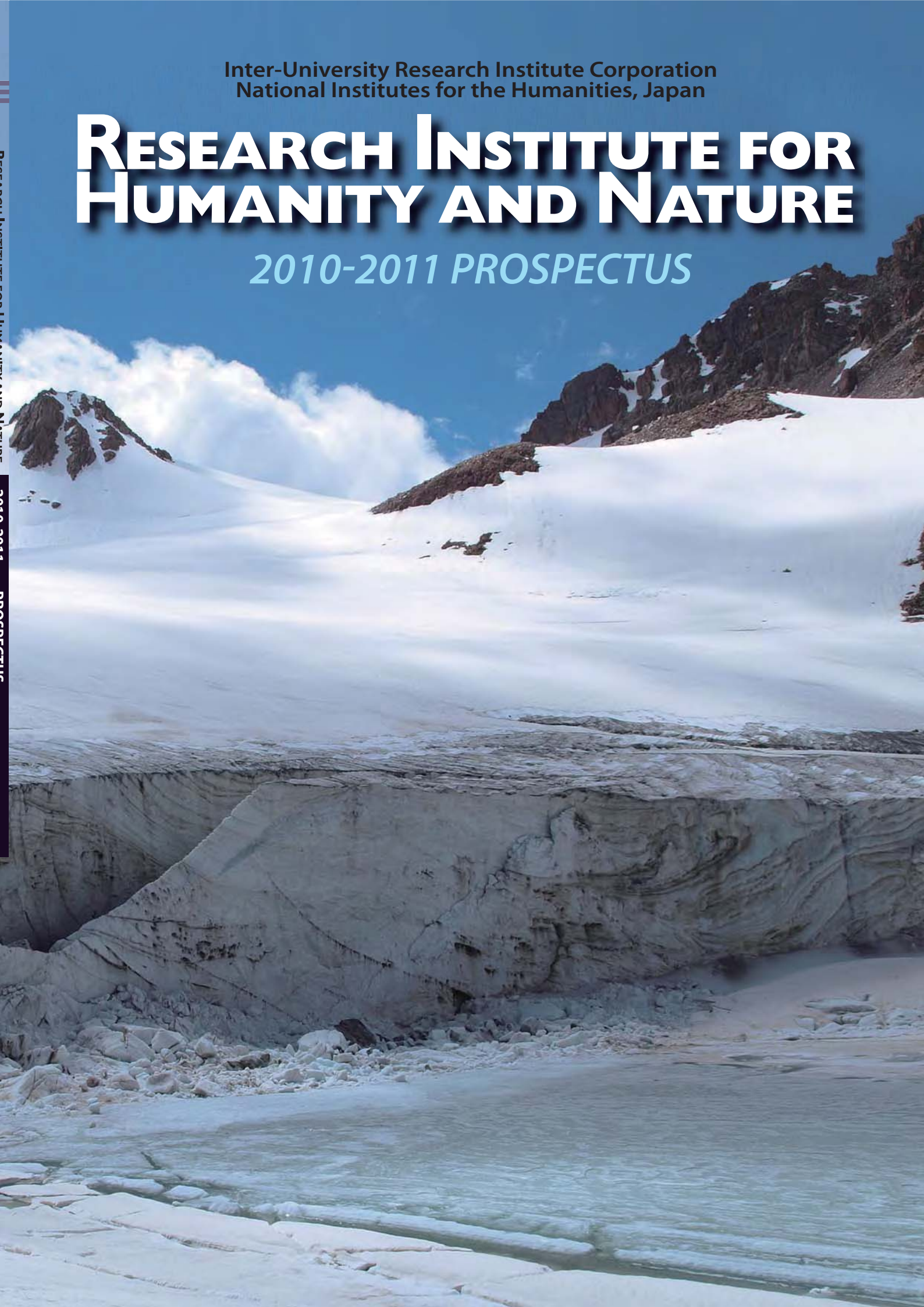
Inter-University Research Institute Corporation
National Institutes for the Humanities, Japan

