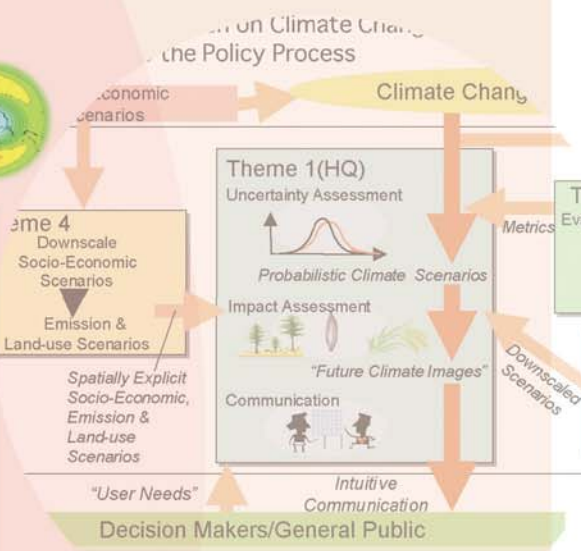
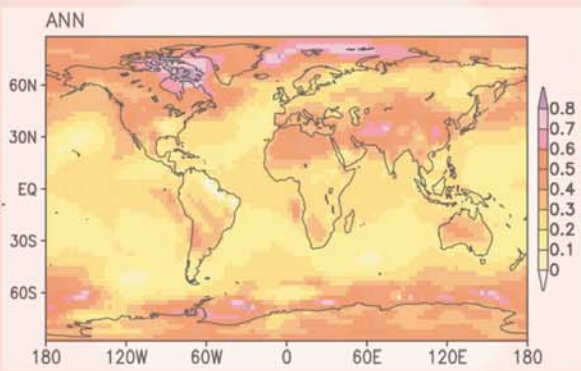
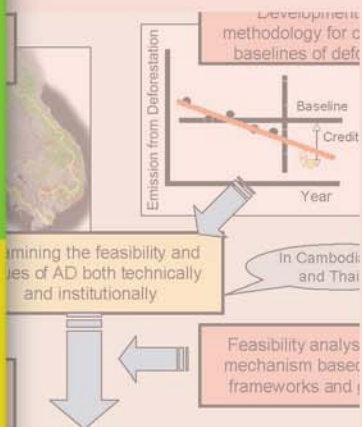
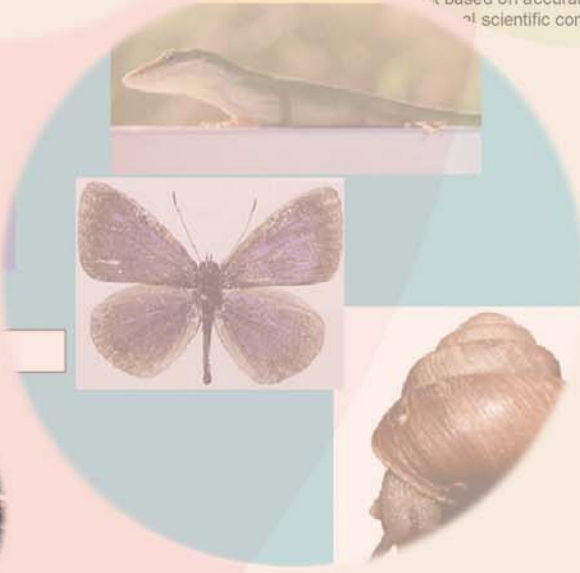
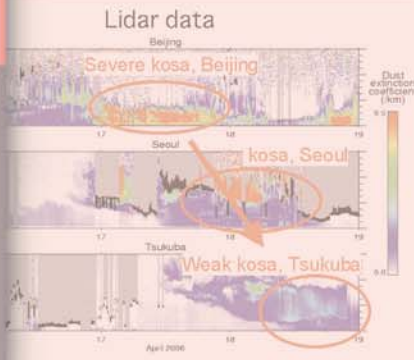
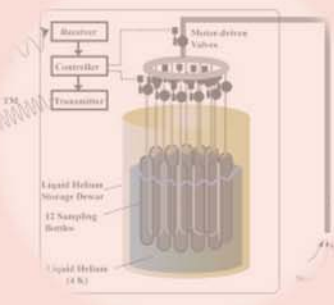


# GLOBAL ENVIRONMENT RESEARCH FUND

## FY2007



\* science to stakeholders as a basis for decision making based on accurate science and scientific community through IPCC



# The Global Environment Research Fund in FY2007

## Outline

### Features:

- The GERF is a competitive grant scheme for global environmental research, initiated in 1990 with calls for proposals. Since then, the GERF has played a role as a core fund in Japan for promoting global environmental studies through interdisciplinary interaction among natural, social and political sciences.
- Each year the Ministry of Environment formulates a "Global Environment Research Program" through consultation with external reviewers. Based on the program, research projects are conducted in a timely fashion in accordance with the international situation, reflecting domestic/international trends in global environmental research.
- Applicants are to be researchers belonging to Japanese research institutions.
- The research projects will be evaluated in collaboration with external reviewers, weighing in such factors as degree of contribution (in terms of either policy or science) and feasibility, taking into consideration domestic/international trends in the global environment.

## System

### Research Areas:

- **Global system changes**  
Stratospheric ozone depletion, global warming, and hydrological circulation on a global scale
- **Transboundary pollution**  
Transboundary pollution in the atmosphere, through oceanic and terrestrial areas, and along international rivers
- **Conservation and recovery of broad-regional ecosystems**  
Ecological disturbances, loss of biodiversity, tropical deforestation, desertification broadly occurring on a regional level (East Asia)
- **Sustainable societies and policies for their implementation**  
Integrated research on global environmental conservation in relation to the environment, economy, and society

### Categories of Projects:

Categories of Research	Conditions	Research Period	Average of Annual Budget per Project (1US\$=120yen)
Strategic R & D Area	Large-scale projects for which the Ministry of the Environment provides a research framework	5 years (three years for Period I and two for Period II)	About \$2 million
Global Environmental Research Area	The research contributes to solving individual or combinations of global environmental issues	3 years (could be extended to 5 years)	About \$0.4 million
Revolutionary Research in Feasibility Study	Researchers are required to be 40 year or younger in age	1 or 2 years	About \$80 thousand

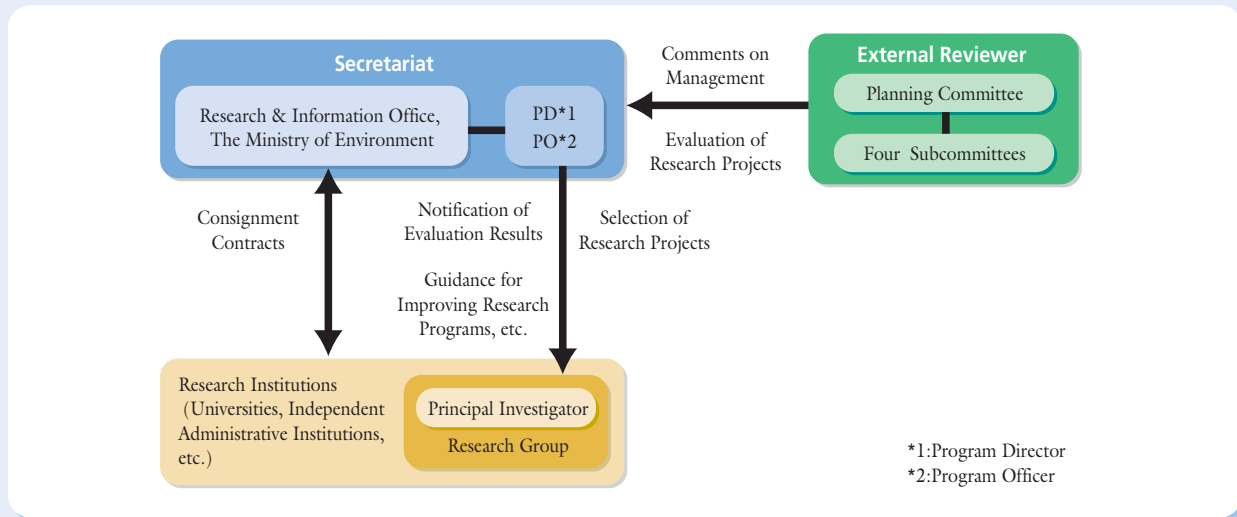
### Projects of the Strategic R & D Area:

- S-2: Development of GHG Sink/Source Control Technologies through Conservation and Efficient Management of Terrestrial Ecosystems – Intermediate to Long-Term Strategies for the Stabilization of Atmospheric GHG Concentration – (FY2003-2007)
- S-3: Japanese Climate Policy Scenarios towards the Year 2050 (FY2004-2008)

S-4: Comprehensive Assessment of Climate Change Impacts to Determine the Dangerous Level of Global Warming and Appropriate Stabilization Target of Atmospheric GHG Concentration (FY2005-2009)

S-5: Integrated Research on Climate Change Scenarios to Increase Public Awareness and Contribution to the Policy Process (FY2007-2011)

### Implementation Structure:



### Intermediate Evaluation:

- Research projects in the Global Environmental Research Area (for which the research period is three years) will undergo intermediate evaluation in their second year.
- Research projects in the Strategic R & D Area (for which the research period is five years) will undergo intermediate evaluation in their third year.
- Research projects in the Global Environmental Research Area rated highly in the evaluation will be considered for an extension. Research projects that achieve good results in the examination will be allowed a two-year extension (bringing the total to five years).

### Recent Major Achievements

- **AIM (Asian-Pacific Integrated Model):**

The analytic results of the AIM are utilized for policy analysis including tax systems, subsidy policies, presumed effects on the Kyoto Mechanism, and presumed effects on global warming and impacts on economics through the introduction of new technologies, etc.

- **Desertification Early Warning System (EWS):**

The analytic results of an integrated model will be submitted to CRIC5 (Committee for the Review of the Implementation of the Convention) as a representative example of Japan's efforts.

- **Impact of Invasive Alien Species on Ecosystems:**

The research on alien species has been helping policymakers shape the Invasive Alien Species Act, and has been utilized in the establishment of protected forest ecosystem areas in the Ogasawara Islands.

- **Japan Low-Carbon Society 2050:**

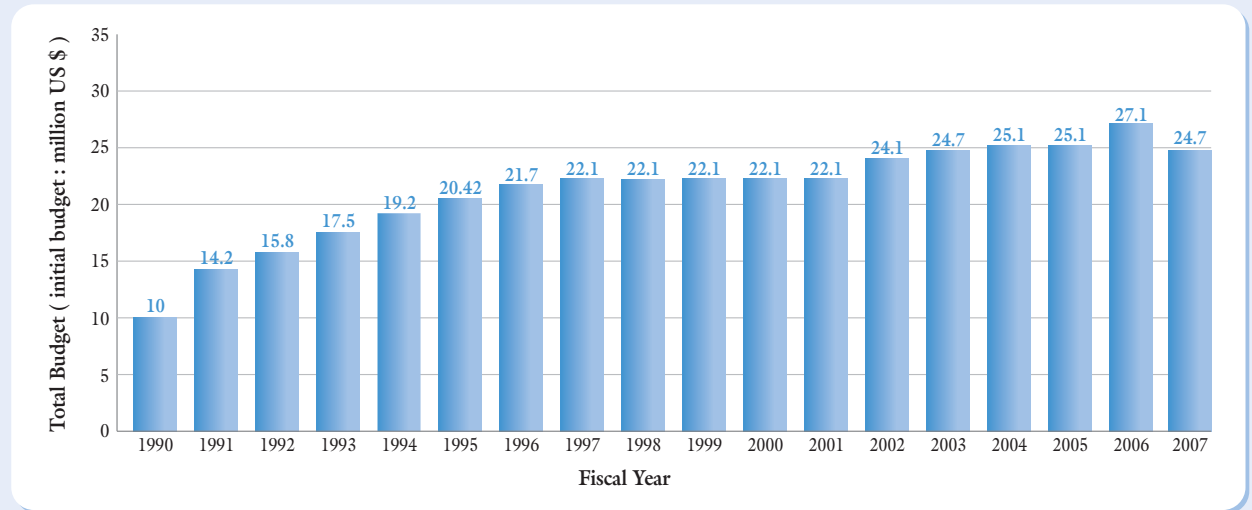
This is a cooperative scientific project between Japan and the UK started in February 2006. The research results are influencing formal/informal international negotiations for the Framework Convention on Climate Change.

