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

GLOBAL ENVIRONMENT RESEARCH FUND

FY2006

Contact

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Ministry of the Environment

The Global Environment Research Fund in FY2006

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:

- Ozone layer depletion
- Global warming
- Transboundary air pollution, including acid deposition
- Marine pollution (including pollution on a global scale from chemical substances)
- Degradation of natural resources (tropical deforestation, loss of biodiversity, desertification, etc.)
- Social and policy research focused on global environmental issues

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-1: Integrated Research on Carbon Budget Management in Terrestrial Ecosystems of Asia in the 21st Century (FY2002-2006)

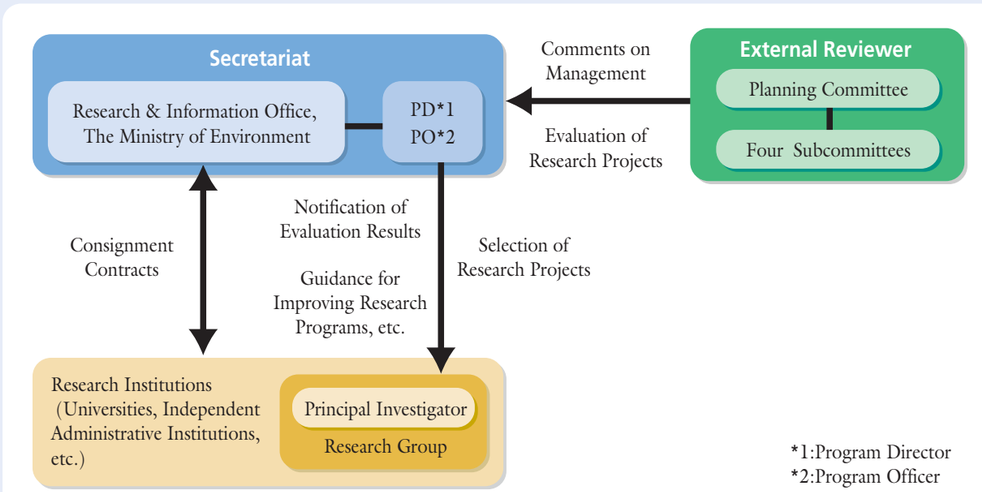
S-2: Development of GHG Sink/Source Control Technologies through Conservation and Efficient Management of Terrestrial Ecosystems – Intermediate to Long-Term Strategies for the Stabilization of Atmospheric GHG Concentration – (FY2003-2007)

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:

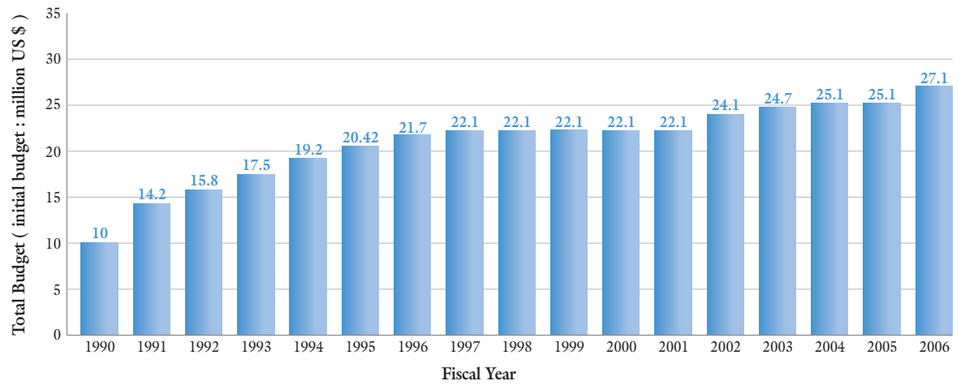
- Research projects in the Global Environmental Research Area (for which the research period is three years) will undergo intermediate evaluation in their second year.
- Research projects in the Strategic R & D Area (for which the research period is five years) will undergo intermediate evaluation in 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

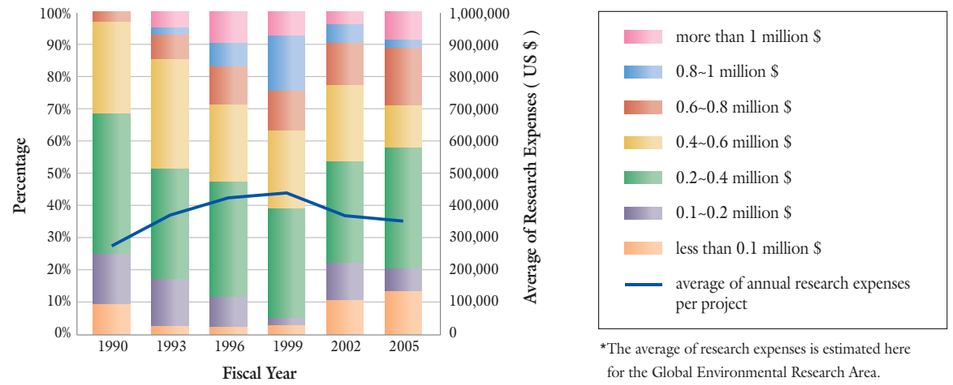
- **AIM (Asian-Pacific Integrated Model):**
  The analytic results of the AIM are utilized for policy analysis including tax systems, subsidy policies, presumed effects on the Kyoto Mechanism, and presumed effects on global warming and impacts on economics through the introduction of new technologies, 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.
- **Invasive Alien Species Impact on Ecosystems:**
  Research results are being utilized as basic data establishing areas to protect forest ecosystems 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.

Management Performance

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



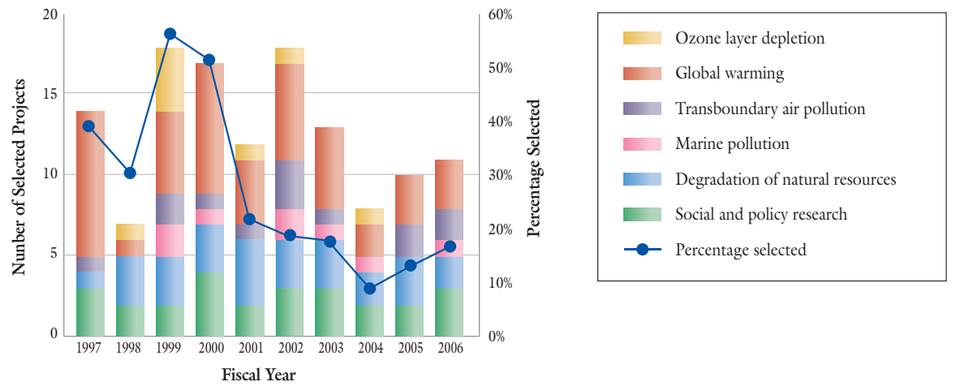
Trends in Annual Research Expenses per Project (1 US$ = 120 yen):



*The average of research expenses is estimated here for the Global Environmental Research Area.