Research Institute for Humanity and Nature

2010-2011 PROSPECTUS



Research Institute for Humanity and Nature 2010-2011 PROSPECTUS

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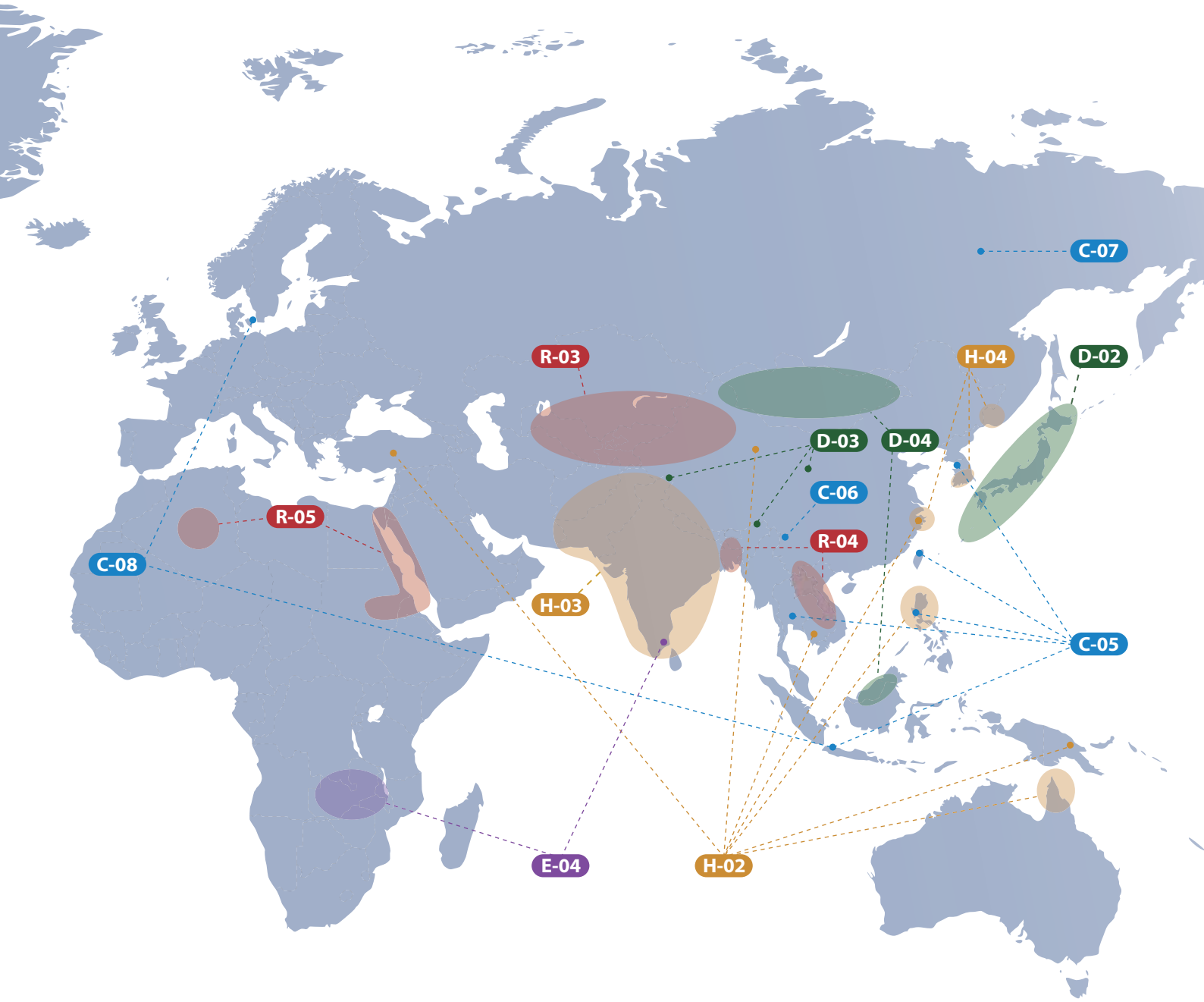
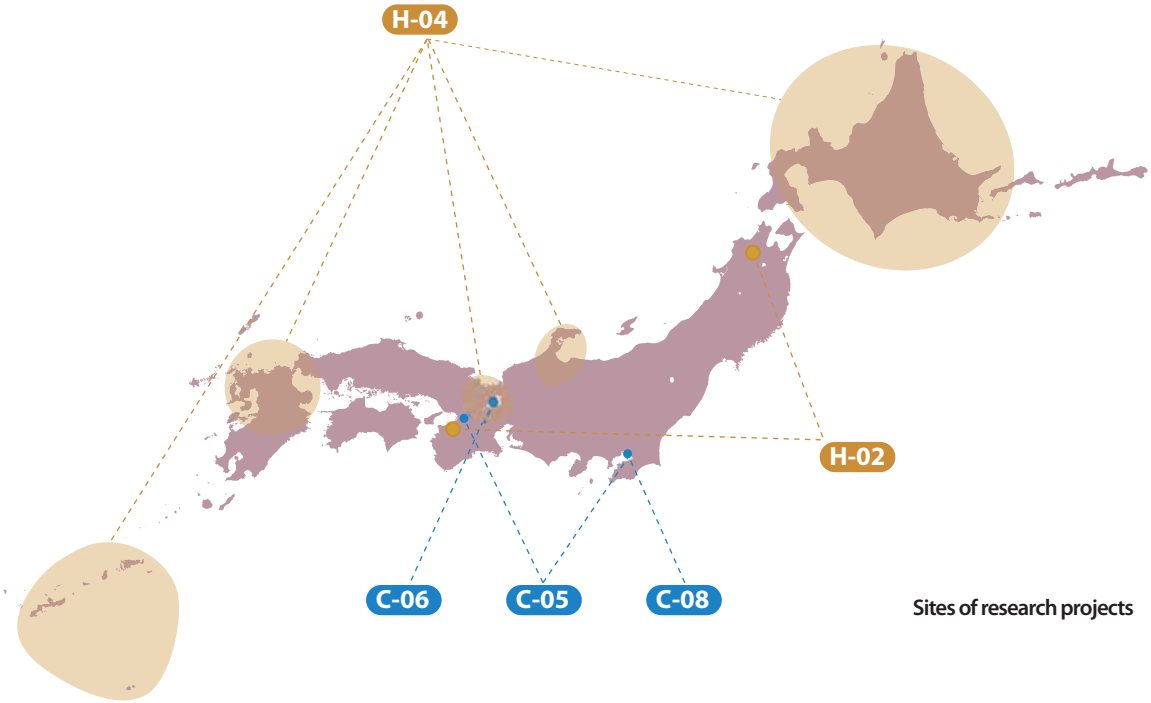




