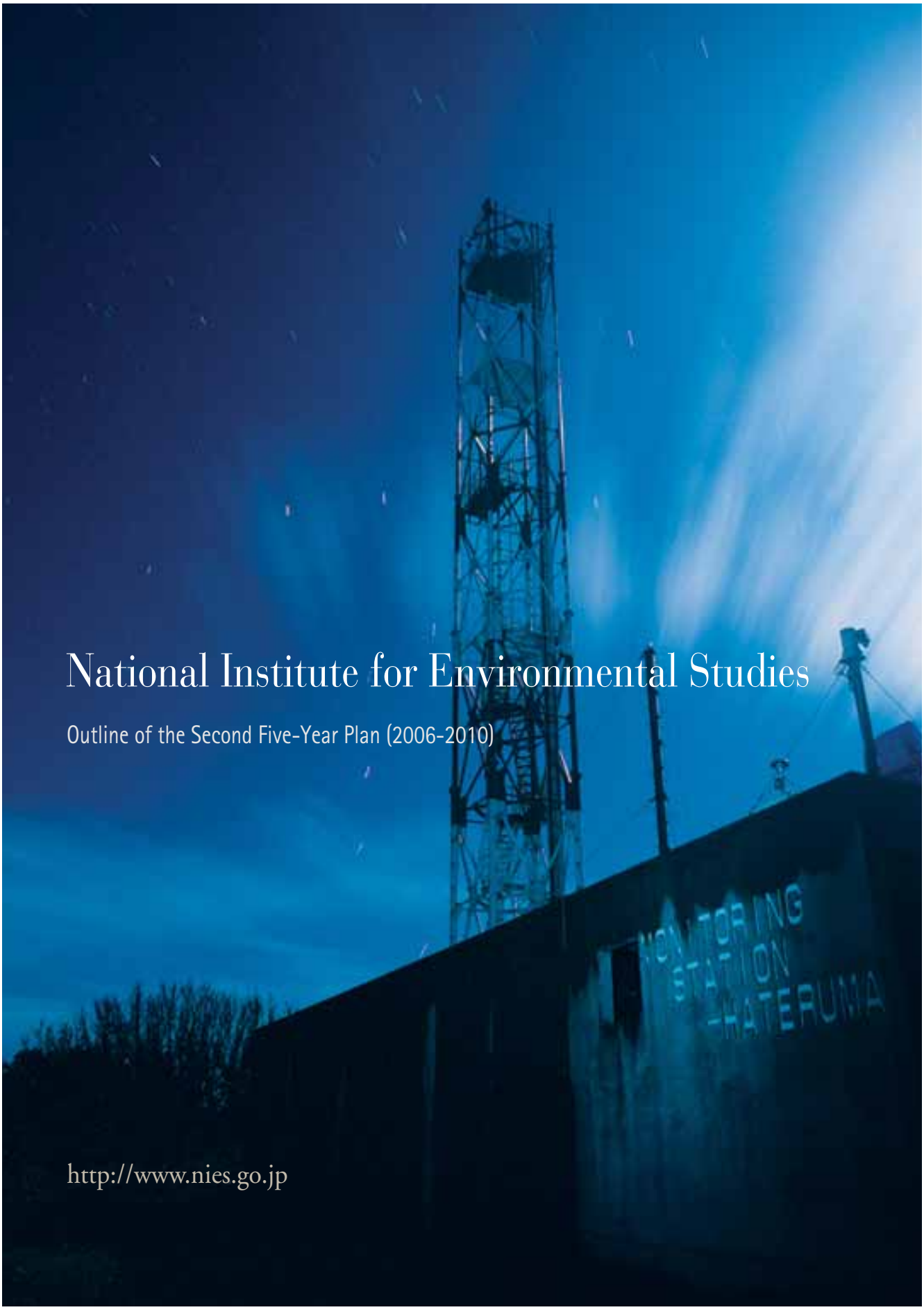


National Institute for Environmental Studies

Outline of the Second Five-Year Plan (2006-2010)

http://www.nies.go.jp

Foreword

The National Institute for Environmental Studies (NIES) has been focusing on solving environmental issues since its establishment in 1974. NIES provides a scientific and technological infrastructure for environmental administration with integrated and interdisciplinary research on a wide range of issues. Our framework allows us to focus comprehensively on environmental issues with the cooperation of experts in diverse fields ranging from pure sciences, engineering, agricultural sciences, medical sciences, pharmacology, and fishery sciences, to law and economics.

Environmental issues have evolved from serious regional problems such as pollution to long-term global scale issues such as climate change, the creation of a recycling society, and the deterioration of ecosystems, all of which have a basis in human activity. Since the Kyoto Protocol came into force, the importance of scientific research has become especially important in the efforts to mitigate climate change. We are now required to come up with specific plans for the second commitment period. Furthermore, problems such as environmental risk, the establishment of a society with sustainable material cycles, and the worsening of the environment in the Asian region require a multifaceted approach including not only the natural sciences, but also the social sciences.