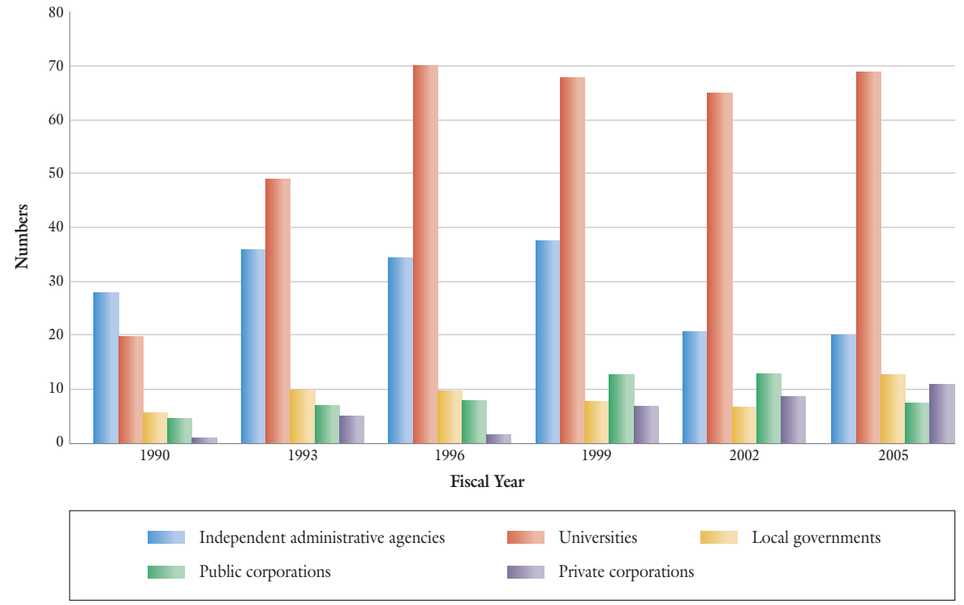
Percentages of Research Projects Selected:

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



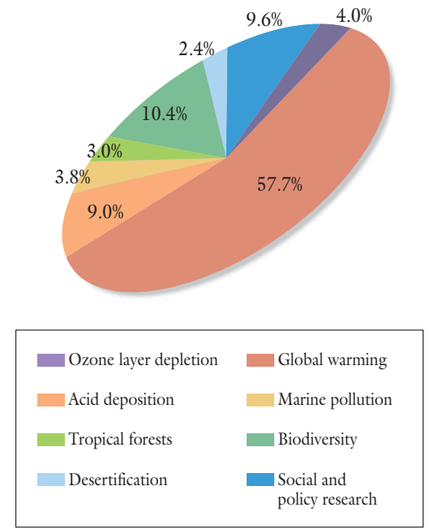
Number of Participating Institutions:

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

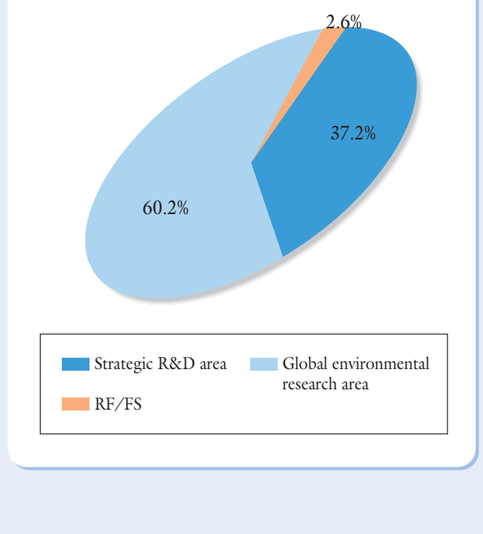


The State of Implementation of Research Areas and Research Categories:

Ratios of categories of research conducted in FY2006 (based on the budget distribution)



Ratios of areas of research conducted in FY2006 (based on the budget distribution)



Ozone Layer Depletion, Global Warming

Research on Explanation of Long-Term Trend and Prediction of Future Change of Ozone Layer (2002-2006)

Principal Investigator : **Takashi IMAMURA,** National Institute for Environmental Studies (NIES) <A-1>

NIES, The University of Tokyo, Kyushu University, Kyoto University, Nagoya University, Meteorological Research Institute, Nara Women's University, Hokkaido University

In this research project, the following investigation is being conducted: (i) numerical experiments to understand the response of stratospheric ozone to the increase of CO_2, (ii) detection of the variation of water vapor in the tropical tropopause layer and tropical lower stratosphere, (iii) determination of photochemical reaction parameters relevant to stratospheric ozone loss, and (iv) understanding of the trend and variability of stratospheric ozone in the low- and mid-latitude. The results of these works are expected to provide scientific grounds when ozone layer protection under the conditions of the increase of greenhouse gases is considered.

A Study on Elucidating Mechanisms of Polar Ozone Depletion Using Satellite Remote Sensing Data (2004-2006)

Principal Investigator : **Hideaki NAKAJIMA,** National Institute for Environmental Studies (NIES) <A-10>

NIES, National Institute of Information and Communications Technology, Kyoto University, Tohoku University, Nara Women's University, Nagoya University, The University of Tokyo

The purpose of this study is to quantitatively understand the mechanisms of polar ozone depletion, which is anticipated to recover soon, but has not yet confirmed. In order for that purpose, we will comprehensively utilize the satellites' observational data, such as ILAS-II onboard the ADEOS-II satellite launched in December 2002, and ILAS onboard the ADEOS satellite launched in August 1996. In this study, we will try to give some fundamental information on chemical and physical ozone change mechanisms, and try to answer the question: whether the ozone layer has started to recover or not.

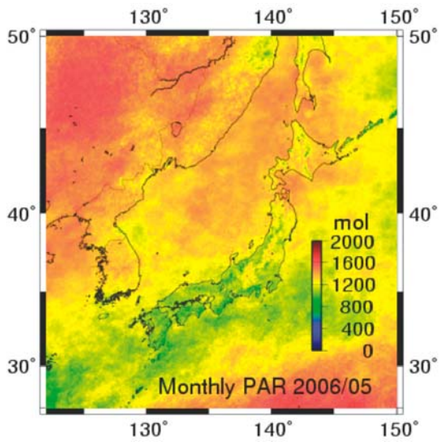
Strategic R & D Area

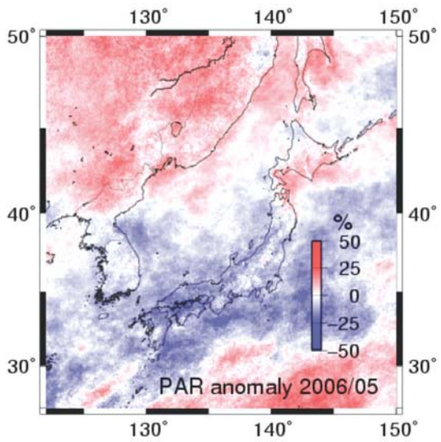
Integrated Research on Carbon Budget Management in Terrestrial Ecosystems of Asia in the 21st Century (Period Ⅰ: 2002-2004) (Period Ⅱ: 2005-2006)

Project Leader : **Takehisa OIKAWA,** University of Tsukuba <S-1>

University of Tsukuba, Meteorological Research Institute,
National Institute of Advanced Industrial Science and Technology,
Forestry and Forest Products Research Institute, National Institute for Agro-Environmental Sciences,
National Agriculture and Food Research Organization, National Institute for Environmental Studies,
Hokkaido University, Kyoto University, Gifu University, Kobe University, Shinshu University,
Okayama University, Kagoshima University, Shimane University, Tsuru University,
Tamagawa University, Ryukoku University, Hiroshima University, The University of Tokyo,
Yamanashi Institute of Environmental Sciences, Japan Wildlife Research Centre

Our greatest objective of project clarifies dynamics of carbon budget of terrestrial ecosystems in eastern Asia which are composed of various vegetations by using up-to-date technologies such as eddy covariance method, artificial satellite information, large-scale mathematical model and so on.
Gross Primary Productivity (GPP), which is one of the most significant carbon fluxes, is mainly determined by incident photosynthetically active radiation (PAR). Left and right hand side figures described below show monthly PAR distributions in May 2006, and their anomaly, estimated from artificial satellite, respectively, where they are high spacial resolution (1 km) and high frequency (daily). Based on these data, carbon fluxes in each site will be evaluated by ecosystem model.