Sites of research projects

Circulation

Diversity

Resources

Ecohistory

Ecosophy

Feasibility Study (As of April 15th, 2010)

Message from the Director-General

The Research Institute for Humanity and Nature (RIHN) was established in 2001 by the Government of Japan to promote "integrated cooperative research toward the solution of global environmental problems" and to create the field of global environmental studies. To this end, RIHN solicits, funds and hosts three- to five-year fixed-term research projects on key areas of interaction between humanity and nature.

Until recently, much environmental study has been undertaken by researchers operating largely within the natural sciences. For us, natural science is one branch extending from the broader stem of human knowledge. We strive for comprehensive, integrative research capable of describing the true dynamism of earth phenomena and humanity's place in it. In this sense, our subject is humanity in the midst of nature.

At RIHN, we call this study of the human experience in a dynamic, changeable nature *humanics*; it offers a rich research framework, one based in nuanced appreciation for past human success and failure, present social and biophysical processes, and their inevitable change and unknown future. We use the concept of *futurability*, a translation of a Japanese term that combines the ideographs for "future" and "potential", to express the wide range of possibility in future development.

The year 2010 marks the end of RIHN's first decade as an institute and the beginning of its second planning phase. RIHN has made steady progress, having attracted many talented researchers from Japan and around the world. Yet both RIHN's intellectual goals and research structure continue to evolve as we consider how to enable the future potential in, and enhanced design of, interactions between humanity and nature.

This prospectus describes RIHN's endeavors to date and introduces the innovations to be adopted in our second phase. I hope the reader is impressed with the quality and breadth of RIHN research and will join us in our efforts to improve it. I invite your warm understanding and support, as well as your critical assessments, of this prospectus and all RIHN activities.

TACHIMOTO Narifumi

Integration

Integration entails the assimilation of multiple knowledge traditions—those stretching back millennia as well as those of the contemporary natural and human sciences—into a single framework. RIHN investigates global environmental problems at a regional level—a level at which it is possible to resolve both macro-level and micro-level processes. We emphasize basic research, i.e., field surveys and data collection, conducted within multidimensional research frameworks that illuminate the interconnections of biophysical phenomena and human systems, thought and action.

International Networking

RIHN research projects are based on networks of Japanese and international scholars and research institutions. At both the project and institute level, RIHN establishes complementary partnerships in order to conduct fieldwork, address local problems, organize symposia, or to focus or strengthen academic communication within specific research fields. Our home research community is also enriched by the presence of many foreign visiting professors and researchers.

