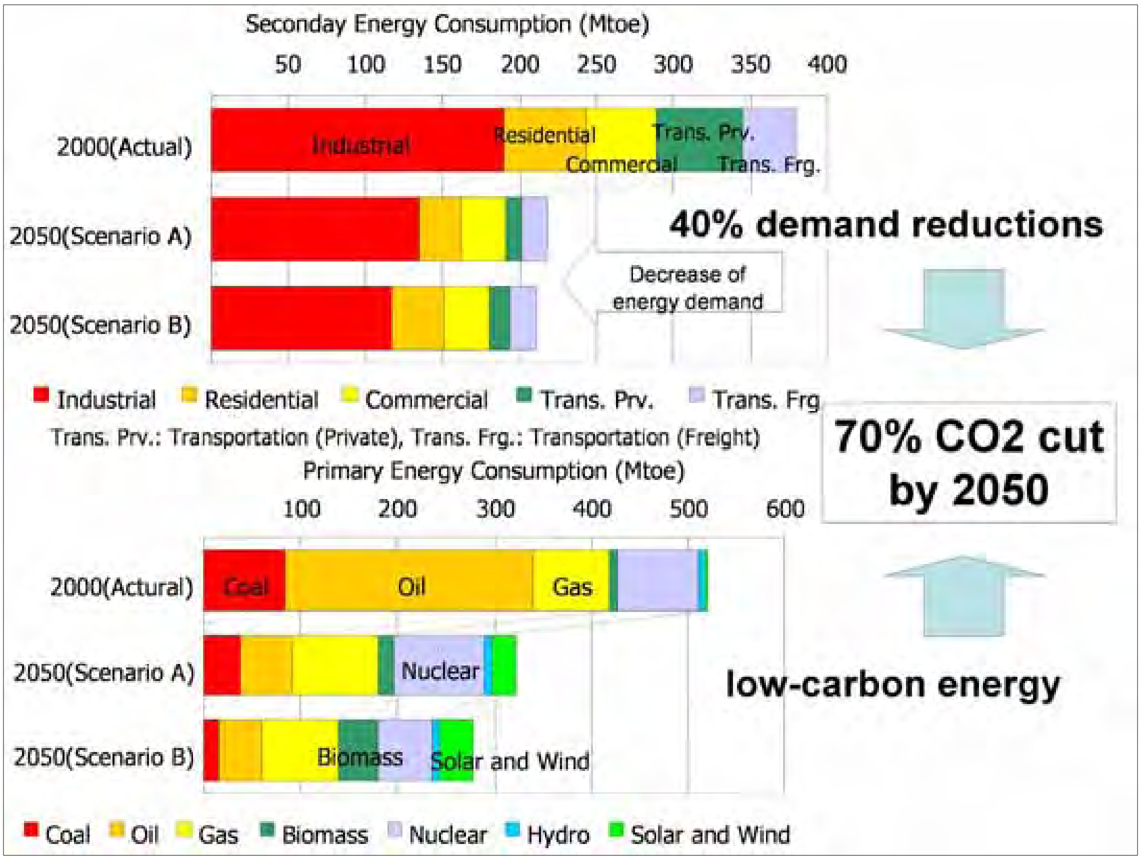
we prepared two different but likely future societies for Japan

Vision A	Vision B
Vivid, Technology-driven	Slow, Natural-oriented
Urban/Personal	Decentralized/Community
Technology breakthrough Centralized production /recycle	Self-sufficient Produce locally, consume locally
Comfortable and Convenient	Social and Cultural Values
2%/yr GDP per capita growth	1%/yr GDP per capita growth
	