- **Dust and Sandstorm (Kosa) Monitoring Network:**

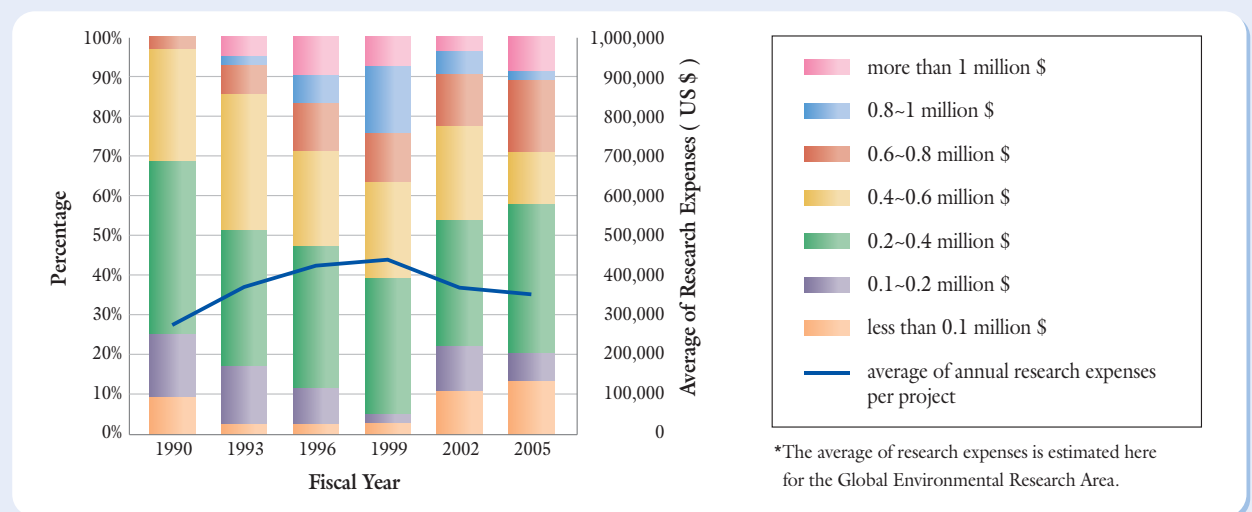
The research on Kosa has been contributing to the devising of policies aiming to solve the Kosa problem, which is a shared concern understood in common by all parties at the Tripartite Environment Ministers Meeting among China, Japan and Korea (TEMM).

## Management Performance

### Trends in the Total Budget (1 US\$ = 120 yen):

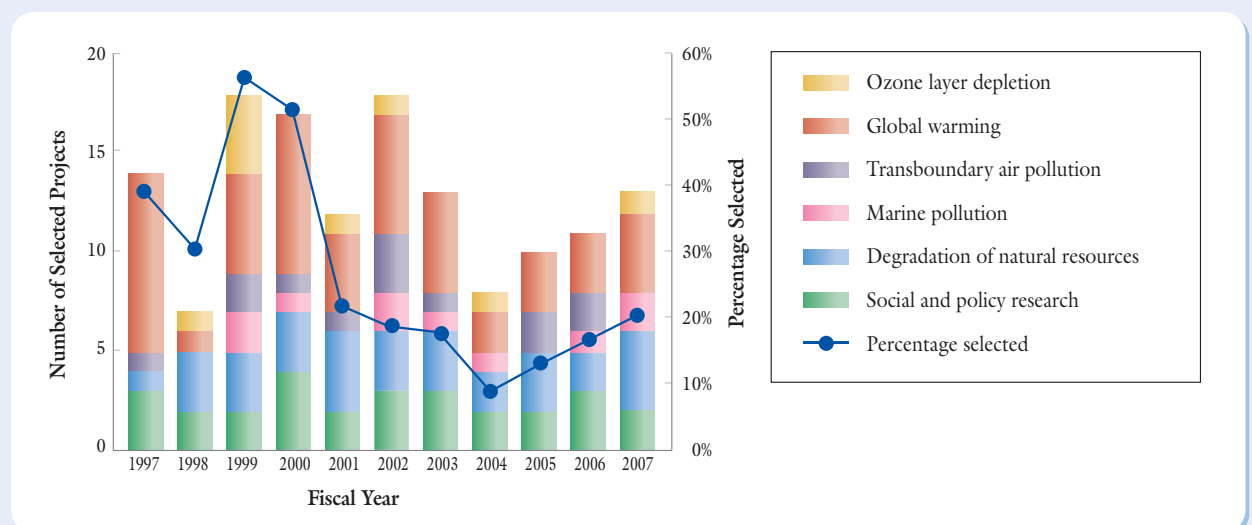


### Trends in Annual Research Expenses per Project (1 US\$ = 120 yen):



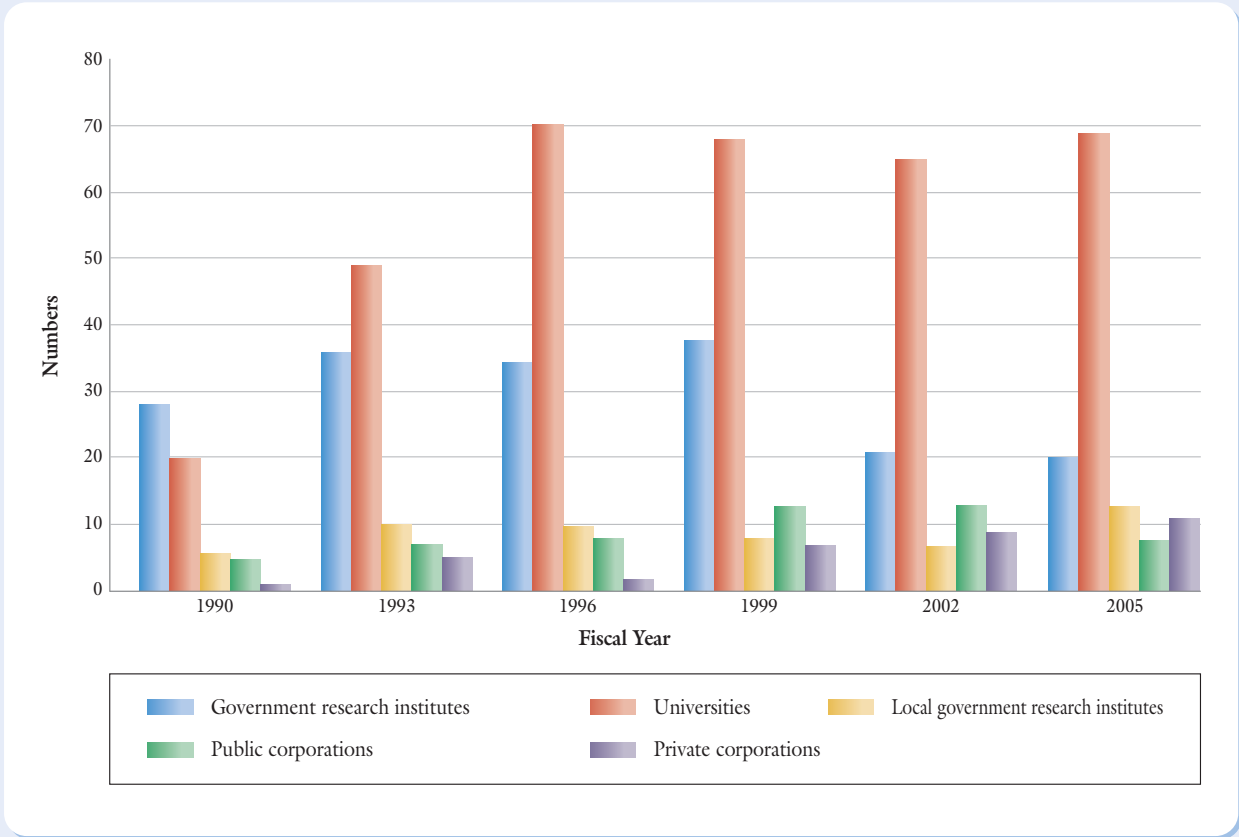
### Percentages of Research Projects Selected:

#### Numbers of selected projects and trends in the selection ratio (Global Environmental Research Area)



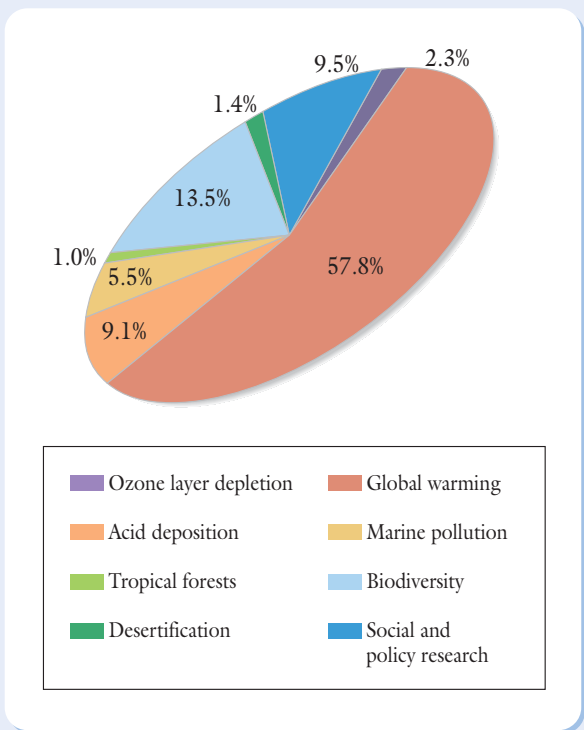
### Number of Participating Institutions:

Trends in numbers of research institutions (in the case of universities, counted by university not faculty)

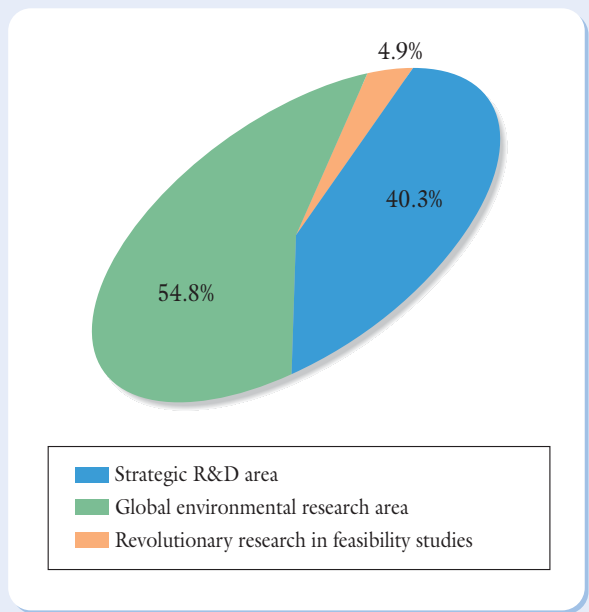


### The State of Implementation of Research Areas and Research Categories:

Ratios of categories of research conducted in FY2007 (based on the budget distribution)



Ratios of areas of research conducted in FY2007 (based on the budget distribution)



# Global System Changes – Stratospheric Ozone Depletion, Global Warming, etc. –

Strategic R & D Area

## Development of GHG Sink/Source Control Technologies through Conservation and Efficient Management of Terrestrial Ecosystems – Intermediate to Long-term Strategies for the Stabilization of Atmospheric GHG Concentration –

( Period I : 2003-2005 )

( Period II : 2006-2007 )