Leadership

Each research project is housed within one of five research domains, which is overseen by a director who is responsible for describing the domain's key theoretical, empirical and methodological components, and for encouraging synergies between individual projects. As RIHN now enters its second term, a new Core Research Hub has been established in the Center for Coordination, Promotion and Communication. Its role is to focus discussion between the Director-General, Deputy-Director Generals and Domain Directors on RIHN's long term research trajectory, to strengthen synergies between the five domains, and so to establish RIHN as a center in global environmental studies.

Fluidity

At RIHN, professors, associate professors, and assistant professors work through fixed-term appointments, as do project researchers and administrative staff involved in project and institute support. This structure is unique within Japan, and it encourages personal and intellectual exchange with individuals and partner institutes in Japan and abroad. In addition, the phased flow of project research, from Incubation Study (IS) to Full Research (FR), allows for the flexible guidance and evolution of each project.

Mission and Goals: Developing Consilience

RIHN research projects are organized through five research domains: circulation, diversity, resources, ecohistory, and ecosophy. In concept, the domains are complementary but to date they have operated largely as separate fields. In order to describe how their findings may achieve a higher level of integration—to form the field of 'global environmental studies' and achieve a qualitative improvement in human ability to address global environmental problems—the institute must further elicit and develop synergies between projects and domains. As we open RIHN's second phase, we are developing a new set of initiatives to accomplish this task.

First phase research projects

In the first phase, individual projects conducted multidisciplinary research on key areas of environmental concern, including water circulation, atmosphere, climate, oceans, subsurface environments, islands, ecosystem and landscape change, food production systems, disease ecology, and environmental history.

First phase: Domain-specific project structure

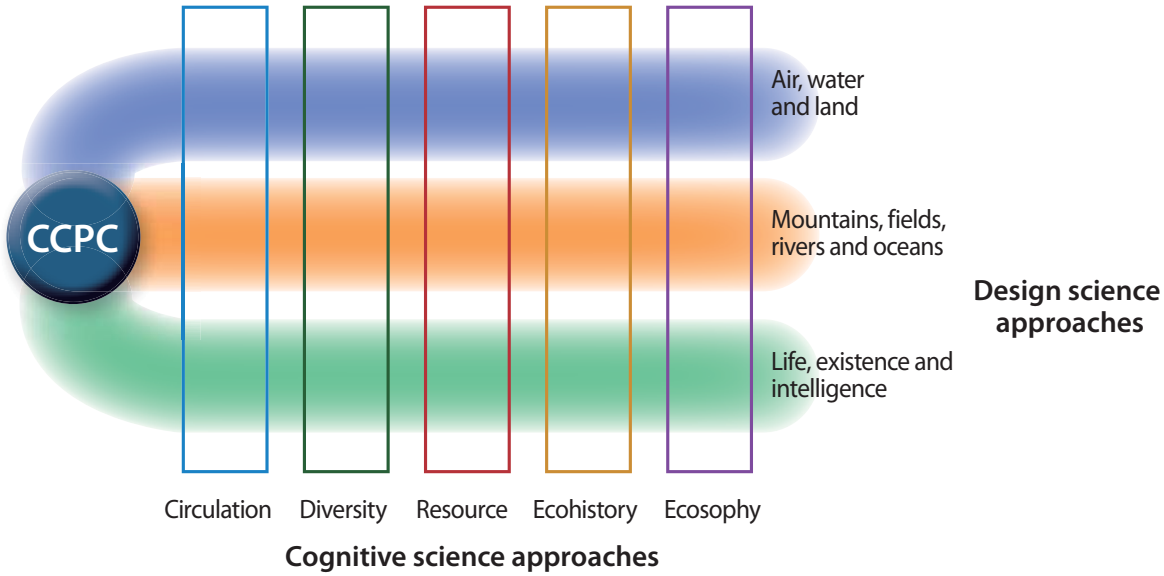
Second phase initiatives

Beyond description, *consilience* entails "a jumping together of knowledge…across disciplines to create a common groundwork for explanation" (E.O. Wilson 1998). To this end, we now focus our efforts on conjoining the existing domain-based programs through a new set of cross-cutting initiatives. The goal of the initiatives is to elucidate the sources and essential qualities of the problems under study, and so to enable new consideration of the future potential in, and enhanced design of, interactions between humanity and nature, or what we call "futurability".