Strategic R & D Area

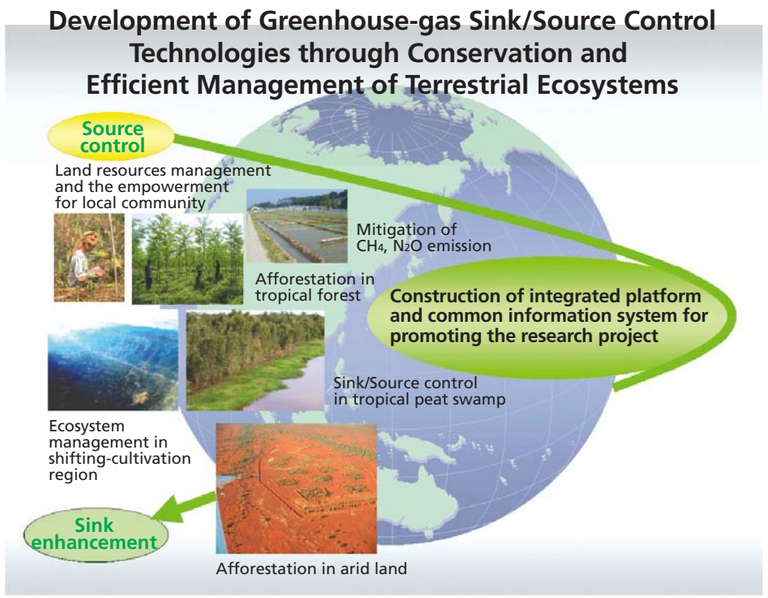
Development of GHG Sink/Source Control Technologies through Conservation and Efficient Management of Terrestrial Ecosystems – Intermediate to Long-term Strategies for the Stabilization of Atmospheric GHG Concentration –

(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 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, Nanzan University, Hokkaido Prefectural Konsen Agricultural Experiment Station,
Yamagata General Agricultural Research Center, Fukushima Agricultural Technology Center,
Niigata Agricultural Research Institute, Kumamoto Prefectural Agricultural Research Center,
Shiseido Co., LTD., Sumitomo Foresty 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 wet land, and 3) agricultural land (cultivated, slash-and-burn, and cattle lands). 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.



Strategic R & D Area

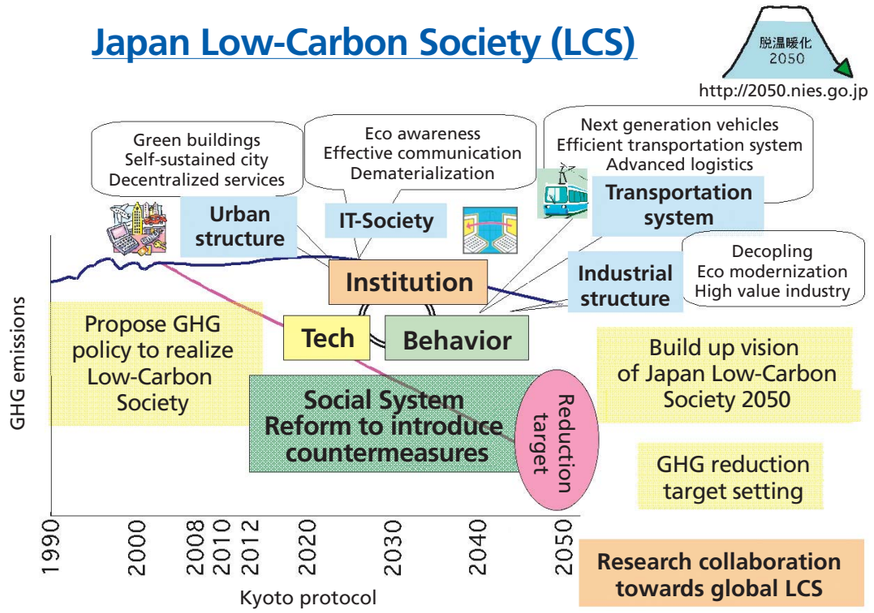
Japanese Climate Policy Scenarios towards the Year 2050

(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, Kyoto University,
Ritsumeikan University, Shiga University, Tokyo Institute of Technology, Aoyama Gakuin University,
The University of Tokyo, Shinshu University, Tokyo University of Science, University of Tsukuba,
Waseda University, Nagoya University, Kobe University, Bunkyo University, Keio University,
NEC Corporation, Fujitsu Ltd., Nippon Telegraph and Telephone Corporation (NTT)

It is necessary to reduce GHG (Greenhouse gas) emissions drastically to stabilize climate change. Japan is also required to assess its long-term global warming policy. A large part of social infrastructure is likely to be replaced by 2050. The desired Japan 2050 future images with 60-80% GHG reduction will be set and the path considering economic impact, technological possibility, institutional and lifestyle change will be simulated objectively and consistently. We have expanded our activities not only in Japan but also internationally and held the first workshop on "Developing Visions for a Low-Carbon Society through Sustainable Development" inviting researchers and governmental officials from around 20 countries in collaboration with UK research institutes.



Strategic R & D Area

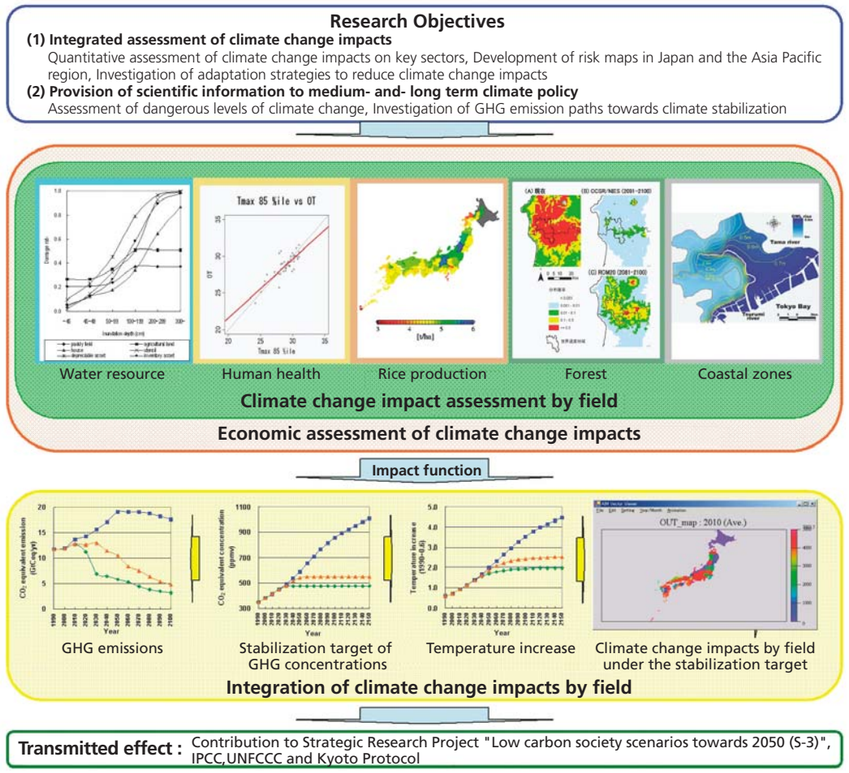
Comprehensive Assessment of Climate Change Impacts to Determine the Dangerous Level of Global Warming and Appropriate Stabilization Target of Atmospheric GHG Concentration

(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 Agriculture and Food Research Organization, 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

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, 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.