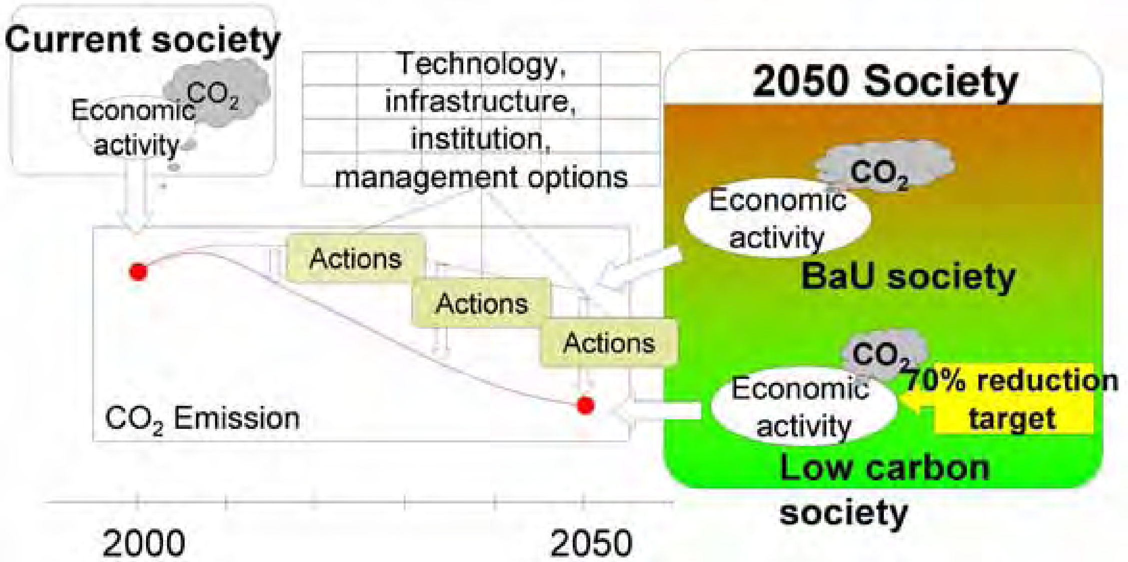
19




Innovations
Residential sector
Energy reduction potential: 40-50%
Energy Consumption (Mtoe)
70
60
50
40
30
20
10
0
2000
2050A
2050B
3
3
4
4
Hi-Insulated housing
Energy Efficiency
Change of the numbers of households
Change of service demand per household
Change of service demand per household
Improvement of energy efficiency
Electricity consumption
H2 consumption
Solar consumption
Biomass consumption
Gas consumption
Oil consumption
Energy consumption in 2000
Change of the number of households: the number of households decrease both in scenario A and B
Change of service demand per household: convenient lifestyle increases service demand per household
Change of energy demand per household: high insulated dwellings, Home Energy Management System (HEMS)
Improvement of energy efficiency: air conditioner, water heater, cooking stove, lighting and standby power


Seconday Energy Consumption (Mtoe)
50 100 150 200 250 300 350 400
2000(Actual)
2050(Scenario A)
2050(Scenario B)
Industrial
Residential
Commercial
Trans. Prv.
Trans. Frg.
40% demand reductions
Decrease of energy demand
Industrial Residential Commercial Trans. Prv. Trans. Frg
Trans. Prv.: Transportation (Private), Trans. Frg.: Transportation (Freight)
70% CO2 cut by 2050
Primary Energy Consumption (Mtoe)
100 200 300 400 500 600
2000(Actural)
2050(Scenario A)
2050(Scenario B)
Coal
Oil
Gas
Nuclear
Biomass
Solar and Wind
low-carbon energy
Coal Oil Gas Biomass Nuclear Hydro Solar and Wind

To achieve 70% CO_2 reduction by 2050, we need "Actions"!



A Dozen Actions towards Low-Carbon Societies

Press release on May 22, 2008

Residential/commercial sector actions

1. Comfortable and Green Built Environment
Efficiently use of sunlight and energy efficient built environment design. Intelligent buildings.

2. Anytime, Anywhere Appropriate Appliances
Use of Top-runner and Appropriate appliances. Initial cost reduction by rent and release system resulting in improved availability.