The Futurability Initiatives

風水土	山野河海	生存知
Fu-sui-do Air, water and land	**San-ya-ka-kai** Mountains, fields, rivers and oceans	**Sei-zon-chi** Life, existence and intelligence
This initiative emphasizes empirical investigation of the biophysical bases of social life in regional and global scale and in past, present and future.	This initiative describes the practices by which cultures and communities humanize nature, ecosystems and landscapes.	The quality of individual and community life depends on the integrity of the collective wisdom concerning life and environment.
Building flexible societies in dynamic earth environments	Linking commons and community for long-term maintenance of ecosystem services	Enhancing human capability and capacity for coexistence

Second Phase Initiative Structure



Research Project Structure in the Second Phase

In its second phase, RIHN will continue to accept research projects within each of the five domains; they will progress in the established manner indicated in the top half of the figure below. Domain-based projects focus on description in the traditional manner of cognitive science.

In addition, beginning in 2010, the Core Research Hub will be able to directly launch projects within the futurability initiatives. Based on the findings of the domain-based projects, initiative-based projects will emphasize expanding the range of possibility in future development through design science approaches.

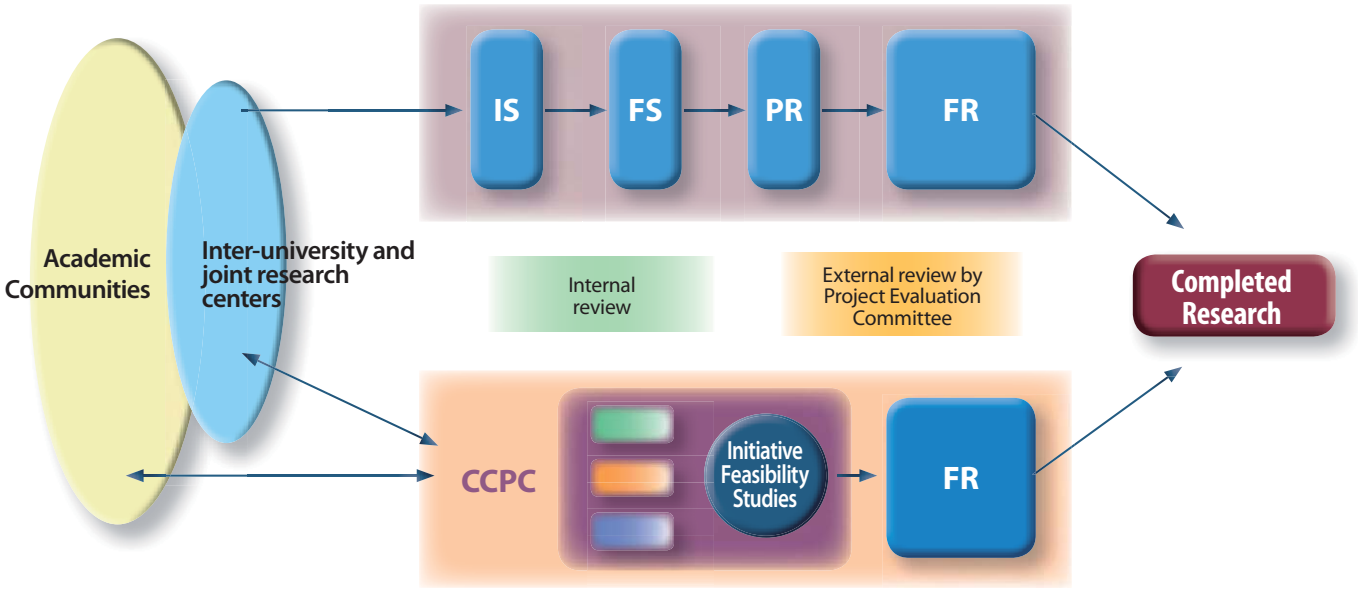
Domain-based Projects

Incubation Studies (IS) are proposed by individual researchers to the RIHN Project Review Committee. If approved, the researcher is granted seed money to prepare a proposal for feasibility study.

Feasibility Studies (FS) allow the study leader a period to develop a proposal for Full Research. FS can be repeated once.

In the transitional **Pre-Research (PR)** period, the project leader formally assembles the team, establishes MoUs necessary for collaboration with other institutions and makes other preparations to enable Full Research

Full Research (FR) lasts from three to five years. It typically involves a research team at RIHN and concurrent activity with collaborators overseas, several periods of field study, workshops and presentations, and outreach or communication to relevant communities. FR projects are evaluated by the PEC at several stages.