A Study on Retrieval Methods of Greenhouse Gas Contents from Satellite Spectral Data and its Application to the Sink/Source Analysis

(2004-2006)

Principal Investigator : **Tatsuya YOKOTA,** National Institute for Environmental Studies (NIES) <B-2>

NIES, Meteorological Research Institute, National Institute of Advanced Industrial Science and Technology, Japan Agency for Marine-Earth Science and Technology, The University of Tokyo, Kyoto University, Nagoya University, University of Tsukuba, Tohoku University

The Greenhouse Gases Observing Satellite (GOSAT) project is now underway in Japan. This research aims to retrieve the precise CO_2 column densities of greenhouse gases, mainly under clear sky conditions. However, we plan to use the GOSAT data efficiently even in the presence of thin clouds (cirrus) and aerosols. Before launching the satellite in 2008, we will use ground-based and airborne measurements to clarify the characteristics of the data under thin clouds/aerosols contaminated conditions. At the same time, we will research and develop methods to utilize the satellite data in carbon source/sink estimation models. In the 2005 fiscal year, we obtained and analyzed observational data from the summit of Mt. Tsukuba (Japan) and airship measurement data using a sensor similar to one employed by the GOSAT. The outcomes should contribute to the GOSAT data processing and utilization, during the first commitment period of the Kyoto Protocol (2008-2012).

Aerosol and Cloud Environmental Studies with Combined Active and Passive Sensors (ACECAP)

(2002-2006)

Principal Investigator : **Teruyuki NAKAJIMA,** The University of Tokyo <B-4>

The University of Tokyo, National Institute of Information and Communications Technology, National Institute for Environmental Studies, Tohoku University, Chiba University, Fukui University

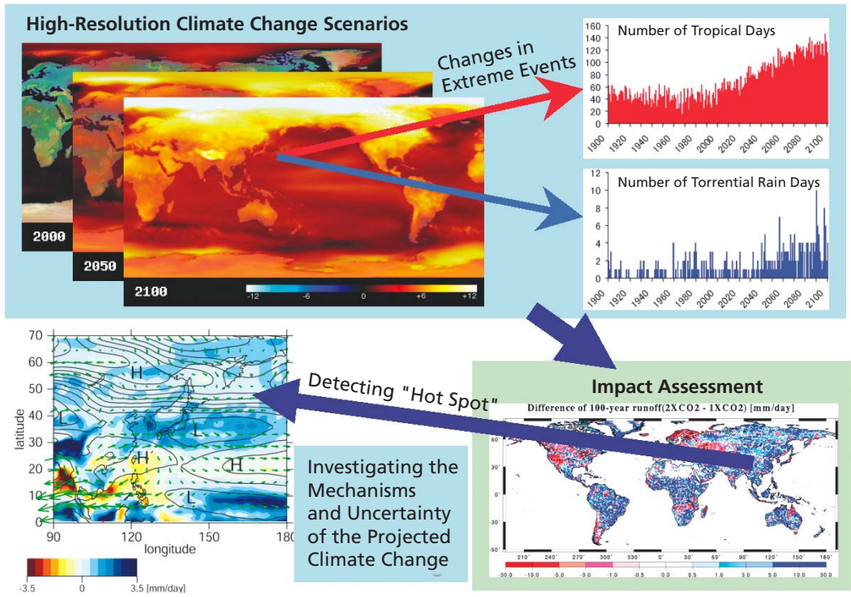
This study has developed a new monitoring system with simultaneous use of cloud radar and lidar for better assessment of direct and indirect climate effects of clouds and anthropogenic aerosols. Applying this system to land-surface and the research vessel 'Mirai' cruises, we have obtained various vertical profile data of aerosol and cloud characteristics covering the Arctic to tropical regions. Comparing the results with simulation results from our aerosol-cloud model, we confirmed the cloud lifetime effect that air pollution can increase the lifetime of low level clouds. This monitoring system will open a new era of 3 dimensional aerosol and cloud observation along with NASA-ATRAIN system just established in 2006 with a cloud radar satellite and a lidar satellite.

Impact Assessment of Future Climate Change Using High-Resolution Climate Change Scenarios including Extreme Events (2004-2006)

Principal Investigator : **Seita EMORI,** National Institute for Environmental Studies (NIES) <B-12>

NIES, Nagoya University, The University of Tokyo

The impact of future climate change will be assessed considering the effects of extreme events such as torrential rain and heat wave, using climate change scenarios generated by the latest computer simulation. The impact of climate change on water resource, water disaster, agriculture and human health will be assessed on a global scale, after the extreme events in the climate simulation is validated. The mechanism and uncertainty of climate change causing serious impact will also be examined. The results are expected to contribute to the IPCC 4th Assessment Report.

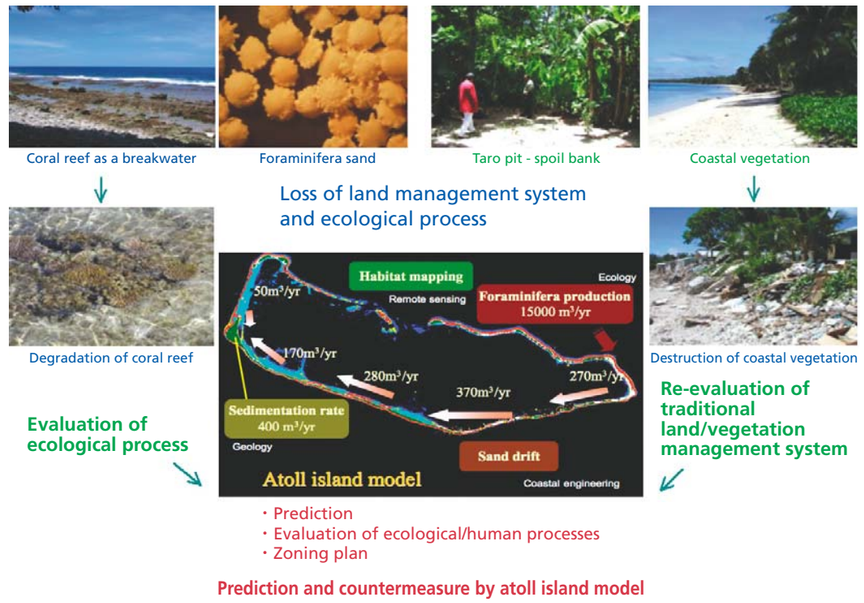


Research on Sustainable Land Management in Atoll Island Countries (2003-2007)

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 evaluated these processes and constructed "atoll island model" to predict future landform changes, and to establish countermeasures and zoning plan for sustainable land management.