In April 2006, NIES embarked on its second five-year plan as a newly established independent administrative institution. Environmental problems are becoming increasingly complicated, and as an organization that serves as a focal point of experts, we have a wide range of knowledge that we can apply to our research. Along with our contribution to domestic and international environmental policies, we can act as a font of information that can be used to solve such complex environmental problems.

As NIES continues to expand and enhance its activities, we ask for your support and cooperation to help us reach our goals.

OHGAKI, Shinichiro
President

History

History of NIES and Major Environmental Events

July 1971	Environment Agency established Worsening of photochemical smog (from end of 1960s) Court judgments on four major pollution cases (1971-73)
March 1974	National Institute for Environmental Studies established
May 1974	Dr. Roland and Dr. Molina report on the depletion of the ozone layer
November 1988	Intergovernmental Panel on Climate Change (IPCC) established
July 1990	NIES restructured to cover global environmental research
October 1990	Center for Global Environmental Research established
May 1992	Basic Environment Law enacted in Japan
December 1997	Kyoto Conference on Global Warming (COP3 of the UN Framework Convention on Climate Change)
January 2001	Environment Agency becomes Ministry of the Environment as part of administrative reform Waste Management Division established at NIES
April 2001	NIES established as an independent administrative institution First Five-Year Plan (2001-2005)
April 2006	Second Five-Year Plan (2006-2010)

View of the institute approaching Mt. Tsukuba

Strategic Research that will lead to a Sustainable Society

The National Institute for Environmental Studies endeavors to solidify its role as a core research organization for environmental issues, while making the most efficient use of its resources. The institute works to address issues that have been identified as priority topics. In our five-year plan (2006-2010), we aim to allocate our resources strategically and dynamically in order to both enhance our research activities and make our operations more efficient. In addition, we will actively work to share our research results and collect, organize, and disseminate environmental information.

1. We have chosen four fields on which to focus our research resources:
   Climate Change, Sustainable Material Cycles, Environmental Risk, and the Asian Environment.
2. We undertake advanced, farsighted fundamental research on a continuous basis for the safety and security of our society.
   We are able to procure competitive funding on the basis of our fundamental research, which forms the backbone of our institute, and that allows us to maintain our top-level standing within the country.
   Furthermore, we are working hard to create an intellectual infrastructure that will let us build research networks and implement our research more effectively.
3. In addition to actively disseminating our most recent research results, we collect and categorize environmental information so that it can be distributed in an easy-to-use format through various media such as the internet.

■ Overview of the Second Five-Year Plan (2006-2010)

Focusing our Resources on Four Priority Programs

We have identified four areas of research on which to focus our combined resources.

Climate Change	We will use the institute's collective strength to perform research on climate change and its impact through monitoring and modeling, and create targets and scenarios that will lead us toward becoming society that ceases to induce climate change.
Sustainable Material Cycles	Our research focuses on materials and substances in order to envision a sound material cycle society. We outline the social mechanisms and technology systems that are necessary to achieve such a society based on appropriate waste management and material cycles.
Environmental Risk	We perform comprehensive research on how to assess environmental risks, such as the effects of chemical substances, invasive species, and nanoparticles on human health and ecosystems.
Asian Environment	In the Asian region, with developing countries experiencing rapid economic growth, we must make a concerted effort to discover paths to sustainable development. We will establish environmental management technologies and strategies for creating a society in which it is possible to live in harmony with nature by examining the problem from various vantage points, including the atmosphere, water, material cycles, and ecosystems. The expected outcome of our research is a scientific basis for providing effective policy recommendations.

Collaboration and Feedback

Maintaining high standards through the fundamental research which forms the backbone of our institute

Through our fundamental research divisions and research centers, we undertake advanced, farsighted research on a continuous basis for the safety and security of our society in order to combat potential and urgent environmental problems.

Pro-active publication of research results paired with the collection, organization, and dissemination of environmental information

In order to foster a scientific understanding of environmental issues, we disseminate a variety of environmental information from both internal and external sources and offer reports on our research activities and results. In addition, we have an effective administrative framework that supports our research activities.

Priority Program

Climate Change

Discovering Paths to Halt Climate Change

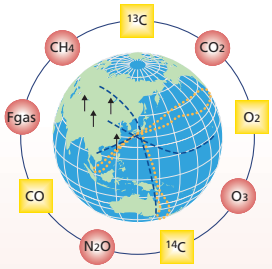
We will clarify the mechanisms of global climate change and its effects and work to predict the impact of future climate change. In addition, we will set long-term climate stability targets and determine how to move towards the creation of international and domestic societies that cease to induce climate change.