Industrial sector actions

3. Promoting Seasonal Local Food
Supply of seasonal and safe low-carbon local foods for local cuisine

4. Sustainable Building Materials Using local and renewable buildings materials and products.

5. Environmentally Enlightened Business and Industry Businesses aiming at creating and operating in low carbon market. Supplying low carbon and high value-added goods and services through energy efficient production systems.

Transportation sector actions

6. Swift and Smooth Logistics
Networking seamless logistics systems with supply chain management, using both transportation and ICT infrastructure

7. Pedestrian Friendly City Design
City design requiring short trips and pedestrian (and bicycle) friendly transport, augmented by efficient public transport

Energy supply sector actions

8. Low-Carbon Electricity Supplying low carbon electricity by large-scale renewables, nuclear power and CCS-equipped fossil (and biomass) fired plants

9. Local Renewable Resources for Local Demand
Enhancing local renewables use, such as solar, wind, biomass and others.

10. Next Generation Fuels Development of carbon free hydrogen- and/or biomass-based energy supply system with required infrastructure

Cross-sector actions

11. Labeling to Encourage Smart and Rational Choices Visualizing of energy use and CO2 costs information for smart choices of low carbon goods and service by consumers, and public acknowledgement of such consumers

12. Low-Carbon Society Leadership Human resource development for building "Low-Carbon Society" and recognizing extraordinary contributions.

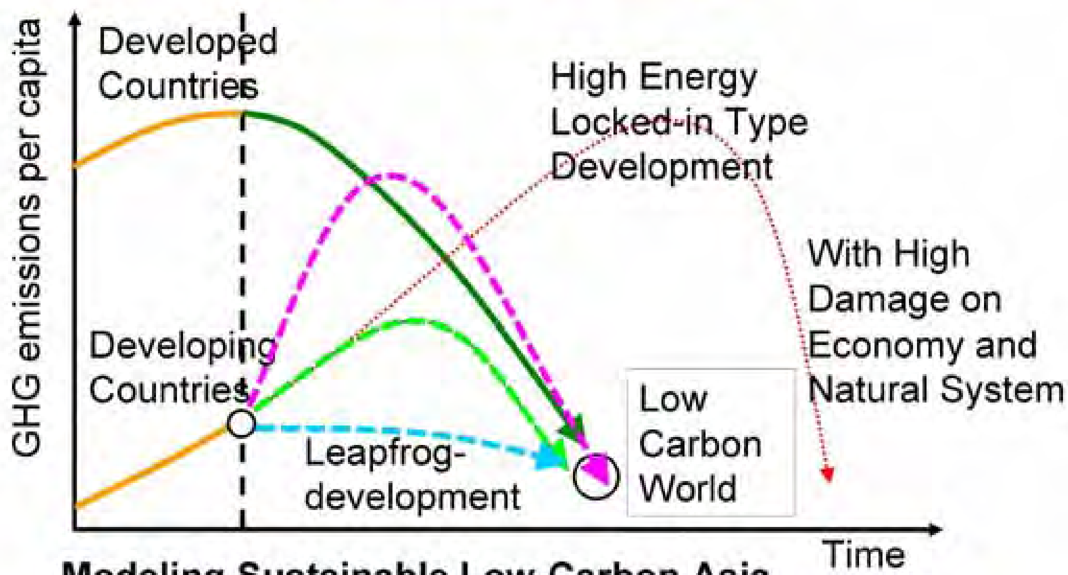
Japan LCS research project and Japanese CC policy

1. Feb 13th 2007 Interim Report "Japan Scenarios torwards Low-Carbon Society (LCS) -Feasibility study for 70% CO2 emission reduction by 2050 below 1990 level-"
- May 24th 2007 Former Prime Minister Abe launched "Cool Earth 50" to reduce 50% GHG emissions by 2050
- June 9th 2008 Former Prime Minister Fukuda set the target of Japanese CO2 emissions reduction by 60-80% in 2050