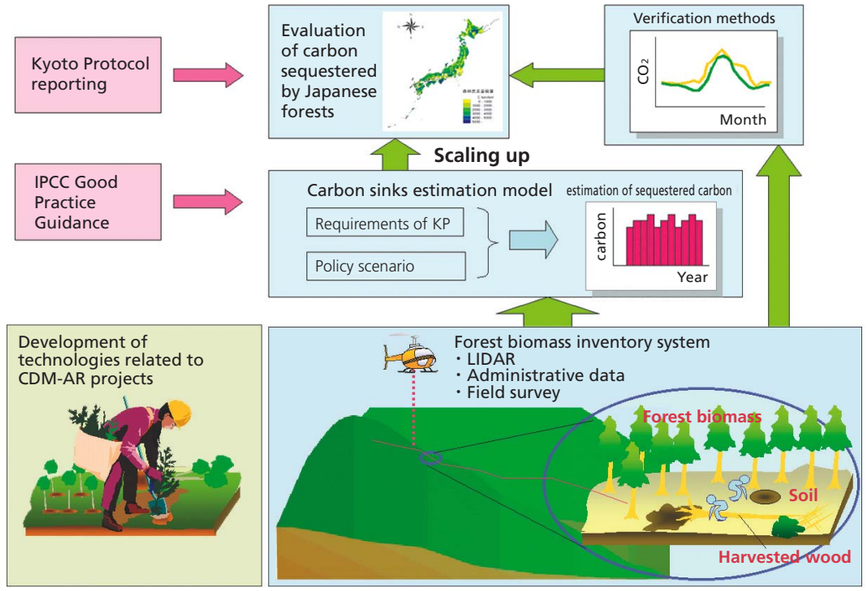
Development of Evaluation Model for Carbon Sink

(2002-2006)

Principal Investigator : **Masahiro AMANO,** Waseda University <B-60>

Waseda University, Meteorological Research Institute, Forestry and Forest Products Research Institute, National Institute for Environmental Studies, The University of Tokyo, Ehime University, Miyazaki Prefectural Wood Utilization Research Center

This research has implemented to develop a specific national inventory system to meet the requirements of Kyoto Protocol. The inventory system clarifies the amount of carbon sequestration in five carbon pools which are composed of aboveground and belowground biomass, litter, dead wood, and soil. In addition to domestic forest function to absorb carbon from the atmosphere, the project has studied several issues related to AR/CDM projects. The carbon pool in harvested wood products is studied for the second commitment period. The results derived from this project are expected to contribute UNFCCC reporting and supplementary requirements under the Kyoto Protocol.



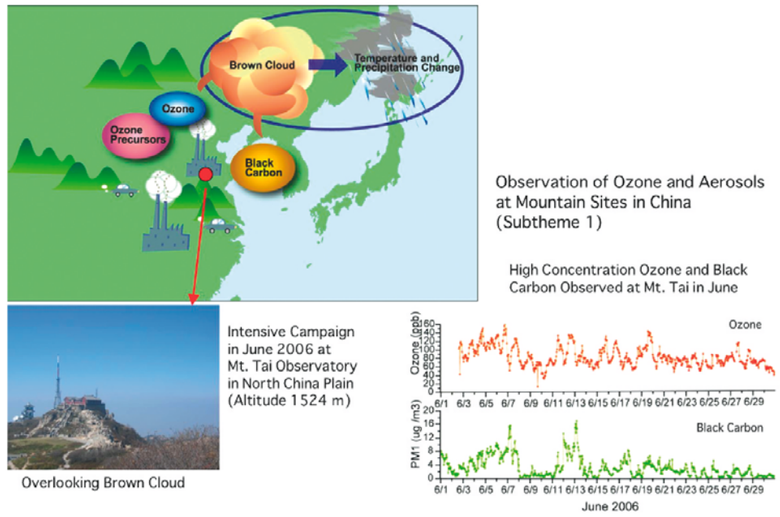
Spatio-Temporal Variability and Climate Impact of Ozone and Black Carbon in Asia

(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 regional climate change. For this purpose, intensive observation of ozone and aerosols was made inside China, where observation was very sparse. The real situation of region-wide air pollution was revealed for the first time. In a research using a model, it was elucidated that ozone transported from Europe and North America over Eurasian continent reaches Asia, and give impact to Japan overlapping with the contribution from Asian continent.



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 have been used to prepare the IPCC 4th 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, Ryukoku University

Our time-series modeling method applied to satellite remote sensing could reveal the changes of 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 in the ground. The effects of forest fires, which severely damage forest ecosystem and emit CO_2 gas, have been brought out in several aspects. We are now integrating these information and expecting to estimate the carbon storage and fixation in Russia. This study will bring about good prospect to contribute to forest management in Russia to combat 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, Tokyo Metropolitan University, The University of Tokyo, 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 21st century.

Asian Precipitation - Highly-Resolved Observational Data Integration towards 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 high-resolution General Circulation Models (GCMs) have allowed us to improve our understanding of the regional impacts of global warming on water resources. 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.

Transboundary Air Pollution including Acid Deposition, Marine Pollution

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

Principal Investigator : **Shiro HATAKEYAMA,** National Institute for Environmental Studies (NIES) <C-051>

NIES, 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 the 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 under way. The data obtained on the way of air-mass-transport will be input to the simulation model and the large scale air pollution in the East Asia is studied as a whole in order to make it possible to propose measures for the large scale 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

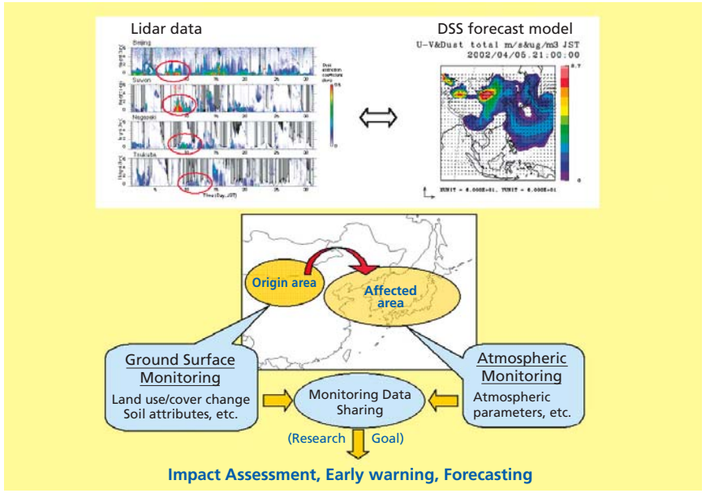
The objective of the study is estimating the changes in nitrogen cycle induced by atmospheric deposition in East Asian ecosystems. Field measurements have been made in China and Thailand to clarify the nitrogen saturation and acidification processes. A model is created to predict the future nitrogen emission mainly from agricultural sector based on the trends of food supply and population dynamics, and to evaluate the nitrogen accumulation/leaching in the ecosystems. 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 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

Dust and sandstorm (DSS, including kosa) problems have been recognized as the environmental common issues in northeast Asia. Long-range transport of DSS links the biogeochemical cycles of land, atmosphere and ocean, and it gives seriously influence to human activities. To develop an useful forecast, early warning models, as well as, to solve various environmental problems of DSS in northeast Asia countries, a regional cooperative monitoring network by Lidar, PM 10 instruments must be established in this region.