1 Long-term variation mechanisms of greenhouse gas concentrations and their regional characteristics

We are determining the spatial distribution of the sources of greenhouse gas sources and sinks and long-term changes in concentrations and flux through observation.

- Creating Japan's largest atmospheric observation net using aircraft and marine vessels. By collecting highly precise and accurate data, we can clarify the status of regional sources and sinks.
- Engaging in long-term observation of oxygen and isotopes and detecting changes in the greenhouse gas balance in order to improve forecasting methods for greenhouse gas concentrations.
- Understanding the dynamic mechanism of the balance and improving the reliability of global flux data by performing detailed flux observations of the Pacific Ocean and observations of mass transfer rates in Asian ecosystems.

Highly Precise Large-Scale Three-Dimensional Observation of Atmospheric Components



Extracting the regional characteristics of the Asia-Oceania area

Observation of vertical and horizontal distribution, chronological change

Observation of greenhouse gas state tracers

CO_2 – oxygen, isotopes (^{13}C, ^{14}C, ^{18}O), CO, distribution
CH_4, N_4O – isotopes, latitudinal distribution, chronological change
Fgas – composition ratios, regional distribution

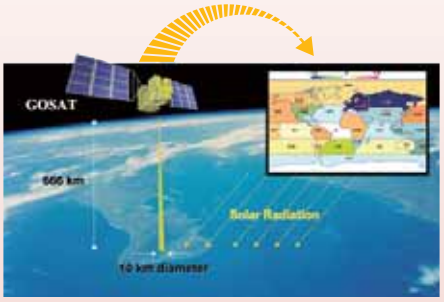
Obtaining the cooperation of commercial airlines and ocean shipping companies in order to perform exhaustive observations on the global environment

Unstaffed monitoring station

2 Greenhouse gas observation from space and use of the observations to estimate global carbon flux distribution

Using data collected from the Greenhouse Gases Observing Satellite (GOSAT), we will derive precise column concentrations of carbon dioxide, methane, etc.

- Developing data retrieval methods, which are applicable under various atmospheric conditions, using near infrared radiances measured by satellites, and verifying and validating the retrieved results.
- Improving temporal and spatial resolutions of inverse models, and obtaining more precise estimates of the distribution of the global carbon flux from the models by using satellite and ground-based measurement data.
- Revealing regional differences and seasonal changes in the global carbon flux obtained from the inverse modeling we developed.

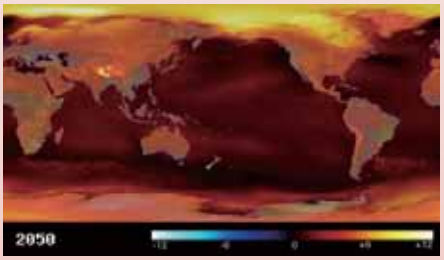


Measurement scheme of Greenhouse Gases Observing Satellite and estimating the distribution of the global carbon flux from inverse models

3 Assessment of climate risk based on integrated climate, impact, and land use models

We work to develop and integrate reliable climate, impact, terrestrial ecosystem, and land use models.

- Improving and enhancing climate, impact, terrestrial ecosystem, and land use models and creating reciprocal links among them.
- Quantifying predictions of global climate change, impact, and changes in terrestrial ecosystems and land use over the next 100 years based on a number of socio-economic development scenarios and assessing levels of certainty.



Results of climate change predictions using a supercomputer
(Joint research by CCSR, NIES, FRCGC)

4 Developing visions for a low carbon society and integrated analysis of climate policies

We perform integrated assessment of climate change mitigation strategies by identifying strategies and envisioning scenarios for meeting medium- and long-term goals for reducing emissions, analyzing international policies, and assessing the cost and effectiveness of countermeasures.

- Creating a vision that will allow Japan to decrease its greenhouse gas emissions by 60 to 80 percent (of 1990 levels) by 2050. Discussing policies that will allow a significant reduction in global greenhouse gas emissions as agreed upon by the world's major powers.
- Presenting short- and medium-term options from quantitative analysis of economic models and international systems research.
- Giving a comprehensive assessment of the long-term outlook and short-term countermeasures involved in Asian climate change strategies through joint research with major Asian countries.