Initiative-based Projects

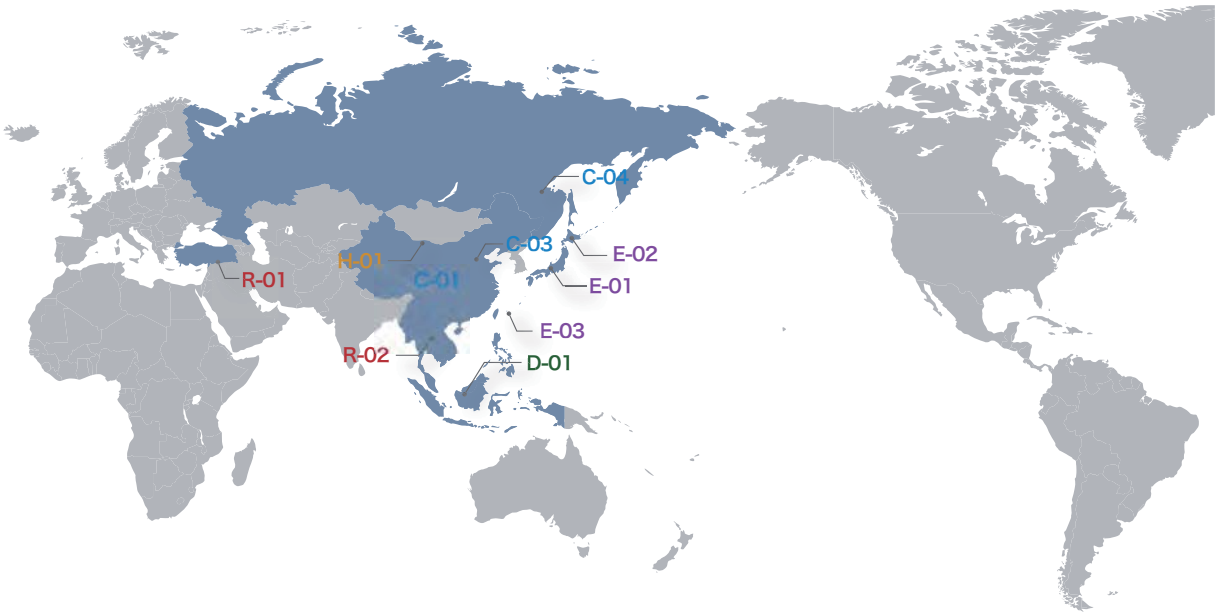
Core research projects will develop synergies based on existing RIHN research and complement RIHN's collaborations with universities and other research institutions around the world. They will be submitted directly as Feasibility Studies for review by the Project Evaluation Committee. If Initiative Feasibility Studies are adopted as Full Research, the schedule of evaluation is the same as that of domain-based projects.

Completed Research

When a project moves to **CR (Completed Research)** status, the contract with RIHN is concluded. Research teams disperse to university research, teaching, and other duties. Project publications and other communications and contributions may follow for several years; they are assessed in the final post-evaluation, two years after formal project conclusion. At RIHN, however, each project forms part of the institute's heritage; project results and data are entered into the RIHN archives upon which future RIHN projects may be formulated.