Overall scheme of scientific objective and methodology for DSS 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

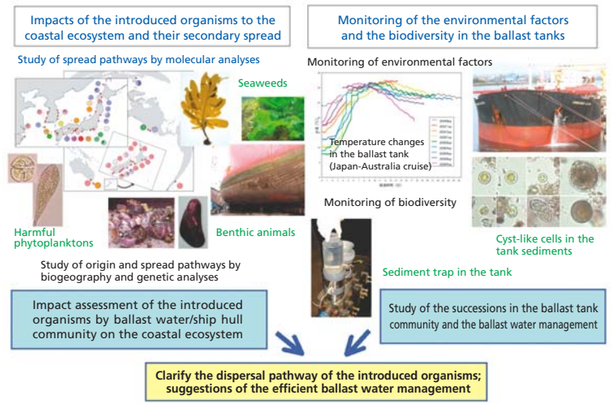
Surface ozone concentration is rising rapidly in East Asia due to increasing emission of Nitrogen Oxides and other pollutants. This raises serious concerns about the risks in vegetation and losses of crop production in this region, particularly in eastern China, which constitutes the world's largest crop production area. In this program, we will conduct computer simulation of ozone production and transportation, field observations of ozone deposition to vegetation, and field experiments on the crop losses. Combining the results of these studies, we will predict the risks to vegetation and the losses of crop harvest caused by the increase in surface ozone in the future. Our findings will underpin scientifically the policy-making efforts towards the conservation of air quality in East Asia.

Studies of Impact of Marine Organisms Introduced by the Ballast Water/Ship Hull Community on Coastal Ecosystems and the Efficient Management of Ballast Waters (2004-2006)

Principal Investigator : **Hiroshi KAWAI,** Kobe University <D-4>

Kobe University, Mie University, National Institute for Environmental Studies, The university of Tokyo, University of Shizuoka, Tokai University

In order to elucidate the processes contributing to intercontinental introductions of marine organisms and to assess their impacts on coastal ecosystems, 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 genetic diversity of representative introduced taxa in the international port areas of Japan and overseas. 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. To date, we have elucidated the genetic diversity of *Undaria pinnatifida* (wakame-kelp), *Ulva pinnatifida* and *Xenostrobus securis* in the native and introduced regions, and discussed the spread pathways, and also clarified the dynamics of biota in the ballast water tanks of an inter-continent balk carrier.



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, Hiroshima University, Fisheries Research Agency

We investigate the marine ecological deterioration such as the outbreaks of Harmful Algal Blooms (HABs) and jellyfish based on the "silica deficiency hypothesis" as follows. While the discharge of nitrogen (N) and phosphorus (P) to the sea is increasing, effluence of silicon (Si), which is supplied by the natural weathering, tends to be hampered by large dams. This shift in the nutrient ratio is advantageous to non-diatom phytoplankton such as dinoflagellates (non-siliceous and potentially harmful) over diatoms (siliceous and mostly benign). It also let the eutrophication substances be retained in the upper layer because the non-diatom phytoplankton does not put them down from the upper layer so effectively as the diatoms do. The retained substances will make the food web including the jellyfish hypertrophic. We develop an ecosystem model and apply it to four major river-sea systems such as the Three-Gorge Dam - Changjiang - East China Sea and evaluate the causality between the anthropogenic factors and the marine ecological deteriorations.

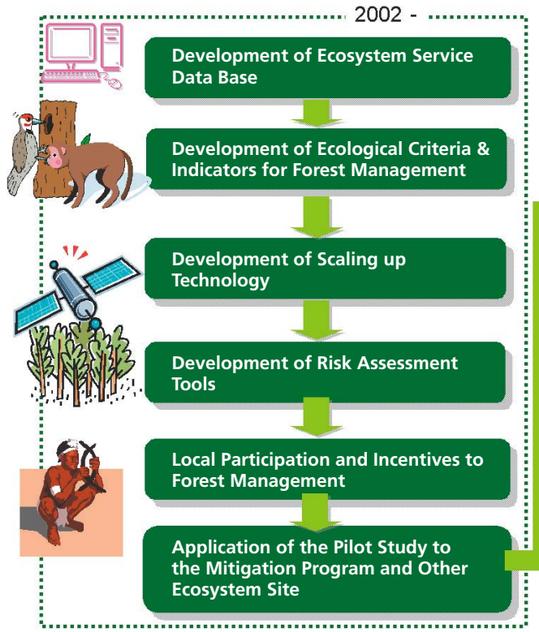
Degradation of the Natural Resources

Studies on Ecosystem Management Approach in Tropical Landscapes (2002-2006)

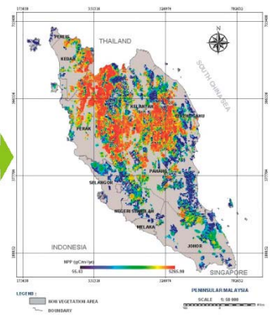
Principal Investigator : **Toshinori OKUDA,** Hiroshima University <E-4>

Hiroshima University, National Museum of Ethnology, Forestry and Forest Products Research Institute, Gifu University, Japan Wildlife Research Center

With the aim of providing new and strategic environmental assessment tools to view the current state of degradation of forests and to forecast future environmental threats to forests from landscape changes, we have focused our efforts on a pilot study area in Peninsular Malaysia. Towards this goal, we gathered available information on ecosystem services and established database by analyzing the inter-linkage between these ecosystem services and values. We are also developing risk assessment tools that can provide baseline information on ecosystem services and values and, in turn, cost- benefit analysis of landuse changes.



An expected output



Mapping of ecosystem services in broader area (e.g. Peninsular Malaysia) (2005-)

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

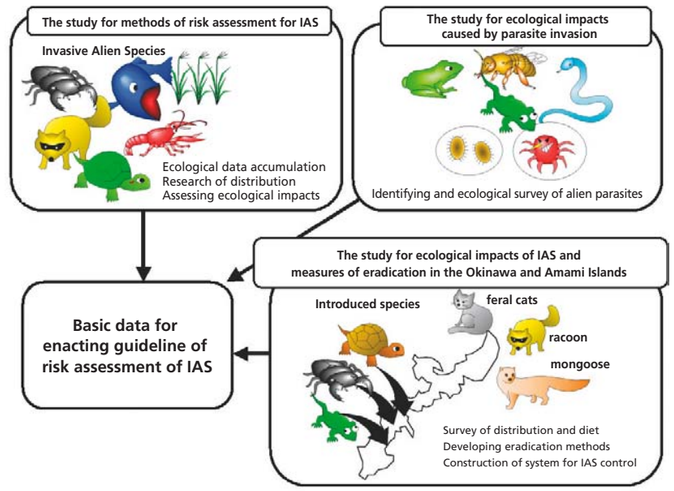
We study the recovery process of damaged tropical forests to the original diversified ones through the reconstruction of symbiotic system among plants and soil microorganisms in Indonesia. Since disaster of forest fire in 1998, plants and microorganisms changed drastically though soil properties did only a little. About 650 species of trees in 5 ha research area changed the dominance according to their abilities in sprouting, photosynthesis, seed dispersal, etc. The microorganisms also changed: nitrogen fixing bacteria coexisting with legume trees was abundant in early stages of recovery, mycorrhiza increased gradually in later stages with the increase of host trees, *Dipterocarpaceae*, the most dominant family in this area.

The Study for Methods and Measures of Invasive Alien Species Risk Assessment (2004-2006)

Principal Investigator : **Kouichi GOKA,** National Institute for Environmental Studies (NIES) <F-3>

NIES, Yambaru Wildlife Center, Forestry and Forest Products Research Institute, The University of Tokyo, Hokkaido University, Tohoku University, University of the Ryukyus, Azabu University, Lake Biwa Museum, World Wild Fund for Nature Japan

In Japan a new law "Invasive Alien Species Act" has been in force since June 2005 aiming to control invasive alien species (IAS). In our study, we aim to clarify ecological impacts caused by the IAS through experiments and researches, and to develop methods for risk assessment. As well, we focus on and reveal ecological risks caused by invasion of parasites attached with alien species. Furthermore, we are constructing the system for eradication and control of the IAS in the Okinawa and Amami Islands, where are treasuries of endemic species and should be regarded as important area of the Japanese biodiversity. Results from these studies will enhance awareness of the IAS problems in the people, and will lead the future course of definite policies for the IAS control.