United Nations Climate Change Conference: Meeting of the Parties to the Protocol (MOP) and Conference of the Parties to the Convention (COP) (Montreal, December 2005)

Priority Program

Sustainable Material Cycles

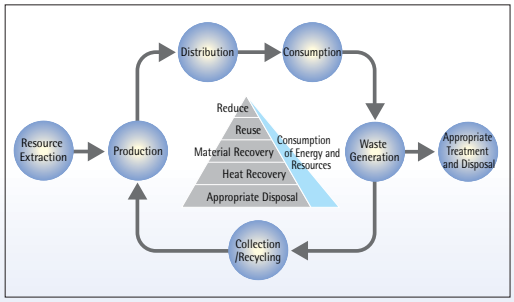
Transition to a Sound Material-Cycle Society

Japan must realize a sound material cycle society in line with the 3Rs (Reduce, Reuse, Recycle), ensuring the appropriate management of material cycles and waste disposal. We will support a social transition in the near future through relevant research activities such as developing advanced technologies and systems and proposing policy options that are in accordance with international principles. We will focus on the following four projects.

1 Designing and evaluating material cycles systems and policy/management techniques for the near future

We forecast near-future material flows that will be affected by temporal changes in social conditions and set strategic targets that will lead to the realization of a sound material cycle society. In addition, we design material cycle systems, relevant policies, and the management techniques necessary to achieve the targets. We have the following research objectives.

- Projecting the amount of recyclable resources and waste that will be produced in the next 10 to 20 years and setting strategic targets using relevant indicators for material cycle management.
- Designing concrete scenarios including technologies and policies, and identifying the specific issues to be solved. Achieving such targets at both the local and national level.



2 Management of hazardous and valuable substances in life cycles of materials and products

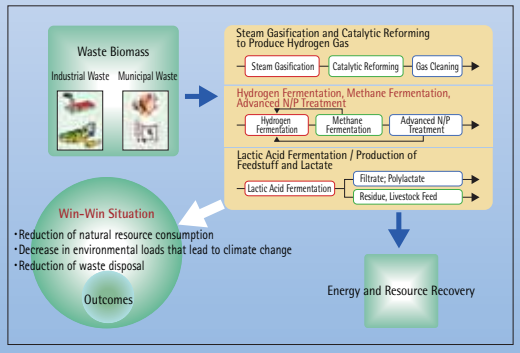
We focus on the behavior and flow of chemical substances through product life cycles from their roles as both contaminants and resources. We then evaluate the validity of related policies on risk management and resource recycling for such substances.

- Investigating the behavior of plastic additives (e.g., brominated flame retardants) and countermeasures for their control during the use, waste treatment, and recycling processes of plastics. Addressing application issues of potential alternatives.
- Evaluating the environmental release of hazardous metals especially in waste recycling or treatment processes. Proposing recyclability indices and recovery measures for hazardous and valuable metals from materials, products, and waste.
- Establishing standardized testing methods for the safety and quality management of secondary materials originating from waste. Developing guidelines for setting safety levels for the materials.

3 Developing win-win resource recycling technology for waste biomass

We are targeting not only the reduction of waste but also the reduction of greenhouse gas emissions and the creation of renewable energies and resources from waste biomass. We are developing material recycling and energy recovery technology systems that efficiently convert waste materials into industrial/agricultural resources and renewable energy. We are also building some new systems that link "venous" to "arterial" industries (i.e. waste processing to primary production) by means of mass conversion technologies. We have the following research targets.

- Developing technologies to efficiently produce hydrogen, methane, biofuel, feedstuff, and bioplastics from waste biomass, to recover phosphorus from wastewater treatment processes, and to improve the energy efficiency of material recycling systems.
- Designing a technological system for a certain region with a specific nature. Demonstrating the developed technologies based on the economical and environmental aspects of the region. Integrating material recycling/energy recovery processes into the entire system centering on basic industries such as energy, steel and cement production.



4 Establishing appropriate management networks and technological systems to support sound international material cycles

We analyze the transaction of waste materials as resources in the international market, and determine the environmental impact of those material cycles. We develop and apply technology systems that will contribute to delivering low environmental loads and be applicable to developing countries in Asia and other regions. We design and support networks in order to manage domestic and international material cycle systems in an appropriate way.

- Proposing evaluation techniques to ensure that international material cycles are managed properly.
- Identifying environmentally sound waste management technologies such as appropriate waste sorting and bio-eco engineering. Illustrating the project design of a Clean Development Mechanism (CDM) for landfill methane reduction. Creating relevant networks in Asian cities.

Priority Program

Environmental Risk

Developing Risk Assessment Methodologies for a Society that Understands Risk

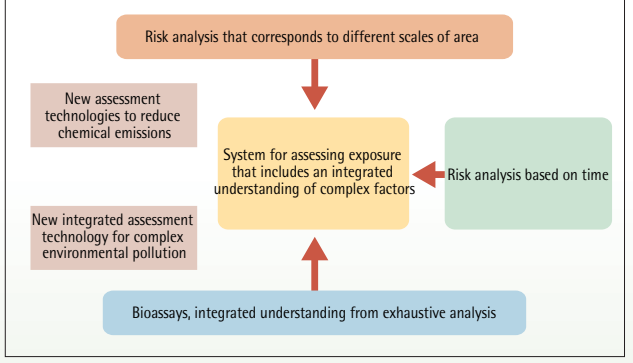
We are creating chemical exposure assessment methods that make use of hierarchical dynamic environmental models and monitoring data obtained from various environmental measurement technologies. To clarify the relationship between environmental factors and diseases such as allergies from the viewpoint of sensitivity, we investigate the effects of chemicals on endocrine, immune, and nervous systems, and the biological impacts of nanoparticles and fibrous substances. In addition, we are proposing environmental risk assessment methods based on biodiversity and ecosystem functioning.