2. May 22nd 2008 Interim Report "Dozen Actions towards LCSs"
- July 29th 2008 Japanese government set "Action Plan for Achieving a Low-carbon Society"

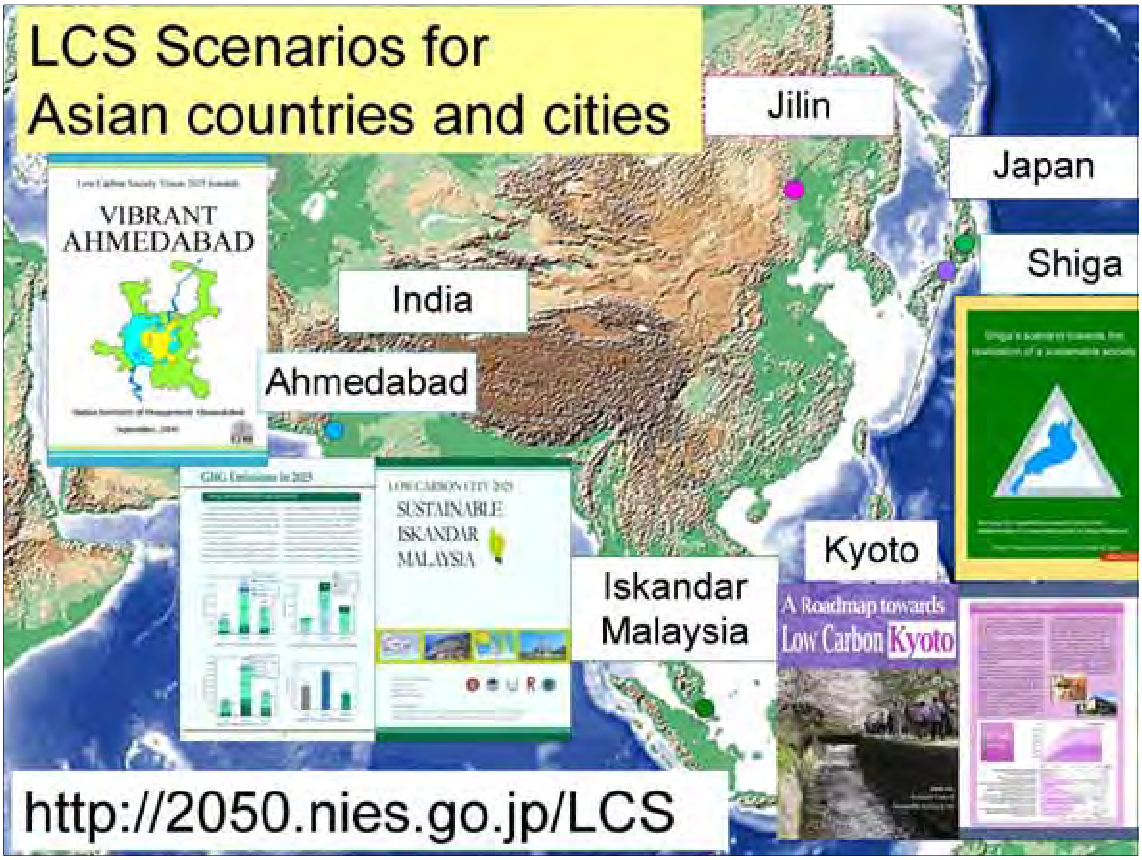
3. March 2008 Japan-UK joint LCS research project released "Call for Action" to G20 in Chiba and G8 EMM in Kobe
- May 24th 2008 G8EMM strongly supports to launch International LCS Research Network (LCS-RNet)