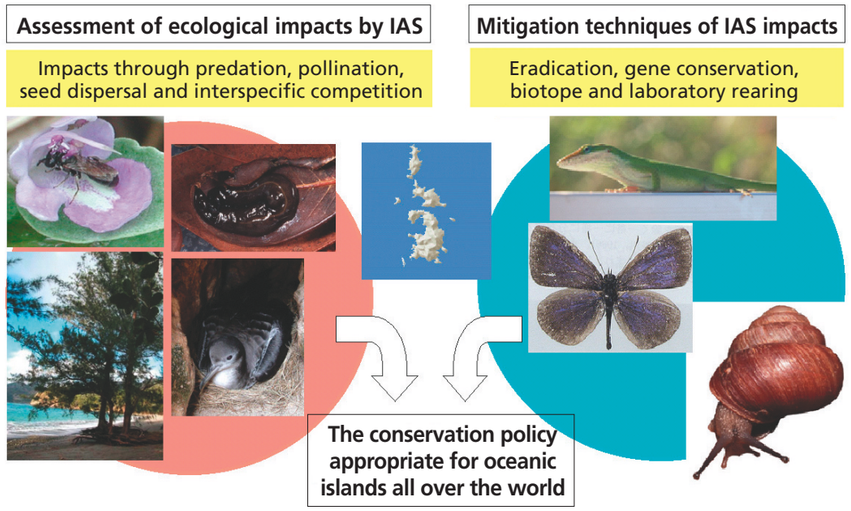


Impacts of Invasive Alien Species on Biodiversity and Fragile Ecosystems in the Oceanic Ogasawara (Bonin) Islands (2005-2007)

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. The 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 Ogasawara.



Targets (IAS) :
Pollinator (*Anolis carolinensis* predate endemic pollinators)
Interspecific competition (invasive alien plants)
Seed dispersal agents (*Zosterops japonicus*)
Predator1 (cats predate seabirds)
Predator2 (*Platydemus manokwari* predate endemic land snails)

Targets :
for eradication: *Anolis carolinensis*
for laboratory rearing and biotope:
Endemic insects
for gene conservation and laboratory rearing:
Endemic land snails

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

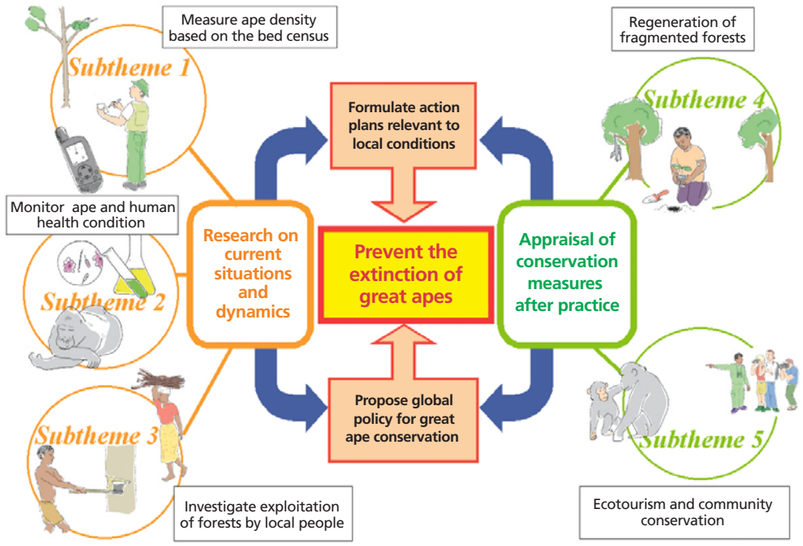
Alpine/subalpine ecosystems are important landscape resources with unique biodiversities and provide goods and services to >10% of population in Japan. However, these are expected to be highly vulnerable to climate change impacts. This project examines biological interactions and environmental properties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

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

In order to save the great apes from extinction, this study first aims to formulate realistic conservation action plans relevant to diversified local conditions, and finally to propose a global policy for the great ape conservation to an international forum such as GRASP. Research consists of (1) extensive survey of ape distribution and population density based on the bed census, (2) monitoring of health conditions of apes and human inhabitants by the examination of feces, urine and other samples, and (3) investigation of the nature and degree of the forest exploitation by human inhabitants. In parallel with these, we appraise the effect of some conservation measures after their practice. Such research includes (4) study of regeneration of fragmented forests using the "hexatube" and (5) pursuit of sustainable ecotourism and community conservation.



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

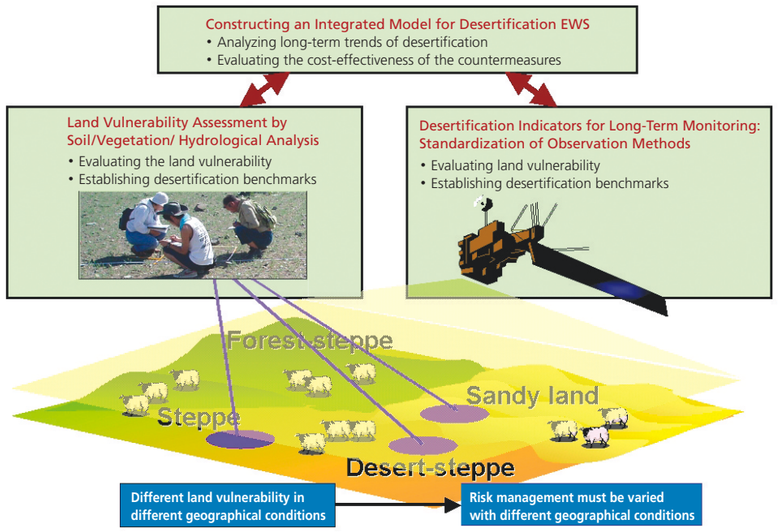
To prevent the extinction of endangered avian species in Japan, we plan to perform an epidemiological survey and to study the route of infection of West Nile virus (WNV) as well as blood parasite infection in snipes and plovers that migrate from Siberia to Australia and New Zealand via Japan. Blood parasite and the WNV are both transmitted by blood-sucking insects. Therefore, we will initially conduct an epidemiological survey of blood parasites in snipes and plovers at breeding sites, stopping points and wintering places. We will then use the results of this survey to estimate the route of the WNV transmission and to establish an effective system to evaluate the risk of infection with the WNV to endangered avian species in Japan.

A Pilot Study in North-East Asia for Developing Desertification Assessment and Constructing an Early Warning System (EWS) (2004-2006)

Principal Investigator : **Kazuhiko TAKEUCHI,** The University of Tokyo <G-2>

The University of Tokyo, National Institute for Environmental Studies,
National Institute for Agro-Environmental Sciences, Okayama University, Chiba University,
University of Tsukuba, Hiroshima University

The goal of this pilot study is to develop desertification assessment and Early Warning System (EWS) in North-East Asia. The desertification mechanism in each geographical condition has been understood in the target area. We have started to develop an integrated model to make it possible to evaluate long-term desertification trends, and to propose the most cost-effective land use plan and ecosystem management. This pilot study will make an important contribution to establishing a system of sustainable use of biological resources in North-East Asia, and was reported to UNCCD COP7 as the official proposal of Japanese government.