1 Integrated exposure assessment analysis of the complex factors of chemical exposure

We aim to establish exposure assessment that effectively and comprehensively considers the complex causes of exposure. We are building a framework for assessing exposure that helps us understand multiple factors from natural environmental dynamics and exposure on a hierarchical time-space scale.

- Developing methods to analyze exposure and determining hierarchical dynamics from the regional to the global level from GIS data.
- Using bioassays and exhaustive analysis techniques to understand the complex causes of exposure.
- Developing new methods for risk assessment that involve an integrated analysis of sociological data and conventional assessment methods.

Risk assessment of the complex causes of chemical exposure based on integrated analysis

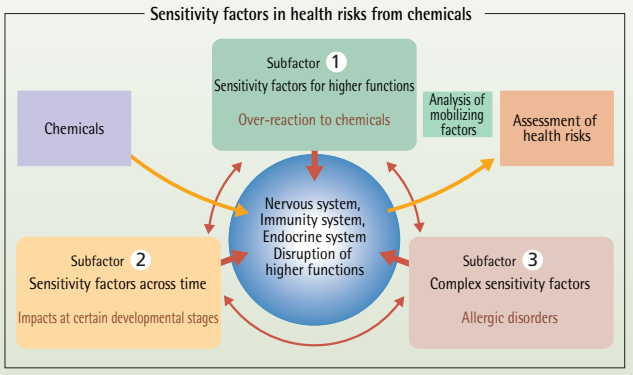


2 Health risk assessment methods of environmental chemicals that cause sensitivity

To understand the triggering of chemical sensitivity reactions in individuals, we analyze the effects of environmental chemicals on higher biological functions such as genetics, developmental, reproductive, immune, and neuro-behavioral systems. Our aim is to establish experimental models for assessing health risk from environmental chemicals at low doses in susceptible individuals.

- Establishing a new experimental model to identify and assess harmful effects on nervous and immune system functions following exposure to environmental chemicals at low doses.
- Selecting reliable and feasible methods to investigate the effects of environmental chemicals on experimental animals in various developmental stages (fetus, infant, elderly).
- Developing a screening system to assess complex sensitivity factors that reveals when exposure to environmental chemicals aggravates health disorders (e.g. allergic diseases).

Sensitivity factors in health risks from chemicals

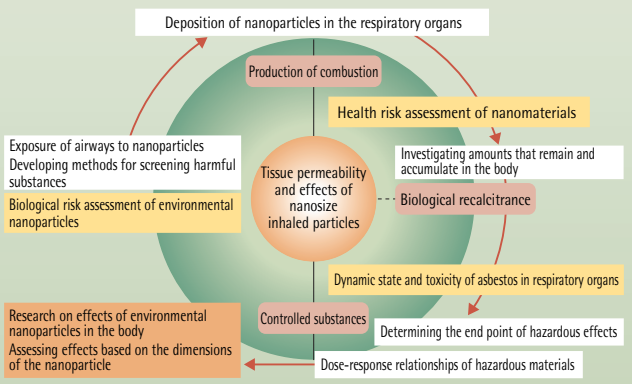


3 Assessing the health risks associated with the disposition of environmental nanoparticles

We investigate the biological impact of ultrafine particulate matter and environmental nanoparticles and determine how they behave in the body. We are working towards establishing health risk assessment methods that are geared to these kinds of particles rather than to regular chemicals.

- Performing research on environmental particles in the exhaust gases of vehicles that have a particle diameter of less than 50nm and have high cell and tissue permeability. Investigating the toxicity of nanomaterials that are being used as particles and assessing health risk and impacts on respiratory organs.
- Examining the disposition and biological impact of asbestos, which permeates tissues and is thought to cause lung cancer. Researching toxicity assessments of asbestos that has been disposed and treated with heat.