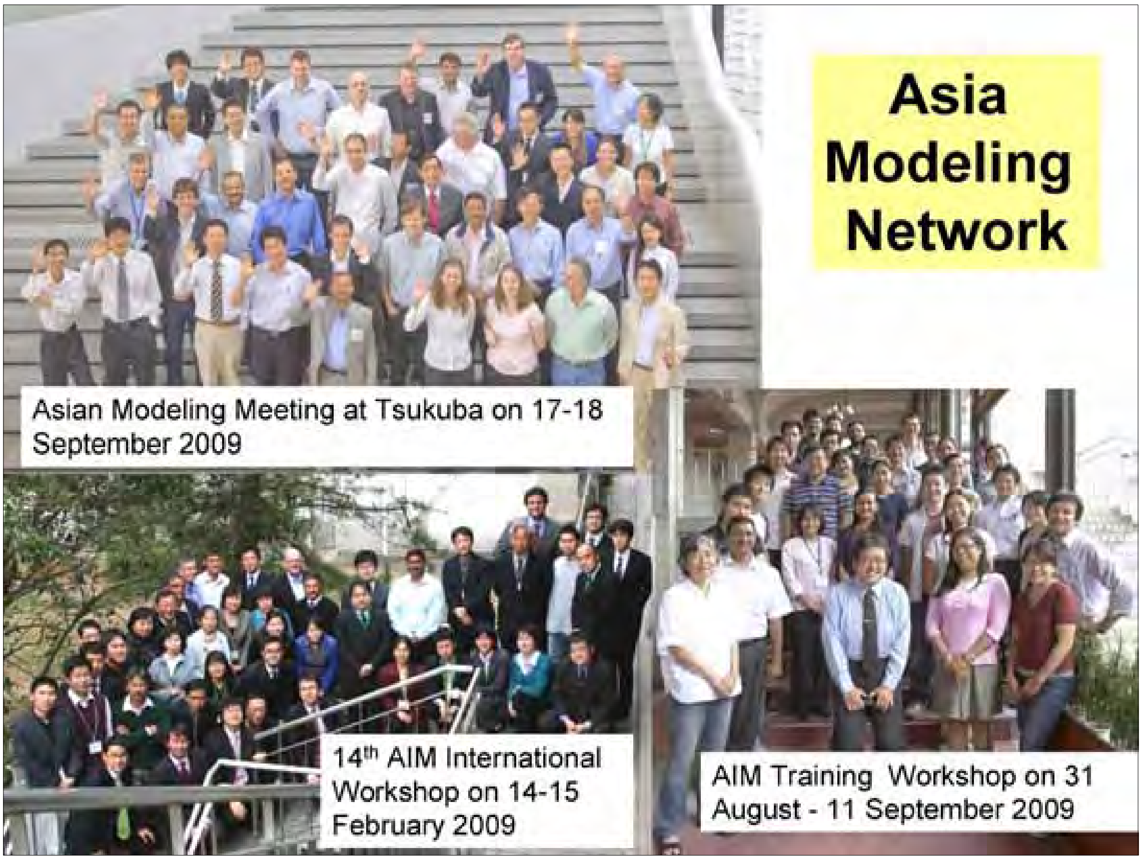
2. Asian LCS scenarios study



Modeling Sustainable Low-Carbon Asia

We have just started new research project "Asian Low-Carbon Society Scenario Development Study" (project leader: Mikiko Kainuma) during FY2009-2013, funded by Global Environmental Research Program, MOEJ


LCS Scenarios for
Asian countries and cities
Jilin
Japan
Shiga
India
Ahmedabad
VIBRANT
AHMEDABAD
SUSTAINABLE
ISKANDAR
MALAYSIA
Kyoto
Iskandar
Malaysia
A Roadmap towards
Low Carbon Kyoto
http://2050.nies.go.jp/LCS


Asia
Modeling
Network
Asian Modeling Meeting at Tsukuba on 17-18
September 2009
14th AIM International
Workshop on 14-15
February 2009
AIM Training Workshop on 31
August - 11 September 2009


Timing is important!
Thank you for your attention!

International Workshop on Realization of Low Carbon Society through Climate Change Adaption
Closing Remarks

President. Wei MENG
Chinese Research Academy of Environmental Sciences

Distinguished NIER president Prof. YOON Seung-Joon, NIES president Prof. OHGAKI Shinichiro, Ladies and Gentlemen:

After two days' intensive discussion, the Parallel Workshop of TPM6 is now coming to a conclusion. I'd like to express my sincere thanks to researchers who made splendid presentations, and also to those staff who made great efforts in the preparation of this meeting!