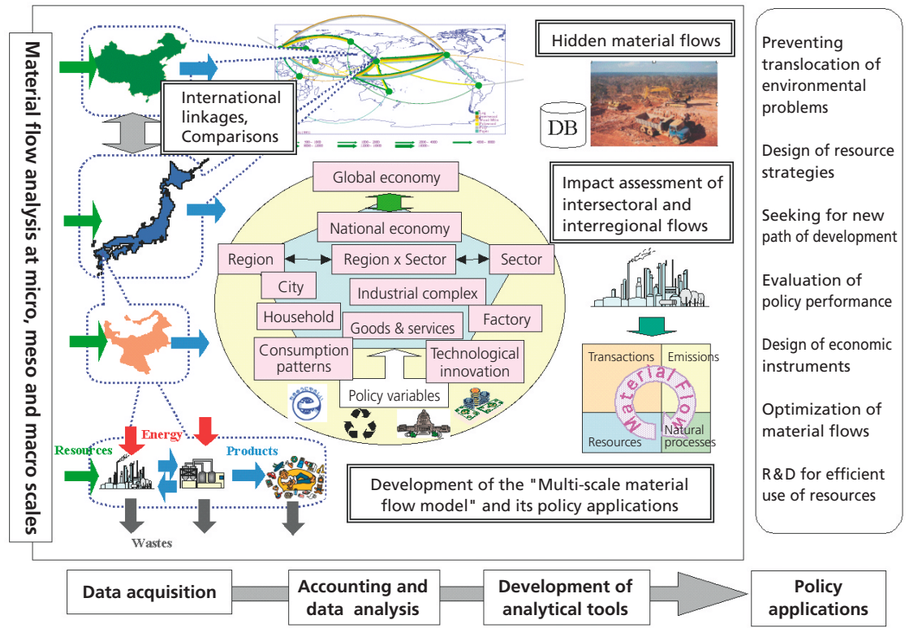
Social and Policy Research focused on Global Environmental Issues

Study on Material Flow Models to Assess Achievement towards Sustainable Production and Consumption (2004-2006)

Principal Investigator : **Yuichi MORIGUCHI,** National Institute for Environmental Studies (NIES) <H-9>

NIES, National Institute of Advanced Industrial Science and Technology, National Institute for Materials Science,
The University of Tokyo, Nagoya University, Osaka University, Wakayama University,
Hiroshima University, Doshisha University

This study aims to develop models to analyze relationships between the economy and the environment by capturing material flows associated with economic activities, such as extraction of resources, transaction of commodities as well as emissions of environmental burdens like GHGs and solid wastes. Special attention is paid to indirect environmental burdens such as “hidden flows” behind imported natural resources and products, which are induced by inter-spatial and inter-sectoral material flows in a global economy. Outcomes of the study are expected to play the role of the compass, guiding us towards sustainable production and consumption goals.



Legal Principles for Guiding the Medium and Long Term International Regime against Global Warming (2004-2006)

Principal Investigator : **Tadashi OTSUKA,** Waseda University <H-7>

Waseda University, National Institute for Environmental Studies, Japan Coast Guard Academy, Meiji Gakuin University, Ryukoku University, Rikkyo University, International Christian University, Tokai University, Tokyo Metropolitan University, Rakuno Gakuen University, Institute for Global Environmental Strategies

The ultimate goal of our project is to present a proposal for an international mid- or long-term system for prevention of global warming. We have focused on environmental law principles, like the polluter-pays principle, common but differentiated responsibility principle and principle of ability to pay, as bases for such international system. We will propose a legal model for an international system which includes both international agreeability and environmental effectiveness. It will provide a meaningful input for the discussion on the post-Kyoto regime.

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

Principal Investigator : **Yoshitaka AOYAMA,** Hiroshima Institute of Technology <H-051>

Hiroshima Institute of Technology, Kyoto University, Okayama University, Nihon University, Osaka University, Meijo University, Nikken Sekkei Ltd., Institute of Community Revitalization Research Inc.

It is necessary to reduce the emission of carbon dioxide (CO_2) 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, law, and education of European urban cities. Moreover, we have simulated the reduction of CO_2 emission by introducing transport strategies through the package approach, and analyzed their effect on the regeneration of the central urban area. 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

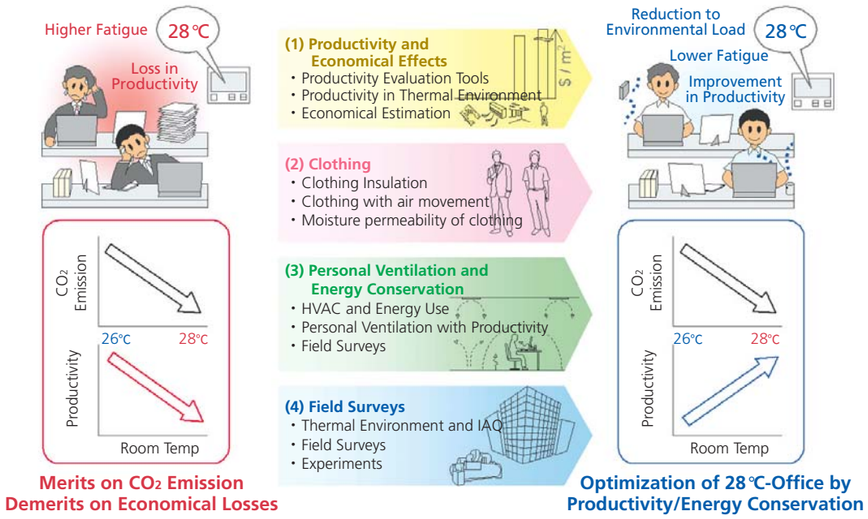
The goal of this research project is to analyze how general public perceive and understand environmental issues, which information sources are effective for better understanding, and how they connect those information to everyday actions. We examine mass media (TV, newspapers, magazines), movies, internet 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. In 2006, our results show that the attention of global warming is growing rapidly.

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

Principal Investigator : **Shin-ichi TANABE,** Waseda University <H-061>

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

To evaluate the effects of and to search for the best practices of offices with 28℃ settings in summer, the economical effects and the degrees of energy conservation are investigated in this project. Experiments and field surveys are conducted to quantify the effect of indoor environmental quality on the office workers' performance and comfort. COOL BIZ and personal air-conditioning systems are also evaluated through field surveys. When the advantages and effectiveness of 28℃-offices were proved, the technologies and the know-how can be applied to hot and humid regions in the world and can contribute to tackle the global environmental issues.



Merits on CO_2 Emission
Demerits on Economical Losses

Optimization of 28℃-Office by Productivity/Energy Conservation

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. In this project, choosing seven areas from six Asia-Pacific countries, we will describe such transition and its environmental consequences in detail and, through systematic analyses, reveal the interrelationship between the transition and the changes of local chemical environments. Final goal of the project will be to make a policy recommendation to minimize unnecessary adverse consequences of such transition.

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

The Kyoto Protocol sets emission targets only for the five years between 2008-2012, and targets for years beyond it need to be negotiated in the near future. The objective of this research project 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, such as that of G8 and Asia-Pacific Partnership (APP).

Feasibility Studies

Environmental Tax Reform and its Impacts on Technological Innovation (2005-2006)

Principal Investigator : **Tetsuo ONO,** Osaka University <FS-053>

Osaka University, Shiga University, Osaka University of Economics

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_2 for Flux Partitioning of Atmosphere Terrestrial Biosphere CO_2 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