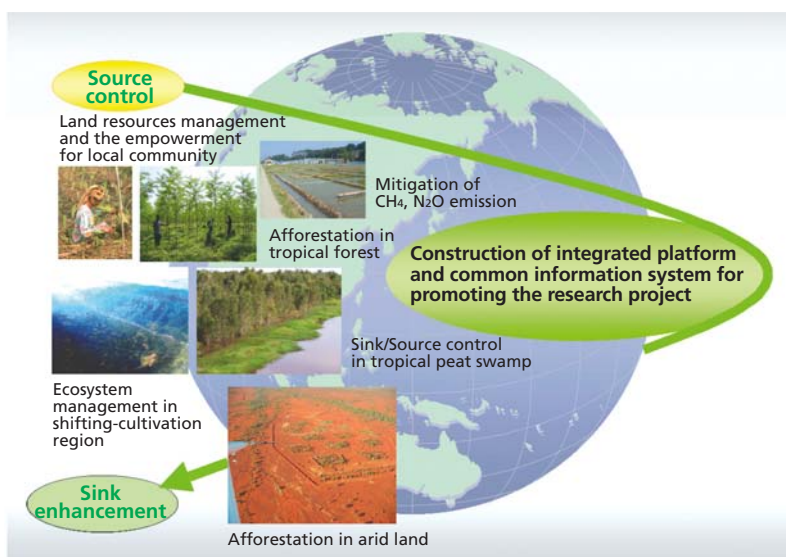
Project Leader : **Koichi YAMADA**, Seikei University

<S-2>

Seikei University, National Institute for Agro-Environmental Sciences, National Institute of Vegetable and Tea Science, National Institute of Livestock and Grassland Science, National Agricultural Research Center for Hokkaido Region, National Agriculture and Food Research Organization, Japan International Research Center for Agricultural Sciences, Forestry and Forest Products Research Institute, Forest Tree Breeding Center, Utsunomiya University, Ehime University, Osaka University, Kyoto University, Kanazawa University, Shinshu University, University of Tsukuba, The University of Tokyo, Hokkaido University, Chiba University, Nagoya University, Mie University, Tokyo University of Agriculture and Technology, Nanzan University, Hokkaido Prefectural Kosen Agricultural Experiment Station, Fukushima Agricultural Technology Center, Niigata Agricultural Research Institute, Kumamoto Prefectural Agricultural Research Center, Shiseido Co., Ltd., Sumitomo Forestry Co., Ltd.

In this research project, technologies of greenhouse-gas (GHG) source control and sink increase for the stabilization of atmospheric GHG concentrations are developed through conservation and efficient management of terrestrial ecosystems. Three typical ecosystems which have large potential impact on GHG concentrations are studied: 1) forest including arid land, 2) tropical wetlands, and 3) agricultural land (cultivated lands, slash-and-burn system, and livestock management). New technologies which are

environmentally sound and economically competitive will be developed, targeting the term after the Second Commitment Period of the Kyoto Protocol (2012). Environmental effect and economic aspect can be calculated for the implementation of each technology and system developed from the global viewpoint in the research project. Thus, its outcome can effectively contribute to policy planning. The GHG reduction potential of 0.1Gt-C/y was expected from the interim result of this research.



## Japanese Climate Policy Scenarios toward the Year 2050

( Period I : 2004-2006 )

( Period II : 2007-2008 )

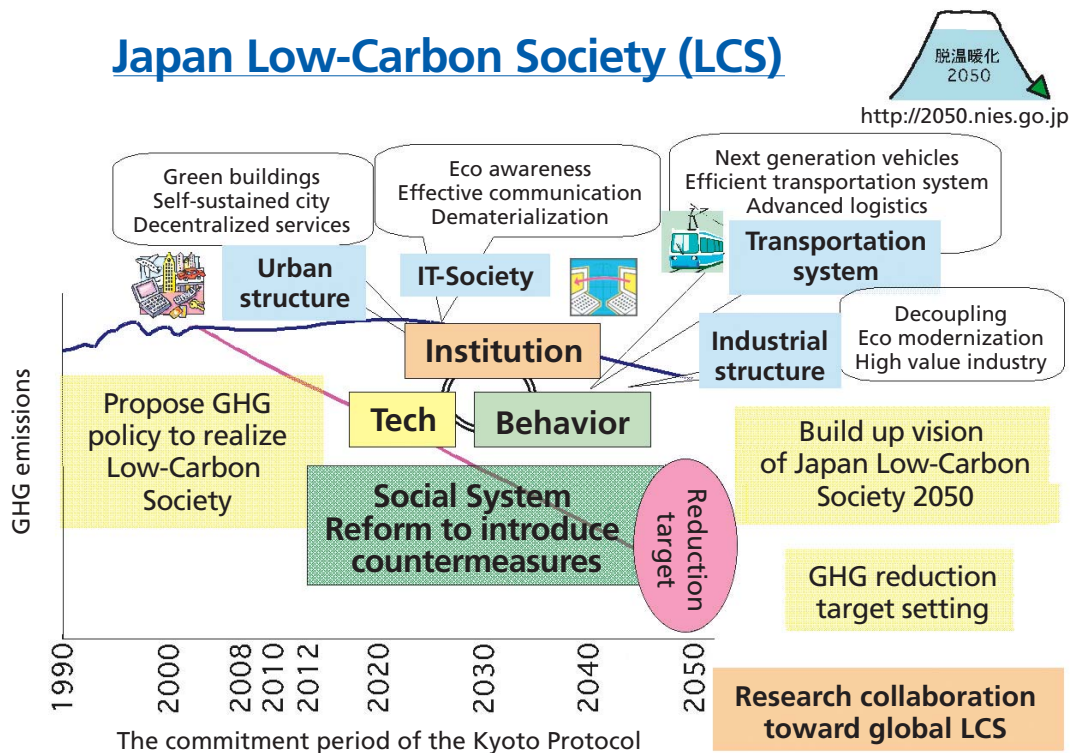
Project Leader : **Shuzo NISHIOKA**, National Institute for Environmental Studies (NIES)

<S-3>

NIES, National Institute of Advanced Industrial Science and Technology, Forestry and Forest Products Research Institute, The Japan Institute of Energy, Institute for Global Environmental Strategies, Kyoto University, The University of Tokyo, Kobe University, Shinshu University, Nagoya University, Tokyo Institute of Technology, Tokyo University of Marine Science and Technology, Ritsumeikan University, Bunkyo University, Waseda University, International University of Japan, Keio University, Tokyo University of Science, Nippon Institute of Technology, Mizuho Information & Research Institute, Inc., JKL, Inc., Nikken Sekkei Research Institute, Nippon Telegraph and Telephone Corporation, Mitsubishi Research Institute, Inc.

The 2007 G8 Summit concluded that "we will consider seriously the decisions made by the European Union, Canada and Japan which include at least a halving of global emissions by 2050". This research investigates feasibility to develop a low-carbon society (LCS) in Japan, that 60-80% CO<sub>2</sub> emissions can be reduced by 2050 below 1990 level, while analyzing institutional and lifestyle

change, economic impact, roles of industrial structure, and technological possibility. The result was published as "Japan LCS scenarios" on February 15, 2007. Now our research moves into investigating how to realize such society in 2050. We also have expanded our activities with UK to develop global LCS scenarios.



# Comprehensive Assessment of Climate Change Impacts to Determine the Dangerous Level of Global Warming and Appropriate Stabilization Target of Atmospheric GHG Concentration

( Period I : 2005-2007 )

( Period II : 2008-2009 )

Project Leader : **Nobuo MIMURA**, Ibaraki University

<S-4>

Ibaraki University, National Institute of Infectious Diseases, National Institute for Land and Infrastructure Management, National Institute for Environmental Studies, National Institute for Rural Engineering, National Institute for Agro-Environmental Sciences, Japan International Research Center for Agricultural Sciences, Forestry and Forest Products Research Institute, Tohoku University, University of Tsukuba, The University of Tokyo, Kyushu University, Meijo University, Osaka Prefecture University, Japan Research Institute, Mitsubishi Research Institute, Inc.

This project aims at assessing the physical and socioeconomic impacts of climate change in Japan and the Asia Pacific region, focusing on water resources, human health, agriculture, forest ecosystem, coastal zones, and disaster prevention. Studies of spatial and temporal distributions of the

impacts and adaptation to them are coordinated to determine the dangerous level of global warming. Appropriate emission paths are also studied to build a scientific basis for the stabilization target of atmospheric GHG concentration.

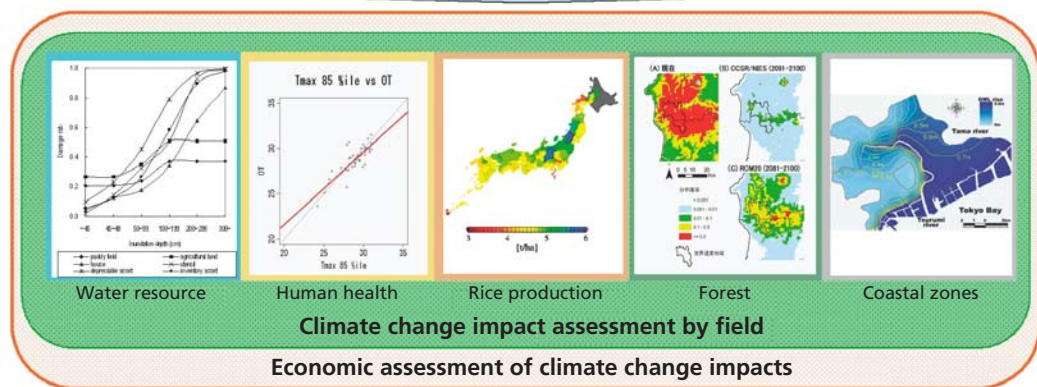
### Research Objectives

**(1) Integrated assessment of climate change impacts**

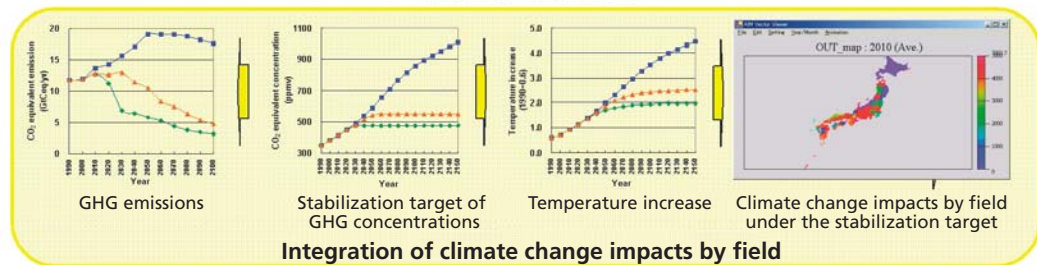
Quantitative assessment of climate change impacts on key sectors, Development of risk maps in Japan and the Asia Pacific region, Investigation of adaptation strategies to reduce climate change impacts

**(2) Provision of scientific information to medium- and long term climate policy**

Assessment of dangerous levels of climate change, Investigation of GHG emission paths toward climate stabilization



### Impact function



**Contribution to :** Strategic Research Project "Low carbon society scenarios toward 2050 (S-3)", IPCC, UNFCCC and Kyoto Protocol



Strategic R & D Area

## Integrated Research on Climate Change Scenarios to Increase Public Awareness and Contribute to the Policy Process

( Period I : 2007-2009 )

( Period II : 2010-2011 )