At TPM6, representatives from NIER, CRAES, and NIES presented their latest research and development, reviewed TPM activities and discussed future cooperation potentials. We see substantial research development achieved in each institute under our efforts. We are even glad to see that the cooperationand communication in field of environmental management and environmental scientific research among our three countries have been pushed forward with the strengthening and deepening of TPM. CRAES will continue to push this cooperative mechanism forward steadily as always.

In Parallel Workshop of TPM6, further communications and discussions concerning climate change, low carbon economy and society as well as industrial pollution control and green technologies were conducted. We not only shared among our three institutes' research achievements on adaptation to climate change and development of low carbon society, but also fostered mutual understanding in these fields,thus laid a solid foundation for further discussions on joint research projects. I believe that this would promote further more research for us.

It is found from workshop that besides the common interest in fields of air pollution control, solid waste management, etc., there appeared new research space and cooperation potential in fields of adapting to climate change and developing low carbon society. As the international efforts towards adaptation to climate change go on further, low carbon society is getting more and more attentions throughout the world, becoming inevitable choice for human society's development under the background of climate change. As one of the largest developing countries, China is eager to explore and research on a better and rapid way for social economic development according to the capacity and restriction of its resources and environment. It is an urgent task for Chinese government to choose the most appropriate path for the development of low carbon society, which should be suitable for China's specific situation. Nowadays, it is also a key research subject for researchers. It is noticed from the presentations that relevant research carried out by NIER and NIES would be quite helpful of us to learn and carry out relevant research and management. We hope that we can promote cooperative research in this field through the platform of TPM.

This meeting has achieved its expected results in terms of discussion achievements on relevant topics and the extent of academic communications.

Thanks again for the organizer of TPM6 and the Parallel Workshop, for your considerate and meticulous arrangement! Hope our three countries make more achievements in the cooperation and communications of environmental scientific research.

On this occasion, I would like to extend my sincere invitation to Presidents of NIER and NIES, as well as your colleagues, for attending TPM7 and the parallel workshop in China next autumn. CRAES would make the best to prepare and hold a fruitful and pleasant meeting.

Thank you! And wish you good health!

International Workshop on Realization of Low Carbon Society through Climate Change Adaption
Closing Remarks

President. Shinichiro OHGAKI
National Institute for Environmental Studies

Ladies and gentlemen, now we have come to the close of the parallel workshop of TPM6. Firstly I would like to express my appreciation to all the speakers for your very useful and interesting presentations.

I think this parallel workshop on the Realization of Low Carbon Society through Climate Change Adaption was a very successful side activity of TMP6. We were able to familiarize ourselves with a great deal of information relating to output from modeling research, monitoring observation, technology and policy research from the relevant experts in our three institutes.

Generally speaking, this scientific evidence makes an essential contribution to policy making. However, separated and segmented evidence alone can only contribute on a relatively small scale to policies for achieving an actual low carbon society and low carbon world. This means that scientific researchers must integrate their scientific evidence in order to strengthen the dialogue between science and policy making.

This TPM is an extremely valuable and effective platform for this integration by allowing us a good opportunity to exchange information, thereby fostering international research collaboration.

Finally, I would like to express my sincere thanks onceagain to all the members of NIER and President YOON Seung-Joon for your excellent preparation and organization of the TPM6 during the past 3 days. I look forward to the continued strengthening of our friendship and collaboration at the next TPM hosted by CRAES.