The disposition of nanoparticles in the environment and assessment of associated health risks

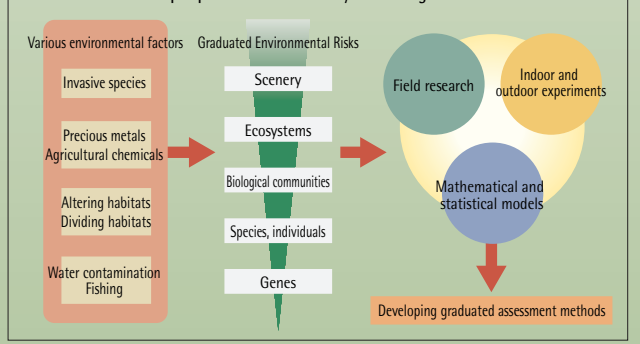


4 Developing environmental risk assessment methods based on biodiversity and ecosystem functioning

The objective of the project is to establish comprehensive assessment systems for natural ecosystems through the development of stage-specific assessment procedures for loss of biodiversity and ecosystem functioning. Specifically, we are aiming to do the following.

- Analyzing through field and experimental studies impacts of various environmental stress factors on biological populations and communities in aquatic ecosystems.
- Assessing invasion risk of alien species and their parasites.
- Performing risk analysis in the field using mathematical models.

Developing environmental impact assessment methods based on the perspectives of biodiversity and ecological function



Priority Program

Asian Environment

Creating a Society in Harmony with Nature

We perform research on Asia's atmospheric environment, wide area transboundary air pollution, sustainable management of the water environment in continental, coastal, and oceanic areas, and preservation of ecosystems in watershed areas such as large rivers. This research forms the scientific infrastructure for contributing to policy recommendations for promoting Asian environmental management and building societies in harmony with nature through international cooperation.

1 Developing methods for evaluating the atmospheric environment in Asia

We collect scientific knowledge on the East Asian atmospheric environment through international joint research and establish environmental management tools. By combining observation and modeling, we plan to develop methods to evaluate the atmospheric environment.

- Establishing in-situ observation sites for multi-constituent/continuous observation of atmospheric gases and aerosols and expanding the lidar and in-situ observation network of Asian Dust to include Mongolia and Southeast Asian regions.
- Performing intensive observations by aircraft in China and Japan.
- Establishing databases from the information gathered during this project and joint research.
- Establishing a method for understanding wide area atmospheric pollution through multiscale numerical modeling and observation databases.
- Combining bottom-up and top-down methods for analyzing observational data by using numerical models to improve emission inventories for atmospheric pollutants.
- Developing chemical climate models to forecast the state of the Asian atmospheric environment to 2030.

2 Developing systems for evaluating regional water and material cycles in East Asia

We aim to establish the necessary tools for sustainable water environment management by gathering scientific knowledge through international collaborative research on East Asian water environments with a focus on the Chiang Jiang River and the Yellow River. We are developing a system for evaluating regional water and material cycles by integrating observation and scientific models.

- Improving remote sensing technology to assess wide area water and material cycles, developing new observation methods, and using these methods to create integrated observation systems.
- Creating an East Asia environmental information database that includes information on water, heat, and material cycles based on satellites, GIS, and observational data.
- Investigating the correlations among complex impact processes related to wide area climate, land forms, and terrestrial cover to develop an assessment model for water and material cycles.
- Evaluating and predicting the effects of changes in the land and climate on water cycles (such as water shortages and floods) and material cycles (such as carbon, nitrogen, etc.).
- Consolidating a technology inventory system for sustainable environmental management and developing socio-environmental indicators for assessing sustainable urban and watershed environments. The system provides strategic design and evaluation of appropriate technology alternatives and countermeasure policy programs for local and regional stakeholders.

3 Developing methods for evaluating watershed environmental impacts

We are developing methods for the environmental impact assessment of Asian watershed ecosystems in Southeast Asia and Japan. We are building a network of international programs involved with the Mekong River watershed area. We provide the scientific knowledge to support the sustainable development of watersheds through international joint research. By clarifying the current state of freshwater fish species in the Mekong River and understanding the environmental dynamics of watersheds, we will evaluate the impacts of dams and other facilities on the ecosystem.