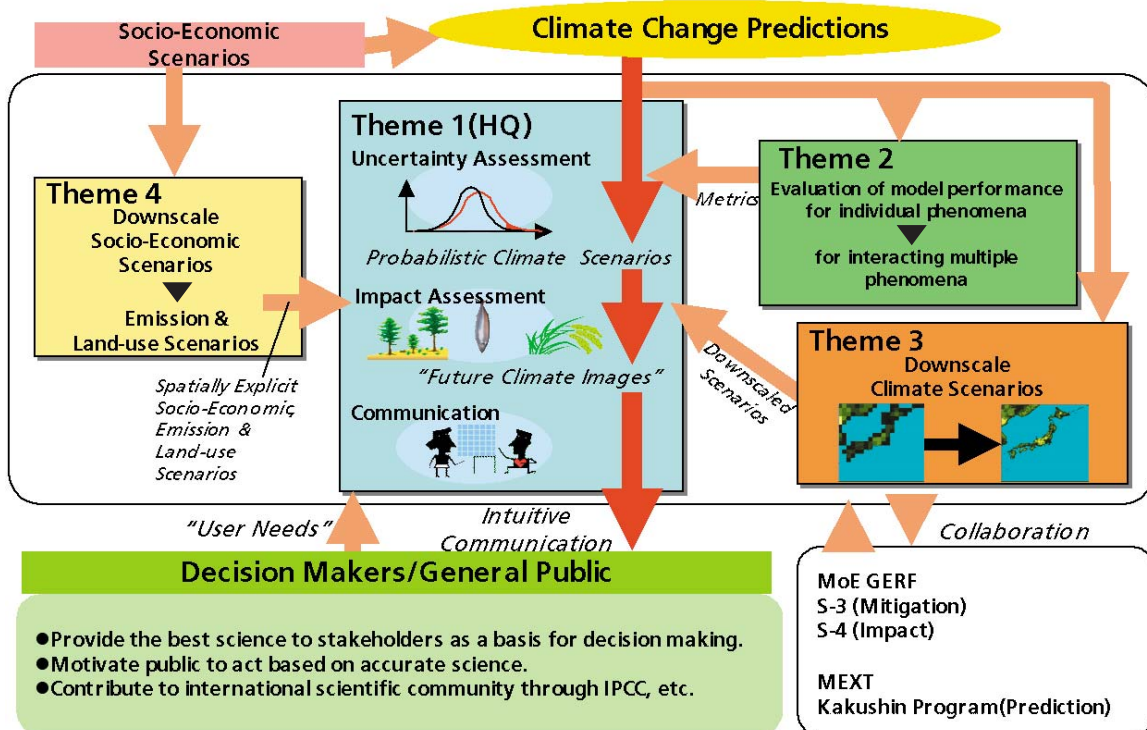
Project Leader : **Akimasa SUMI**, The University of Tokyo

<S-5>

The University of Tokyo, Meteorological Research Institute, National Institute for Environmental Studies, National Institute for Agro-Environmental Sciences, Japan Agency for Marine-Earth Science and Technology, National Research Institute for Earth Science and Disaster Prevention, Hokkaido University, University of Tsukuba, Nagoya University, Kyoto University, Kanagawa University, Toho University, Nomura Research Institute, Ltd.

This research project uses domestic and international climate modeling results to undertake a comprehensive analysis of future climate change prediction in order to assign quantitative uncertainty indices to such predictions. In addition, we use regional climate models to generate spatially-specific predictions for Japan and its environs. We are also working on downscaling

socio-economic scenarios and predicting land-use change. Through these efforts, we are constructing a comprehensive climate change scenario that gives detailed information about the impact of climate change on society, and we are working on a methodology that will ensure that this scenario can be presented to the public in a manner that can be understood intuitively.



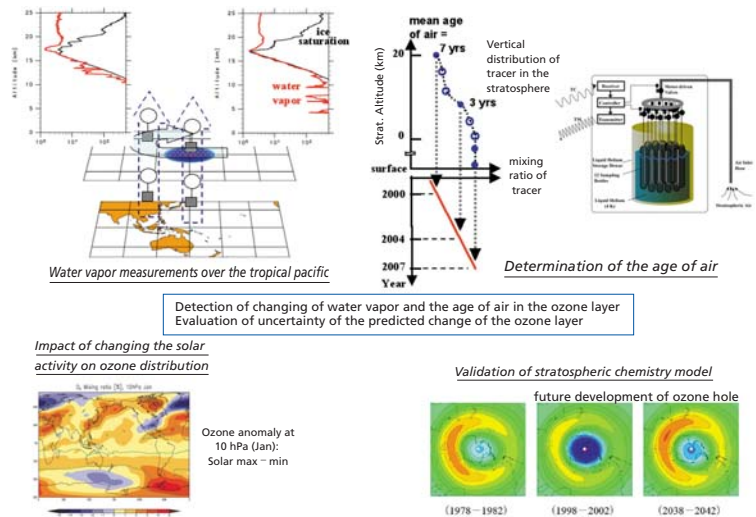
## Studies on Variability of Stratospheric Processes and Uncertainties in the Prediction of Future Change of Stratospheric Ozone (2007-2009)

Principal Investigator : **Takashi IMAMURA**, National Institute for Environmental Studies (NIES) <A-071>

NIES, Hokkaido University, Miyagi University of Education, The University of Tokyo

In this research project, the following investigation is being conducted: 1) evaluation on grounds when further countermeasures for ozone layer protection are considered.

reproducibility of chemical and meteorological fields in the stratosphere calculated by our stratospheric chemical-climate model, 2) detection of the variation of water vapor in the tropical tropopause layer, 3) determination of the mean age of stratospheric air over Japan, and 4) understanding of the impact of solar activity change on ozone distribution. The results of these works are expected to provide scientific



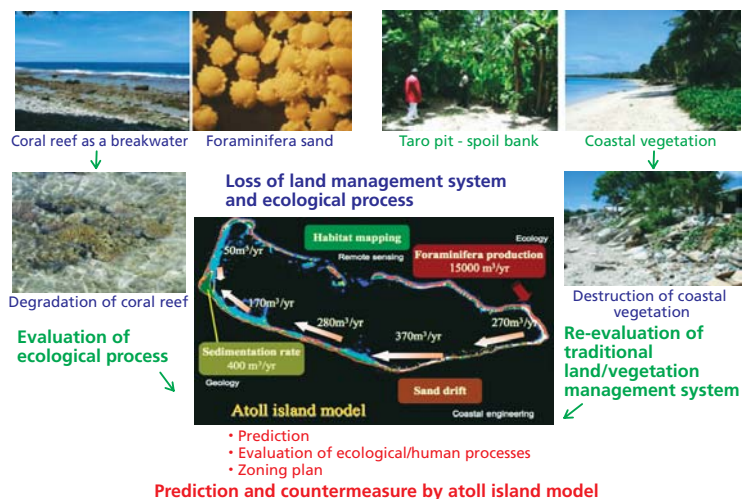
## Research on Sustainable Land Management in Atoll Island Countries (2003-2007)

Principal Investigator : **Hajime KAYANE**, The University of Tokyo <B-15>

The University of Tokyo, National Institute for Environmental Studies, Ibaraki University, Keio University

Atoll islands are low, flat lands with an altitude of a few meters. Consequently, they are extremely vulnerable to a rise in sea level. Not only physical process but also ecological process of sand supply by coral and foraminifera and human process of traditional land and vegetation management have acted important roles in formation and maintenance of the atoll islands. However, these processes have been degraded rapidly in the course of modernization. We have evaluated these processes and constructed "atoll island

model" to predict future landform changes, and to establish countermeasures and zoning plan for sustainable land management.



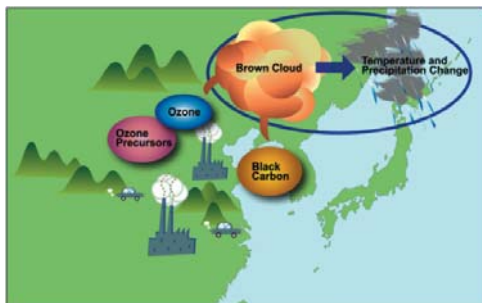
## Spatio-Temporal Variability and Climate Impact of Ozone and Black Carbon in Asia (2005-2007)

Principal Investigator : **Hajime AKIMOTO**, Japan Agency for Marine-Earth Science and Technology (JAMSTEC) <B-051>

JAMSTEC, Nagoya University, National Institute for Environmental Studies, Tokyo Metropolitan University, Nara Women's University

Tropospheric ozone and black carbon are considered to play a significant role in the enhancement of global warming, although they are not included in the targeted species of the Kyoto Protocol. This project aims at elucidating spatio-temporal variability of these species in Asia, and to evaluate their sensitivity for climate change. For this purpose, intensive observation of ozone and aerosols was made inside China, where observation has been very sparse. In a research using a chemical-

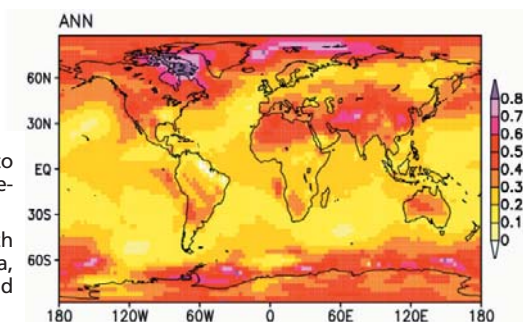
climate model, climate sensitivity of tropospheric ozone has been evaluated. It was found that distribution of temperature increase due to the increase of tropospheric ozone is quite different from that by long-lived (well-mixed) greenhouse gases such as CO<sub>2</sub>. Temperature rise from pre-industrial era to present is large in North America, Mediterranean, North Africa, Middle East, North India, China and Northeastern sea of Japan as shown below in the figure.



Schematic View of Project

Distribution of temperature rise due to tropospheric ozone increase since pre-industrial era (Annual mean)

Temperature rise is large in North America, Mediterranean, North Africa, Middle East, North India, China and Northeastern sea of Japan.



## Assessing the Impact of Mitigation and Adaptation Policies on Climate Change Using the Asia Pacific Integrated Model (2005-2007)

Principal Investigator : **Mikiko KAINUMA**, National Institute for Environmental Studies (NIES) <B-052>

NIES, Kyoto University

It is important to study measures both to reduce adverse impacts of climate change and to mitigate greenhouse gas emissions. This research aims to develop an integrated assessment model that would link important models such as energy end-use model, air pollution model, water resource model and economic model collaborating with the Asian

researchers. The integrated assessment model is utilized to assess policies to achieve the millennium development goals as well as the climate mitigation target. The simulation results are provided to discussion on the carbon tax policy in Japan and are cited in the IPCC 4<sup>th</sup> Assessment Report.

## Study on Estimation of Carbon Storage and Fixation in the Boreal Forest in Russia ( 2005-2007 )

Principal Investigator : **Haruo SAWADA**, Forestry and Forest Products Research Institute (FFPRI) <B-053>

FFPRI, Hokkaido University, Kyoto University

Our time-series modeling method applied to satellite remote sensing could reveal the changes in surface temperature and vegetation condition of each pixel for 20 years with 10 days interval. The vegetation and soil data of typical forest ecosystems in Russia have also been collected and we could find that, as an example, forests on permafrost keep a large amount of carbon below the ground. The

effects of forest fires, which severely damage forest ecosystem and emit CO<sub>2</sub> into the atmosphere, have been brought out in several aspects. We are now integrating these results to estimate the carbon storage and fixation in the Boreal forest ecosystem in Russia. This study will contribute to sustainable forest management in Russia to mitigate global warming in the world.

## Qualitative Assessment and Prediction of Asian Monsoon Change Induced by Human Activities ( 2006-2008 )

Principal Investigator : **Tetsuzo YASUNARI**, Nagoya University <B-061>

Nagoya University, The University of Tokyo, Tokyo Metropolitan University, Japan Agency for Marine-Earth Science and Technology

The global increase in greenhouse gases, the changes in aerosol qualities and quantity, and landcover/vegetation modification over Asia could cause large impact on Asian monsoon climate. Our research project aims to assess the influence of the human activities on a long-term variation in monsoonal precipitation qualitatively, through the investigation of the current status by using long-

range observational data and numerical experiments with a high-resolution climate models. These results would contribute to assessment and prediction of economic/agricultural activities and measures for water resources and disaster alleviation in the Asian monsoon region associated with climate change in the 21<sup>st</sup> century.