List of Participants

1. Delegation of China

Name	Position	Email (@craes.org.cn)	Tel(office)
Wei MENG	President	mengwei	86-10-84913883
Yun ZHOU	Director, International Cooperation Center	zhouyun	86-10-84915198
Yunjiang YU	Director, Science and Technology Division	yuyj	86-10-84915278
Fan MENG	Acting Director , Institute of Atmospheric Environment	mengfan	86-10-84918049
Chunlian XU	Assistant Director, Environmental Engineering Design Center	xucl	86-10-84935398-821
Shihai LU	Professor, Institute of Ecology	lv_sh	86-10-84914588
Yanping LI	Engineer, Center of Cleaner Production and Circular Economy	leeyp	86-10-84920936
Jiafeng FU	Assistant Professor, Climate Change Center	fujf	86-10-84915152

2. Delegation of Japan

Name	Position	Email (@nies.go.jp)	Tel(office)
Shinichiro OHGAKI	President	ohgaki	81-29-850-2300
Yoshifumi ASUOKA	Executive Director(Researcher)	yyasuoka	81-29-850-2301
Makoto SAITO	Director, Planning Division	m-saito	81-29-850-2302
Hideyuki SHIMIZU	Special Senior Researcher, Asian Environment Research Group	hshimizu	81-29-850-2451
Masaharu URAKAMI	Chief, Public Relations and International Coordination, Planning Division	mmurakami	81-29-850-2304
Joanne HANDA	English Editor, Public Relations and International Coordination, Planning Division	handa.joanne	81-29-850-2827
Motoyuki IZUOCHI	Senior Researcher, Asian Environment Research Group	mizuochi	81-29-850-2496
Tatsuya HANAOKA	Senior Researcher, Climate Policy Assessment Research Section, Center for Global Environmental Research	hanaoka	81-29-850-2710
Tomoo OGURA	Senior Researcher, Climate Risk Assessment Research Section, Center for Global Environmental Research	ogura	81-29-850-2306

3. Delegation of Republic of Korea

Name	Position	Email (@korea.kr)	Tel(office)
Seung-Joon YOON	President	yoonsj	82-10-9959-1206
Ho-Seok SONG	Director, Research Planning Division	hssong	82-10-7923-0326
Hyun-Mi KIM	Senior Researcher, Research Planning Division	hmikim	82-10-2644-8683
Gil-Jong OH	Director, Resource Recirculation Research Center	gjoh0519	82-10-4331-8972
You-Deug HONG	Director, Climate Change Research Division	ydhong	82-10-9897-1165
Kyung-Hee CHOI	Director, Risk Assessment Division	nierchoi	82-10-4111-6850
* Yeon-Soon AHN	Councilor, The Embassy of the Republic of Korea in China	ays117	86-10-8351-0860
Dong-Jin LEE	Senior Researcher, Resource Recirculation Research Center	dongj7	82-11-738-9020
Lim-Seok CHANG	Senior Researcher, Air Quality Research Division	ischang	82-10-5051-7161
Kyung-Hyun KIM	Senior Researcher, Water Pollution Cap System Division	khkim	82-10-2798-2468
Chang-Geun SONG	Senior Researcher, Climate Change Research Division	cksong	82-10-9991-4257
Hee-Young KU	Researcher, Research Planning Division (staff)	kheey83	82-10-2939-0212
Kyoung-Sun KIM	Researcher, Research Planning Division (staff)	yjoy122	82-10-2719-0631
June-Hyeong PARK	Editor, Research Planning Division (staff)	jony133	82-10-2773-1338
Sung-Hwa BAE	Editor, Research Planning Division (staff)	windy0805	82-10-9302-4800
Chang-Hyun SIN	Researcher, Research Planning Division (staff)	yjoy122	82-10-3616-3544
Kye-Yo LEE	Researcher, Research Planning Division (staff)	kyeyo2	82-10-2726-7896

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Edited by Ho-Seok SONG, Hyun-Mi KIM,
Hee-Young KOO, Kyung-Sun KIM

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Address:
Research Planning Division,
National Institute of Environmental Research
Tel: 82-32-560-7011, Fax: 82-32-568-2036
Web site: http://www.nier.go.kr
E-mail: hmikim@korea.kr