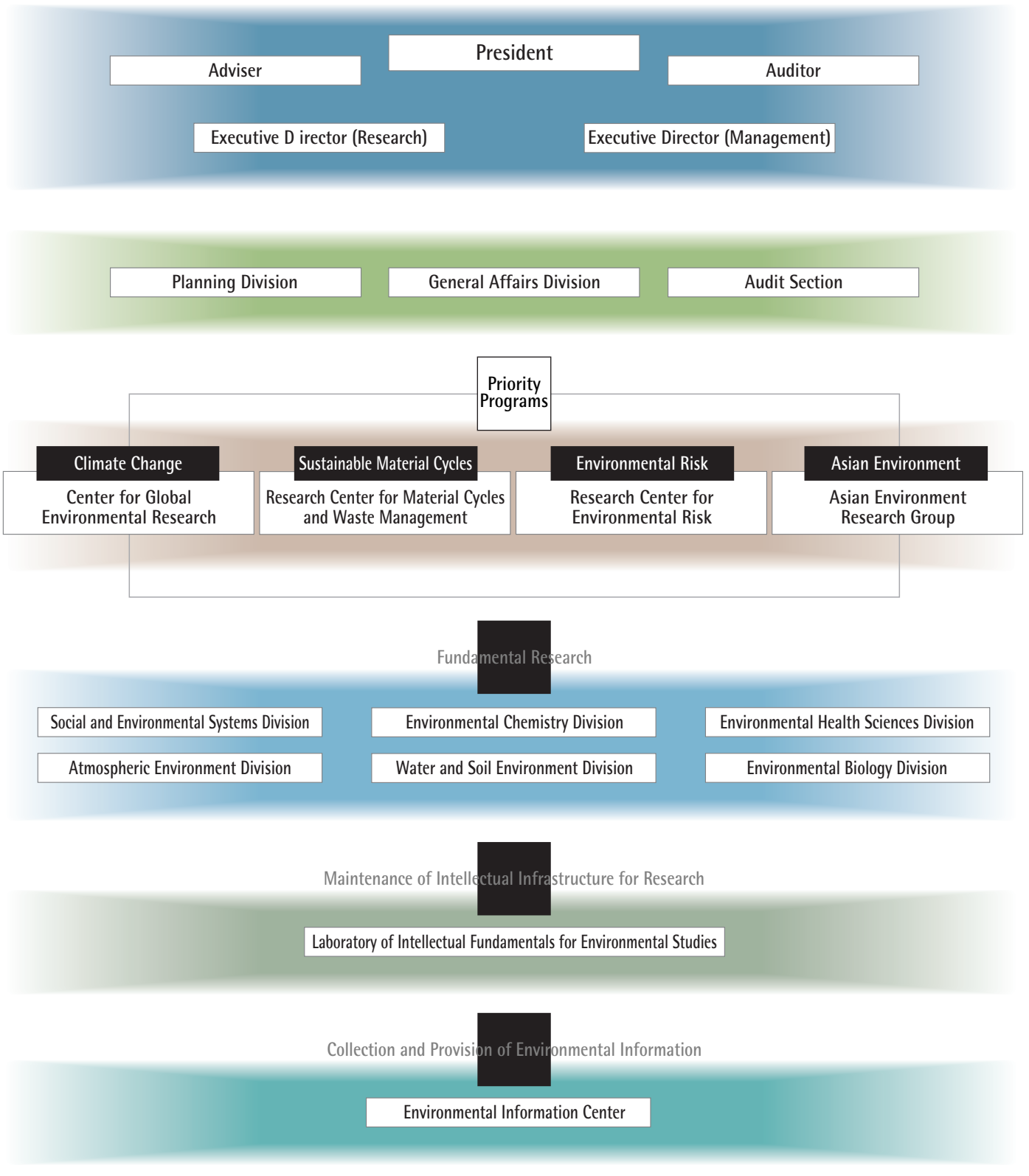
- Making high resolution land cover classification maps of certain areas and maps to assess wetland function and using them to understand natural deterioration in watershed ecosystems.
- Collecting data on the diversity of major organisms, ecological information, and climate and water quality to make an environmental database of watershed ecosystems.
- Collecting water environment data essential to environmental impact assessment and using it for modeling. Developing landscape ecology methods to evaluate suitable habitats and methods to evaluate impacts on estuary ecosystems that can be used in watershed ecosystem management.

International and domestic cooperation on atmospheric observation

San Xia (Three Gorges) Dam about one week after closing the sluice gates (June 17, 2003)

Organization - Strategic and dynamic framework that makes the best use of our assets -

In order to anticipate the environmental and societal conditions and issues that will exist in the next decade and make contributions that are relevant to environmental policy, we have established four priority research programs that identify the problems that the institute must tackle in a focused and integrated way. We have created a research structure and support framework that allows the strategic and dynamic use of the research resources we have collected up to now and works towards the combined goals of strengthening our research activities and optimizing our management practices.



Ⓓ Fuji Hokuroku Flux Observation Site (Yamanashi)

Ⓐ Investigating baseline water quality at Lake Mashu (Hokkaido)

Research Activities and Field Stations throughout Japan

The National Institute for Environmental Studies has research and observation facilities throughout the country and does fieldwork to determine the current state of environmental conditions.