## Asian Precipitation Highly-Resolved Observational Data Integration toward Evaluation of the Water Resources (APHRODITE's Water Resources) ( 2006-2008 )

Principal Investigator : **Akiyo YATAGAI**, Research Institute for Humanity and Nature (RIHN) <B-062>

RIHN, Meteorological Research Institute

The recent high-resolution General Circulation Models (GCMs) have allowed us to improve our understanding of the regional impacts of global warming on water resource. However observational datasets to validate such GCMs have not been developed. We propose to develop state-of-the art daily grid precipitation datasets based on long-term

rain-gauge observations over Asia, and to assess the performance of GCMs. Our project will also highlight the importance of orographically-enhanced precipitation to the water resources. The gridded precipitation products developed by this project are released on the web-page (<http://www.chikyu.ac.jp/precip/index.html>).

## Upgrading of GHG Inventory and Evaluation of Reduction Measures in Waste Sector ( 2007-2009 )

Principal Investigator : **Masato YAMADA**, National Institute for Environmental Studies (NIES)

<B-071>

NIES, Ryukoku University, Osaka University

In order to achieve the reduction target on GHG (greenhouse gas) emission in Japan, strategies for maximizing effects of several reduction measures should be considered. Moreover, it is important to promote Japanese projects on the Clean Development Mechanism in developing countries. Upgrading of the GHG inventory according to

change in society and advancement in technology is basic for these activities. In this study, we will upgrade activity data and emission factors of CH<sub>4</sub>, N<sub>2</sub>O and NH<sub>3</sub> in the waste sector, and will design and evaluate GHG reduction measures for the waste sector in Japan and developing countries in Asia.

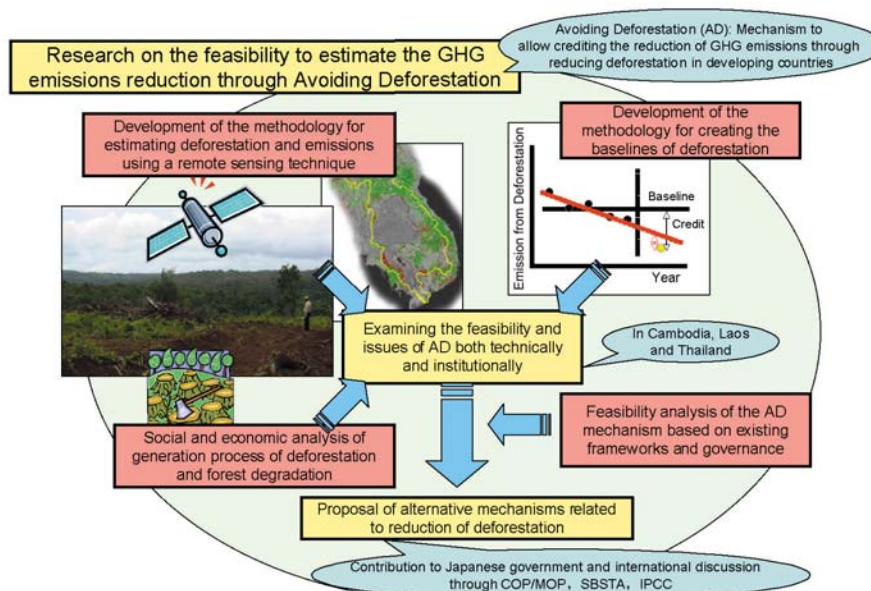
## Research on the Feasibility to Estimate the GHG Emissions Reduction through Avoiding Deforestation ( 2007-2009 )

Principal Investigator : **Mitsuo MATSUMOTO**, Forestry and Forest Products Research Institute (FFPRI) <B-072>

FFPRI, Japan International Research Center for Agricultural Sciences, Waseda University, The University of Tokyo

The concept of "Avoiding Deforestation (AD)" proposed in COP11 is the mechanism to allow crediting the reduction of GHG emissions through reducing deforestation in developing countries. Though AD was captured international attention as a new mechanism to foster reduction of deforestation in those countries, the concept of AD

possesses a number of issues with regard to its feasibility. This study aims to identify and propose alternative mechanisms related to reduction of deforestation through examining the feasibility and issues of the proposed AD both technically and institutionally.



## Evaluation of the Effect of Global Warming on Soil Respiration of Japanese Forest Ecosystems (2007-2009)

Principal Investigator : **Naishen LIANG**, National Institute for Environmental Studies (NIES) <B-073>

NIES, Shizuoka University, Hiroshima University, Hokkaido University

Soil respiration plays a key role in global carbon cycle, since it has been modeled that global heterotrophic soil respiration increases exponentially with global warming at a rate of 6.2% per °C (IPCC 2007). This temperature sensitivity, however, did not consist with a few studies that conducted at ecosystem level for decadal time scales, in forest soils and grasslands. The objective of this project is to estimate the soil carbon turnover rate of whole Japanese forests under the climate change by using multi-approaches, including the soil warming experiment, open-top chamber facility, cross-country soil incubation and model simulation. Results are expected to improve the scientific basis of the Post-Kyoto Protocol and to contribute to the IPCC 5<sup>th</sup> Assessment Report.

## Development of a Method for Evaluating CDM Activities in Asian Countries (2007-2009)

Principal Investigator : **Eiichi ENDO**, National Institute of Advanced Industrial Science and Technology (AIST) <B-074>

AIST, University of Tsukuba

This study aims at developing a method to evaluate Clean Development Mechanism (CDM) activities in the next decades, focusing on investment in supply-side energy technologies in Asian countries. By combining energy system models of Japan and Asia and life cycle assessment models, potential amount of CO<sub>2</sub> emission credit anticipated from those CDM activities will be discussed with their costs and benefits, in the light of the contribution of technology development to Japanese global environment policies.

# Transboundary Pollution in the Atmosphere, Oceans and Inland Environments such as International Rivers

## Studies on the Processes of Transport and Transformation of Aerosols and their Precursors from Asian Continent (2005-2007)

Principal Investigator : **Shiro HATAKEYAMA**, Tokyo University of Agriculture and Technology <C-051>

Tokyo University of Agriculture and Technology, National Institute for Environmental Studies, Tokyo Metropolitan University, National Institute of Advanced Industrial Science and Technology, The University of Tokyo, Toyohashi University of Technology, Acid Deposition and Oxidant Research Center

The target areas of this study are China, Fukue, and Okinawa, which are a large emission source of air pollutants in East Asia, the course ground of air masses transported, and the downstream receptor, respectively. Long range transport of air pollutants and their chemical transformation will be investigated. For this purpose, aerial and ground-based observations of air pollutants in China, and ground-based observations in Fukue, Okinawa were

carried out in April, 2006. Clarification of the processes of aerosol formation, transport, and removal is now underway. The data obtained on the way of air-mass-transport will be input to the simulation model and the large scale air pollution in East Asia is studied as a whole in order to make it possible to propose measures against such air pollution in this area.

## Synthetic Evaluation of the Effect of Acidic Load on Material Flows in East Asian Catchments Areas (2005-2007)

Principal Investigator : **Junko SHINDO**, National Institute for Agro-Environmental Sciences (NIAES) <C-052>

NIAES, Shinshu University, Tokyo University of Agriculture and Technology, Acid Deposition and Oxidant Research Center, The University of Tokyo

The objective of the study is estimating the changes in nitrogen cycle induced by atmospheric deposition in East Asian ecosystems. Field measurements in China and Thailand showed that ammoniacal substance occupied about 2/3 of nitrogen deposition and nitrate concentration in stream water was extremely high in southern China. A nitrogen balance model suggested the agriculture

was the major source of nitrogen load in East Asia. Future nitrogen emission and its effect on soil and stream water in Asian ecosystems are evaluated based on the trends of food supply. The study is expected to provide the basic information for promoting the environmental cooperation such as EANET with Asian countries

## Network Observation of Dust and Sandstorm(DSS) in Northeast Asia and its Applications to Real-Time Forecast, Analysis of the Kosa Movement, and Evaluation of the Effects on the Environment ( 2006-2008 )

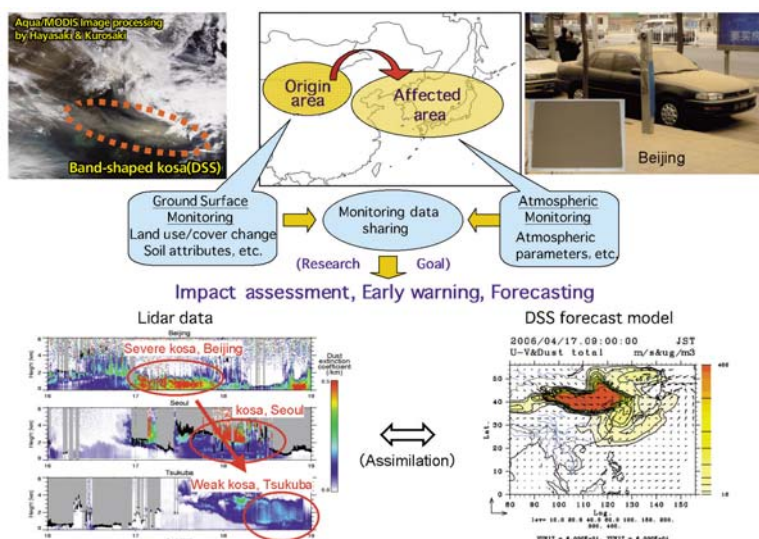
Principal Investigator : **Masataka NISHIKAWA**, National Institute for Environmental Studies (NIES) <C-061>

NIES, Kyushu University, Saitama University

The number of kosa events occurring in Northeast Asia has increased significantly. As there have been reports of SO<sub>2</sub> deposition onto kosa particles during their transport to Japan, other anthropogenic gases might also deposit onto the particles, especially with the increasing industrialization and automobile use in Northeast Asian countries. It is essential that real-time data from the network are shared among Northeast

Asian countries to solve the problems associated with kosa. Our research objectives are to develop a four-dimensional variational (4DVAR) data assimilation system with a real-time data by the lidar monitoring network in Northeast Asia for improvement of a dust modeling system including forecast, and to verify the reaction mechanisms between kosa and acidic gaseous pollutants by laboratory experiments.

### Overall scheme of scientific objective and methodology for dust and sandstorm (kosa) monitoring network in Northeast Asia region



## Predicting the Impacts of Increasing Surface Ozone Concentration in East Asia: Risks to Vegetation and Losses of Agricultural Crops ( 2006-2008 )

Principal Investigator : **Kazuhiko KOBAYASHI**, The University of Tokyo

<C-062>

The University of Tokyo, National Institute for Agro-Environmental Sciences, Ehime University, Japan Agency for Marine-Earth Science and Technology, Tokyo University of Agriculture and Technology

Surface ozone concentration is rising rapidly in East Asia due to increasing emission of the ozone precursors. This raises serious concerns about the damages to vegetation and losses of crop production in this region, particularly in East China, which constitutes the world's largest crop production area. In this program, we are conducting field observations of ozone deposition to vegetation, computer simulation of ozone formation, transportation and deposition, and field

experiments of the crop losses. We have found that burning of crop residue contributes to the spring peak of ozone concentration in East China. We have also shown that wheat yield is substantially reduced by the increase in ozone concentration using open-air release in the field for the first time in the world. Our findings will underpin scientifically the policy-making efforts toward the air quality management across East Asia.



## Study on the Ecological Deterioration of East Asian Marginal Seas due to the Anthropogenic Change in Effluent Nutrient Ratio (2006-2008)

Principal Investigator : **Akira HARASHIMA**, National Institute for Environmental Studies (NIES) <D-061>

NIES, Fisheries Research Agency, Hiroshima University

While the discharge of nitrogen and phosphorus to the sea is increasing, natural flow-down of silicon tends to be hampered by large dams. This shift in the nutrient ratio is advantageous to the non-diatom phytoplankton such as dinoflagellates (non-siliceous and potentially harmful) but not to

diatoms (siliceous and mostly benign), which will further fuel the food web including the jellyfish. We constructed an ecosystem model to apply to the four river-sea systems and evaluate the causality between the anthropogenic factors and the marine ecological deteriorations.

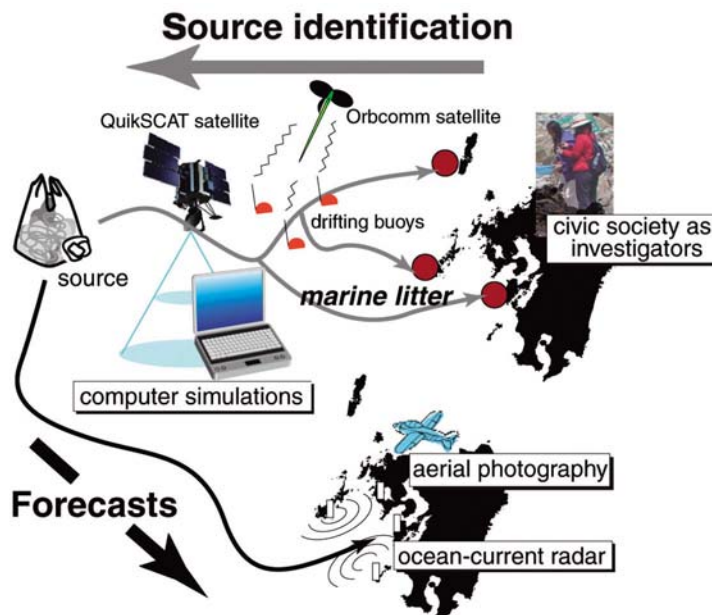
## East China Sea Marine-Litter Prediction Experiment Conducted by Citizens and Researchers (2007-2009)

Principal Investigator : **Atsuhiko ISOBE**, Kyushu University <D-071>

Kyushu University, The University of Tokyo, National Institute for Land and Infrastructure Management, National Institute of Advanced Industrial Science and Technology

In this research project, the spatiotemporal variability of the marine-litter amount is investigated by a voluntary civic organization at the East China Sea coasts. Based on these data, the oceanographers compute major marine-litter sources using a numerical simulation model. In addition, they try to forecast the marine-litter amount at the coasts using the simulation model in

conjunction with the ocean-current radars and aerial marine-litter photography. Information of the marine-litter sources will be required for public awareness to reduce its occurrence. In addition, on-board marine-litter recovery procedures will be proposed using the forecast system developed in this project.



## Dynamics of Marine Organisms Carried by Ship Hull/Ballast Water, and Detection of their New Settlement (2007-2009)

Principal Investigator : **Hiroshi KAWAI**, Kobe University

<D-072>

Kobe University, National Institute for Environmental Studies, Hiroshima University, Marine Ecological Institute Inc., Chiba University, The University of Tokyo, Tokai University

In order to assess the contributions of large-scale cargo ships to intercontinental introductions of marine organisms, we are monitoring the biodiversity and succession of the biota in the ballast tanks and ship hulls of bulk carriers, as well as investigating the biodiversity of introduced organisms in their ports of call for elucidating the early settlement processes. The resulting data will provide a valuable basis for drawing up guidelines to reduce or prevent species introductions, and to contribute to the conservation of the coastal ecosystems of Japan as well as the countries trading with Japan by ship transportation.

# Conservation and Recovery of Large-Regional Ecosystems

## The Study of Recovery of Interactive System of Forest and Soil to Rehabilitate the Tropical Forests (2005-2007)

Principal Investigator : **Eizi SUZUKI**, Kagoshima University

<E-051>

Kagoshima University, National Institute for Environmental Studies, Forestry and Forest Products Research Institute, The University of Tokyo

We study the recovery process of damaged tropical forests after fire or logging in Indonesia. Survey of wide area in West Sumatra revealed that the tree mortality has risen recently, suggesting the forests damaged in wide area. Since most natural forests in Borneo are dominated by Dipterocarpaceae, the recovery of Dipterocarpaceae is our final target. This family rarely regenerates from stump, and the

seeds have very short life span. Then its recovery needs long period. We found a species in Dipterocarpaceae, *Cotylelobium melanoxydon* easily regenerate from sprouts in burned forests, and the most of regenerated trees have the symbiotic mycorrhiza. The establishment of this species may promote that of other species in Dipterocarpaceae.

## Impacts of Invasive Alien Species on Biodiversity and Fragile Ecosystems in the Oceanic Ogasawara (Bonin) Islands (2005-2007)

Principal Investigator : **Isamu OKOCHI**, Forestry and Forest Products Research Institute (FFPRI)

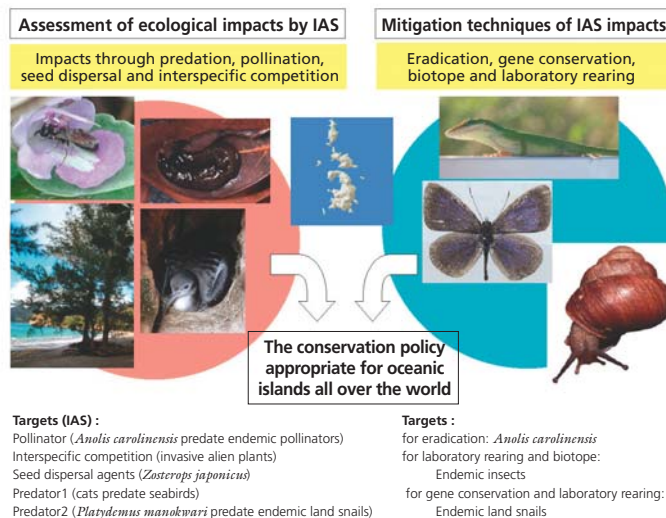
<F-051>

FFPRI, Tokyo Metropolitan University, Tohoku University, Kanagawa Prefectural Museum of Natural History, Japan Wildlife Research Center, Institute of Boninology

The objective of the project is to develop techniques for mitigating invasive alien species by studying their impacts on biodiversity in Ogasawara, where invasive species are thought to destroy native fauna and flora, as happened in other oceanic islands including the Galapagos Islands.

While an oceanic island may become a treasure trove of endemic organisms resulting from evolutionary processes without disturbance thanks to isolation from continents since the dawn of time, the island ecosystem is fragile for the same reason. Invasive alien species affect the entire ecosystem in Ogasawara through predation, interspecific competition, pollination and seed dispersal. By studying the mechanism of impact and techniques for eradicating invasive species and by proposing mitigation techniques

focusing on gene conservation and rearing methods, we expect to contribute to policies for conserving ecosystems in Pacific oceanic islands. Our findings of severe predation on native species by alien predators were considered in planning of conservation activities in the Ogasawara.



## System Construction of Vulnerability Assessment for Alpine and Subalpine Ecosystems Based on Biological Interactions (2005-2007)

Principal Investigator : Jotaro URABE, Tohoku University

<F-052>

Tohoku University, Hokkaido University, Yamanashi University

Alpine/subalpine ecosystems are important landscape resources with unique biodiversities and provide goods and services to >10% of population in Japan. However, these are expected to be highly vulnerable to climate change impacts. This project examines biological interactions and environmental properties sustaining the biodiversity in the

mountain habitats including grasslands, forests, wetlands and lakes. Using the gained ecological knowledge, it constructs a system identifying, assessing and forecasting the ecosystem response to environmental changes, which will contribute to design conservation plans for the alpine/subalpine ecosystems under climate changes.

## Search for Measures to Prevent the Extinction of the Great Apes Based on Natural and Social Sciences (2006-2008)

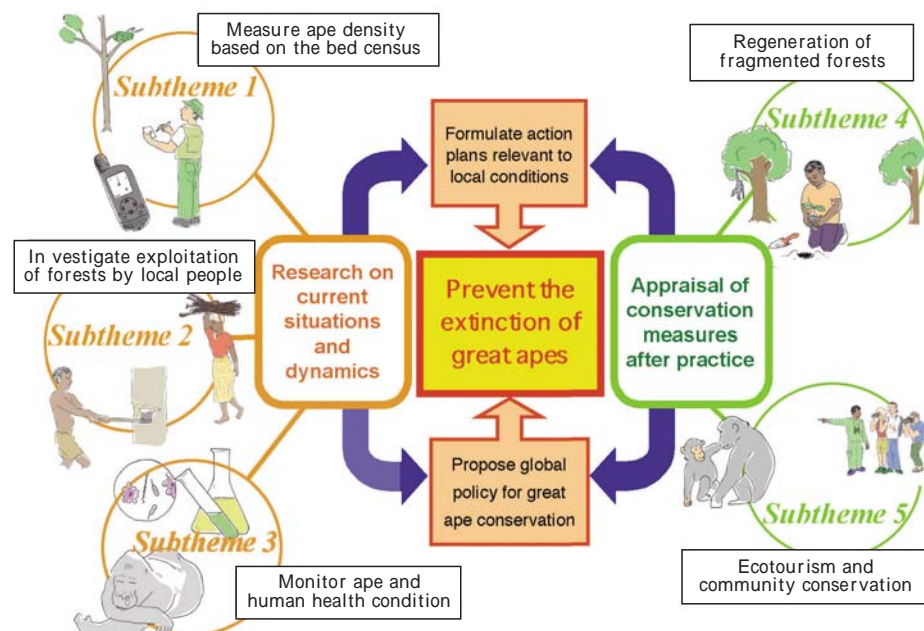
Principal Investigator : Toshisada NISHIDA, Japan Monkey Centre

<F-061>

Japan Monkey Centre, Hayashibara Biochemical Labs., Inc., Meiji Gakuin University, Kyoto University

To save the great apes from extinction, this study aims to formulate realistic conservation action plans relevant to local conditions, and to propose a global policy for the great ape conservation. Research consists of survey of ape distribution and population density, monitoring of health conditions of apes and humans, and investigation of the forest use by human inhabitants. We also appraise the effect of some conservation measures after their

practice, including study of regeneration of fragmented forests, ecotourism and community conservation. So far, we have clarified the outbreak and transmission process of a flu-like disease among a population of chimpanzees, increased survival rate of saplings by the use of the hexatubes and great local variations in the quantity and quality of the forest exploitation by humans



## Investigation on the Route of Transmission and Infectious Risk of West Nile Virus and Blood Parasites by Migratory Birds (2006-2008)

Principal Investigator : **Takashi KUWANA**, National Institute for Environmental Studies (NIES) <F-062>  
 NIES, Nihon University, Rakuno Gakuen University

To prevent the extinction of endangered avian species in Japan, we are performing an epidemiological survey and studying the route of infection of West Nile Virus (WNV) as well as blood parasite infection in snipes and plovers that migrate from Siberia to Australia and New Zealand via Japan. Blood parasite and WNV are both transmitted by blood-sucking insects. Therefore,

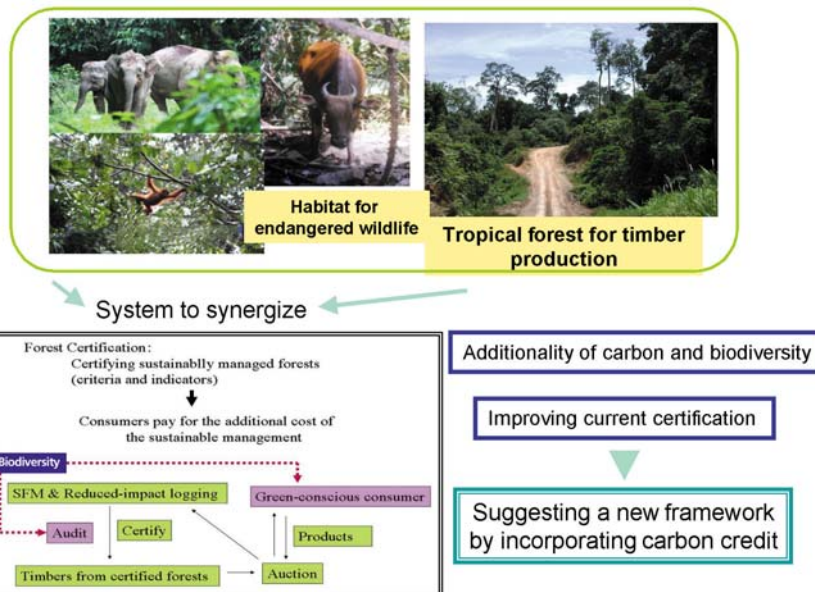
we initially conduct an epidemiological survey of blood parasites in snipes and plover at breeding sites, stopping points and wintering places. Then we use the results of this survey to estimate the route of WNV transmission and to establish an effective system to evaluate the risk of infection with WNV to endangered avian species in Japan.