Ⓑ Monitoring water quality trends at Lake Kasumigaura (Ibaraki)

Ⓔ Endocrine Disrupter Research at Tokyo Bay

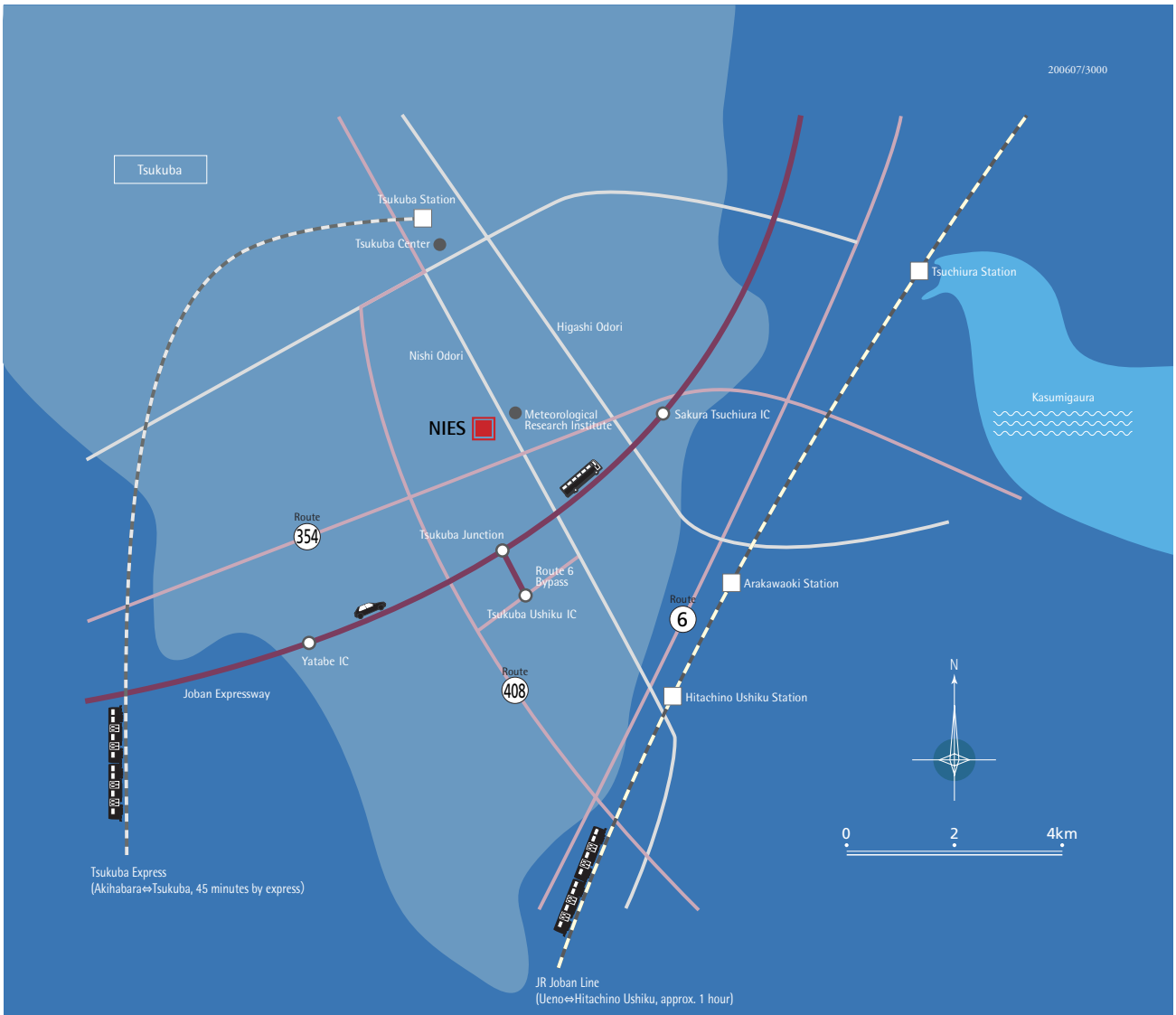
Ⓒ Summer Open House (NIES, Tsukuba)

Ⓒ Ohyama Hall (NIES, Tsukuba)

Ⓒ Radioisotope and Biotechnology Laboratory (NIES, Tsukuba)

Ⓕ

Ⓕ Hateruma Global Environment Monitoring Station (Okinawa)



Directions

Akihabara Station	Tsukuba Express (45 minutes by express)	Tsukuba Station	Bus for Hitachino Ushiku (10 minutes)	NIES	
Ueno Station	JR Joban Line (1 hour)	Hitachino Ushiku Station	Bus for Tsukuba Daigaku Chuo or Tsukuba Center (13 minutes)	NIES	
Tokyo Station (Yaesu Minami Exit)	Highway Bus (1 hour and 10 minutes) Tsukuba Center	Tsukuba Center	Bus for Hitachino Ushiku (10 minutes)	NIES	
Narita Airport (Bus Stop 8 at Terminal 1, Bus Stop 10 at Terminal 2)	Highway Bus (1 hour and 40 minutes) Tsukuba Center, Tsuchiura Station	Tsukuba Center	Bus for Hitachino Ushiku (10 minutes)	NIES	

National Institute for Environmental Studies

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