## Sustainable Management of Tropical Production Forests with the Economic Incentives of Carbon Sequestration and Biodiversity Conservation (2007-2009)

Principal Investigator : **Kanehiro KITAYAMA**, Kyoto University <F-071>  
 Kyoto University, Forestry and Forest Products Research Institute, Tokyo University of Agriculture, Research Institute for Humanity and Nature

A vast area of the Southeast Asian equatorial tropics is occupied with the production forests that are zoned for commercial timber extraction. These production forests are actually serving as the reservoir of endangered wildlife. However, production forests are deteriorating with biodiversity being threatened by the increasing demand for timber. The reduced-impact logging and forest

certification systems that have been suggested for sustainable management are not well adopted by foresters in the tropics. This research will investigate the additionality effect of biodiversity conservation and carbon sequestration in a certified, model production forest, and suggest a new framework to add further economic incentives to the forest certification for better adoption.



## Developing a Sustainable Program for the Recovery of Wild Japanese Crested Ibis and Public Consensus Strategy ( 2007-2009 )

Principal Investigator : **Yukihiro SHIMATANI**, Kyushu University

<F-072>

Kyushu University, The University of Tokyo, Niigata University, Saitama University, Yamashina Institute for Ornithology, National Institute for Environmental Studies, Tokyo Institute of Technology

The captive propagation effort for the Japanese crested ibis (*Nipponia nippon*) in Sado will begin experimental release in 2008, aiming at colonization of 60 captive-bred birds in the wild by 2015. The goals of this study are to develop a "naturally valid and socially feasible and sustainable program for restoring the wild Japanese crested ibis" and to allow the program to be accepted by the local society. This study will be conducted as collaboration between natural and social scientists

addressing both restoration design and the social process to reach public consensus on the restoration program. This interdisciplinary approach will ensure restoration progress from planning toward implementation for the recovery of wild populations. This study pursues a scientifically reasonable and socially acceptable restoration program, which will be a valuable model contributing the global biodiversity strategy.

## Soil Biodiversity and Ecosystem Functioning ( 2007-2009 )

Principal Investigator : **Nobuhiro KANEKO**, Yokohama National University

<F-073>

Yokohama National University, Hokkaido University, Ibaraki University, Shizuoka University, Kyoto University

Soils play a multi-functional role in providing essential ecosystem services such as mediating global nutrient and water cycles, water purification, primary production, carbon sequestration and buffering environmental disasters. Many of these ecosystem functions are probably sustained by a diverse soil biological community, however, there is a lack of evidence to support this argument. We will study the relationship between soil biodiversity and ecosystem functioning in soils and propose that

the conservation of soil biodiversity is essential to maintaining soil quality. We hypothesize that soil ecosystem engineering by soil biota is the key process to better understanding the relationship between soil biodiversity and soil function. Therefore, our research will focus on, but not be limited to, the microbial diversity and bacterial functions in earthworm casts using molecular and isotope techniques.

## Desertification Control and Restoration of Ecosystem Services in Grassland Regions of North-East Asia (2007-2009)

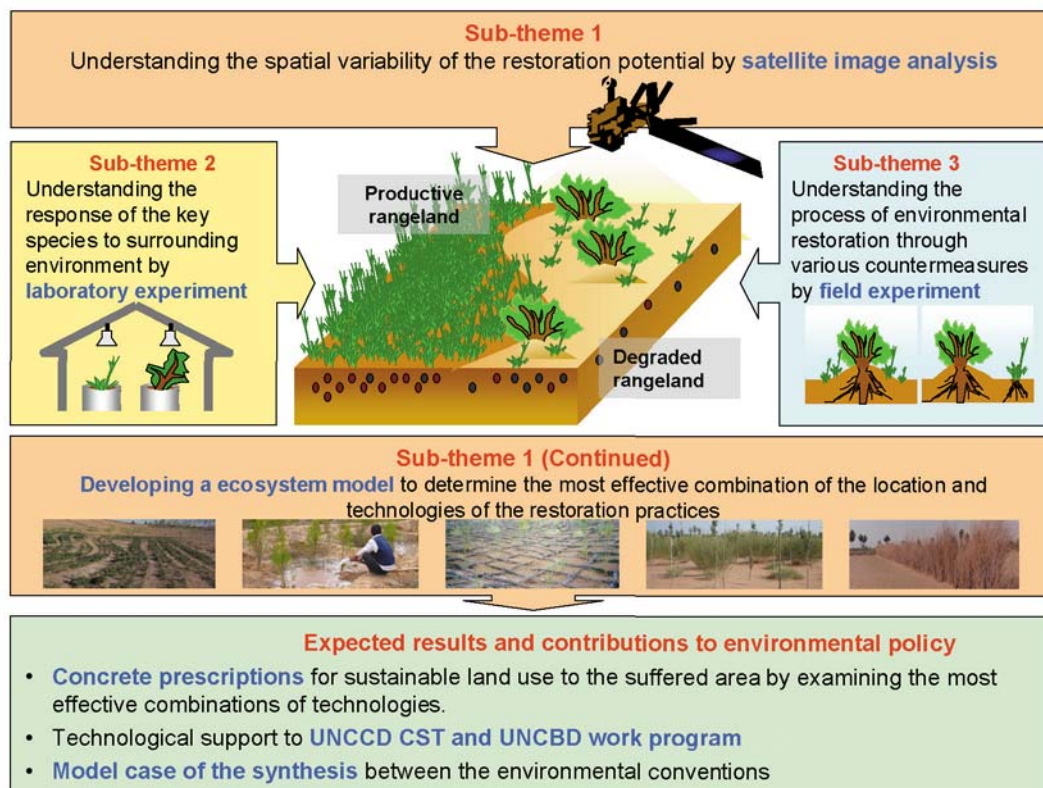
Principal Investigator : Toshiya OGURO, The University of Tokyo

<G-071>

The University of Tokyo, National Institute for Environmental Studies, Okayama University

This study aims to provide a guideline for the ecosystem restoration and the sustainable resource use in the rangelands of North-East Asia. We will provide the scientific evidences of that to where, and which combination of countermeasures can provide the most effective restoration and

sustainable land management. This can contribute directly to the desertified land as the concrete prescription for desertification, to United Nations Convention to Combat Desertification, and UN Convention on Biological Diversity.



# Sustainable Societies and Policies for their Implementation

## Research on Urban Transport Strategies through the Package Approach to Conserve the Global Environment (2005-2007)

Principal Investigator : **Yoshitaka AOYAMA**, Hiroshima Institute of Technology

<H-051>

Hiroshima Institute of Technology, Kobe University, Okayama University, Nihon University, Doshisha University, Meijo University, Nikken Sekkei Research Institute, Institute of Community Revitalization Research Inc., Wakayama National College of Technology

It is necessary to reduce the emission of carbon dioxide (CO<sub>2</sub>) in order to prevent global warming. From the viewpoint of energy consumption, it is advised that as many people as possible should be converted from using cars to using public transportation. The present project team has researched into public transportation systems such as LRT (Light Rail Transit), technology,

administration, finance, and education of European urban cities. Moreover, we have developed a mode choice model considering transport strategies through the package approach and LRT image. We will ultimately propose transport strategies suitable for and feasible in Japan that have incorporated the related areas above.

## A Research on Lifestyle Change and Efficient Measures and their Effectiveness of Information Dissemination for the Environmental Issues (2005-2007)

Principal Investigator : **Midori AOYAGI-USUI**, National Institute for Environmental Studies (NIES)

<H-052>

NIES, Research Institute for Humanity and Nature

The goal of this research project is to analyze how general public perceive and understand environmental issues, which information sources are effective for better understanding, and how they connect those information to everyday actions. We examine mass media (TV, Newspapers, magazines), movies, internet sites, and regional environmental organizations and other sources by using public

opinion surveys in China and Japan. We focus on those information dissemination process and social capital, human networks, and their effects on life style change. According to monthly survey on Japanese and world's "most serious issues", global environmental issue drastically began to be paid attention and become the most serious issue in Japan after January 2007.



## Productivity, Clothing, Energy Conservation and Indoor Environment in 28°C Office (2006-2008)

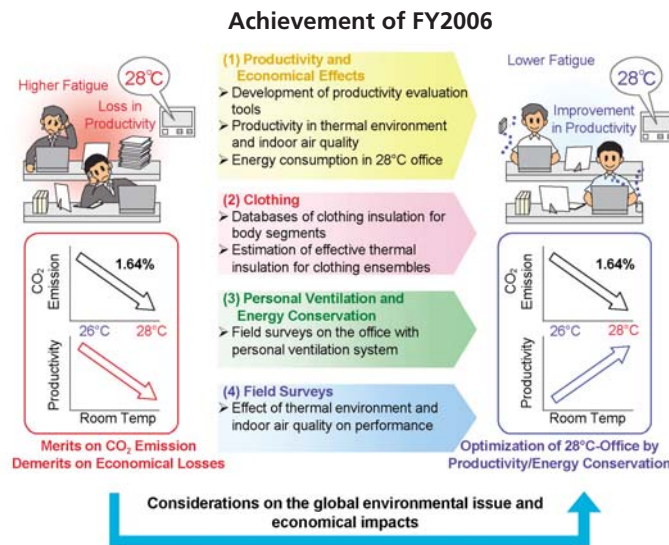
Principal Investigator : **Shin-ichi TANABE**, Waseda University

<H-061>

Waseda University, National Institute of Advanced Industrial Science and Technology, Shibaura Institute of Technology, Musashi Institute of Technology

To evaluate the effects of and to search for the best practices of offices with 28°C settings in summer, the economical effects and the degrees of energy conservation are discussed in this project. Experiments and field surveys are being conducted to quantify the effect of indoor environmental quality on the office workers' performance. Productivity Evaluation Tools were developed and

the databases on a wide variety of clothing thermal resistance were collected. From a simulation, modifying the cooling temperature presetting to be 2°C higher would result 1.64% reduction in the annual primary energy consumption. The installation of the personal ventilation systems and COOL BIZ are under evaluation.



## Research on Evaluation for Design and Achievement of Sustainable Development Scenario with Cooperation between Institution and Technology (2006-2008)

Principal Investigator : **Tatsuyoshi SAIJO**, Osaka University

<H-062>

Osaka University

This research intends to design a sustainable social institution by making mutual feedbacks from both social science and engineering insights upon covering the imperfectness of ignoring technological and regional characteristics in the traditional institution for solving the environmental problems. In addition, it aims at proposing an evaluation index system for sustainability and technological development load map. For these purposes, we suppose to apply such methodologies as experiment, field survey, historical analysis and

legislative system investigation in Shanghai, which is the most urbanistic metropolitan in China that having made energy-saving and environmental protection as its national policies, based on the information of important technological characteristics from the engineering side. Based on these studies, a reference model on which kind of environmental protection technology should be spread for the purpose of formulating sustainable societies in other regions of China in the future is therefore expected to be proposed.

## Evaluation and Alleviation of Environmental Burden due to Economic Development in Asia-Pacific Rural Areas (2006~2008)

Principal Investigator : **Chiho WATANABE**, The University of Tokyo

<H-063>

The University of Tokyo, Prefectural University of Kumamoto

Most of the rural regions in Asian-Pacific countries undergo a very rapid transition from traditional subsistence to cash-economy agriculture. Such transition entails introduction and release-accumulation of chemical substances, such as pesticides and food additives, into the local ecosystem, which in turn would affect not only the health and survival of the inhabitants, but also the

safety of local produce. Choosing seven areas from six Asia-Pacific countries, we will describe such transition and its environmental consequences in detail. Results of the surveys conducted so far appeared to reveal the diverse nature of the subsistence transition and the complexity of the way in which the transition gives impacts on the environment and people.

## Study on Architecture and Process for a Multilateral Agreement on International Climate Policies beyond 2012 (2006-2008)

Principal Investigator : **Yasuko KAMEYAMA**, National Institute for Environmental Studies (NIES)

<H-064>

NIES, Tokyo Institute of Technology, University of Hyogo, Ryukoku University, Waseda University, Institute for Global Environmental Strategies

The Kyoto Protocol sets emission targets only for years between 2008 and 2012, and targets for years beyond it need to be negotiated in the near future. The objective of this study is to come up with a concrete proposal for future climate regime beyond 2012. Such a proposal includes not only a final comprehensive picture of an international institution,

but also a negotiation process to achieve an international agreement on such an institution, as well as linkages with other international/domestic activities related to climate mitigation/adaptation activities, such as that of G8 and Asia-Pacific Partnership (APP).

## Strategic Policy Scenario Design for Sustainable Urban and Industrial System Based on the Integrated Environmental Flux Assessment for Water, Resource and Energy Circulation (2007-2009)

Principal Investigator : **Tsuyoshi FUJITA**, National Institute for Environmental Studies (NIES)

<H-071>

NIES, National Institute of Advanced Industrial Science and Technology, Keio University

This research project is to provide the integrated environmental flux assessment system for the urban scale focusing the GHG as well as local environmental emissions. Decision support system for technology and policy scenarios for urban stakeholders will be developed to identify the sustainable goals and action programs

contemplating to maximize the urban contribution for global environmental improvement while realizing the livable and sustainable local environments. Demonstrative scenario planning and evaluation process among related stakeholders in the metropolis is also implemented.

## Strategies for Sustainable National and Urban Spatial Configuration

( 2007-2009 )

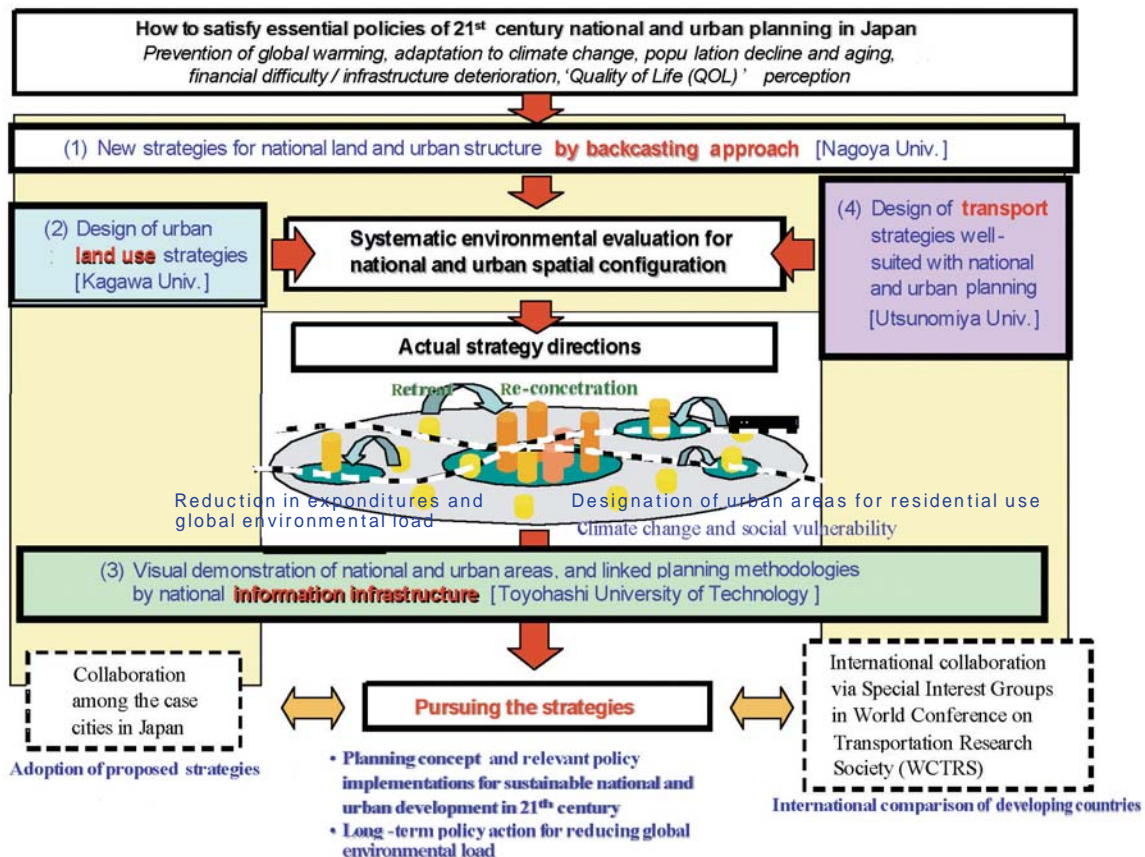
Principal Investigator : **Yoshitsugu HAYASHI**, Nagoya University

&lt;H-072&gt;

Nagoya University, Kagawa University, Toyohashi University of Technology, Utsunomiya University

This project aims at exploring a new national and urban planning concept and relevant policy measures to realize financially and socially sustainable national and urban areas in Japan in consideration of prevention of global warming and adaptation to climate change. A systematic evaluation model for national and urban sustainability is developed by integrating the models for estimating environmental load from human

activities, quality of life in residential areas, cost for maintaining built-up areas, which have been developed in land use and transport planning fields. Appropriate sustainable structure of national and urban areas, which correspond to post-Kyoto protocol to reduce GHG's emission and to deal with likely effects of climate change, and relevant policy implementations are proposed.



# Revolutionary Research in Feasibility Studies

## Development of a Super-GCM and its Application to the Modulation of Meso-Scale Weather Systems under Global Warming (2006-2007)

Principal Investigator : **Masahiro WATANABE**, Hokkaido University <RF-061>

Hokkaido University, Nagoya University, National Institute for Environmental Studies, The University of Tokyo

## Development of Observation Technique of Net Fluxes of Trace Gases and Stable Isotope Ratios of CO<sub>2</sub> for Flux Partitioning of Atmosphere-Terrestrial Biosphere CO<sub>2</sub> Exchange (2006-2007)

Principal Investigator : **Yoshiyuki TAKAHASHI**, National Institute for Environmental Studies (NIES) <RF-062>

NIES

## Global Greenhouse Gas Observation from Satellites in Post-GOSAT Era (2006-2007)

Principal Investigator : **Tsuneo MATSUNAGA**, National Institute for Environmental Studies (NIES) <RF-063>

NIES

## Studies on Contamination Status of Emerging POPs Candidates in Asia-Pacific Region and Development of New Monitoring Methods for These Compounds (2006-2007)

Principal Investigator : **Shin TAKAHASHI**, Ehime University <RF-064>

Ehime University, National Institute for Environmental Studies

## Stable Isotopic Studies on Nitrate in Natural Waters

( 2006-2007 )

Principal Investigator : **Urumu TSUNOGAI**, Hokkaido University

<RF-065>

Hokkaido University

## Development of a Population Discrimination Technique in Toxic Microalgae by Molecular Typing and Estimation of the Globalization by Human Activity

( 2006-2007 )

Principal Investigator : **Satoshi NAGAI**, Fisheries Research Agency

<RF-066>

Fisheries Research Agency

## Recycling-Oriented Society and Urban-Rural Sustainable Land-Use Planning in the Urban Fringe of Asian Large Cities

( 2006-2007 )

Principal Investigator : **Yuji HARA**, The University of Tokyo

<RF-067>

The University of Tokyo

## Assessment of Climate Change using Self-Organizing Map

( 2007-2008 )

Principal Investigator : **Norihiko SUGIMOTO**, Nagoya University

<RF-070>

Nagoya University

## Study of the Influence of Anthropogenic Species in the Atmospheric Iodine Cycle on Global Warming

( 2007-2008 )

Principal Investigator : **Yukio NAKANO**, Hiroshima City University

<RF-071>

Hiroshima City University

**Study on Sampling and Identification of KOSA (Yellow Sand) Bioaerosols for the Investigation of Health Effects of KOSA Exposure in Japan** ( 2007-2008 )

Principal Investigator : **Fumihisa KOBAYASHI**, Kanazawa University

<RF-072>

Kanazawa University, Prefectural University of Kumamoto, Kobe University

**Development of Multivariate Analysis and a Neural Network Approach for Suspended Particulate Matter (SPM) and Air Pollutants** ( 2007-2008 )

Principal Investigator : **Junko KAMBE**, Edogawa University

<RF-073>

Edogawa University

**Development of Fine-Scale Substance Transport Measurement System for Assessing the Effect of Resuspension Event of Sea Bottom Sediment on Marine Environment** ( 2007-2008 )

Principal Investigator : **Yasuyuki NAKAGAWA**, Port and Airport Research Institute(PARI)

<RF-074>

PARI

**Evaluation of the Ecological and Genetic Disturbances Caused by the Internal Invasions and Modeling of Risk Assessments on these Invasions** ( 2007-2008 )

Principal Investigator : **Norio ONIKURA**, Kyushu University

<RF-075>

Kyushu University, Gifu University

**Development of Rapid and High-Throughput Monitoring Methods for Detection of Microorganisms to Describe Complex Microbial Populations in Environment** ( 2007-2008 )

Principal Investigator : **Yuji SEKIGUCHI**, National Institute of Advanced Industrial Science and Technology (AIST) <RF-076>

AIST

## Inter and Intra-Generational Equity and Sustainability

( 2007-2008 )

Principal Investigator : **Kenji TAKEUCHI**, Kobe University

<RF-077>

Kobe University, National Institute of Advanced Industrial Science and Technology, Konan University

## Study on Sustainable Supply and Demand Systems for Bio-Fuel in Asia

( 2007-2008 )

Principal Investigator : **Atsushi MARUYAMA**, Chiba University

<RF-078>

Chiba University, Japan Automobile Research Institute, Intage, Inc.

## A Study on the Effects and Determinants of Corporate Environmental Activities

( 2007-2008 )

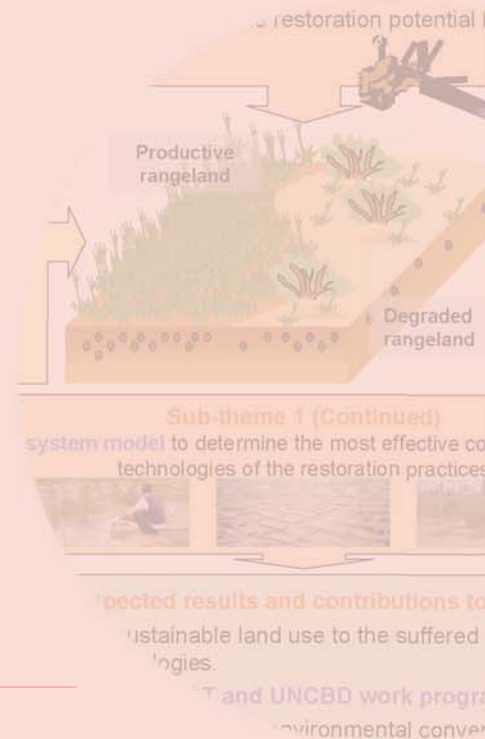
Principal Investigator : **Yuko KITORA**, Doshisha Women's College of Liberal Arts

<RF-079>

Doshisha Women's College of Liberal Arts, Osaka Gakuin University

This pamphlet provides a summary of the research projects conducted under the Global Environment Research Fund, as well as its system, research areas and basic structure of the fund. We at the Ministry of the Environment hope that this pamphlet will provide useful information for people interested in global environmental issues, and that it will encourage further activities for global environmental protection and conservation.

## GLOBAL ENVIRONMENT RESEARCH FUND



### Contact

Research and Information Office,  
Global Environment Bureau, Ministry of the Environment

1-2-2 Kasumigaseki, Chiyoda-ku, Tokyo 100-8975, Japan  
Tel: +81-3-5521-8247 Fax: +81-3-3581-4815  
<http://www.env.go.jp/earth/suishinhi/index.htm>