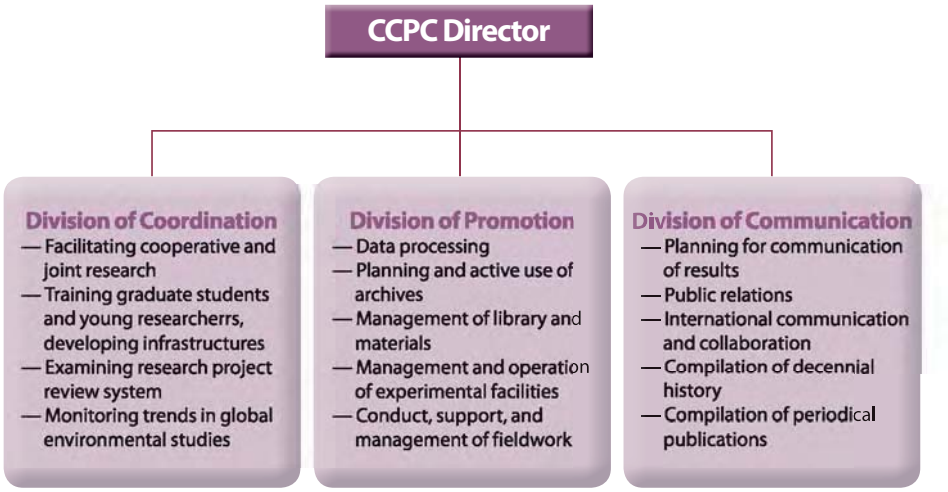
Fiscal Year Completed	Leader	No	Research Project
2006	HAYASAKA Tadahiro	C-01	Emissions of Greenhouse Gases and Aerosols, and Human Activities in East Asia
	KANAE Shinjiro	C-02	Global Water Cycle Variation and the Current World Water Resources Issues and Their Perspectives
	WATANABE Tsuguhiro	R-01	Impact of Climate Changes on Agricultural Production System in the Arid Areas
	NAKAWO Masayoshi	H-01	Historical Evolution of the Adaptability in an Oasis Region to Water Resource Changes
	YACHI Shigeo	E-01	Multi-Disciplinary Research for Understanding Interactions between Humans and Nature in the Lake Biwa-Yodo River Watershed
2007	FUKUSHIMA Yoshihiro	C-03	Recent Rapid Change of Water Circulation in the Yellow River and Its Effects on Environment
	ICHIKAWA Masahiro	D-01	Sustainability and Biodiversity Assessment on Forest Utilization Options
	AKIMICHI Tomoya	R-02	A Trans-Disciplinary Study on Regional Eco-History in Tropical Monsoon Asia: 1945-2005
2008	SEKINO Tatsuki	E-02	Interaction between Environmental Quality of the Watershed and Environmental Consciousness
	TAKASO Tokushiro	E-03	Interactions between Natural Environment and Human Social Systems in Subtropical Islands
2009	SHIRAIWA Takayuki	C-04	Human Activities in Northeastern Asia and their Impact on the Biological Productivity in North Pacific Ocean

Sites of completed research projects



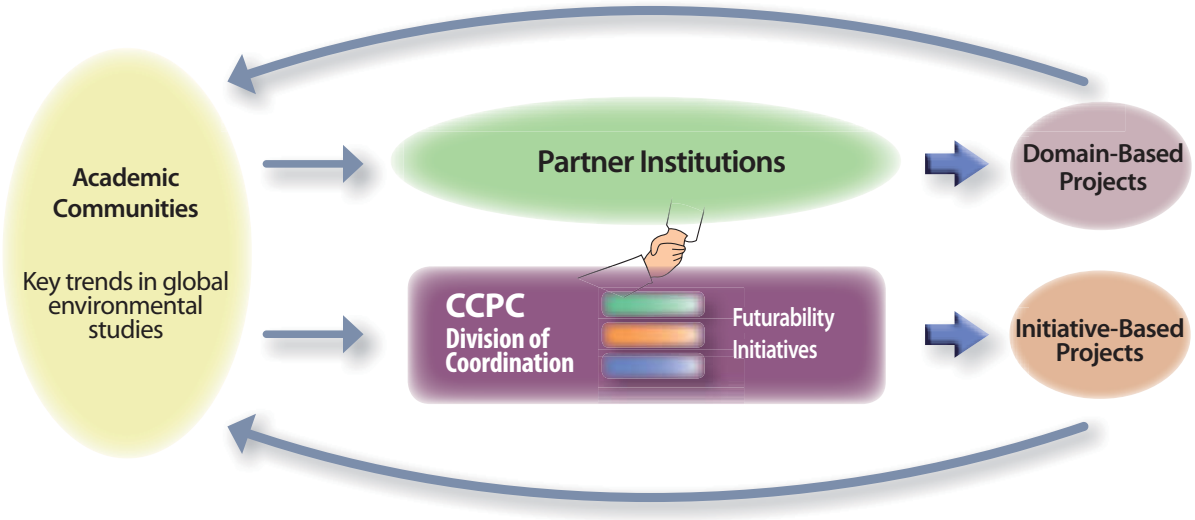
The Center for Coordination, Promotion and Communication (CCPC) is responsible for cross-project, cross-domain investigation, research and support that concerns the entire institute. It has three divisions. The **Division of Coordination** maps out RIHN's mid- and long-term research trajectory and facilitates the cooperative arrangements necessary for its realization. The **Division of Promotion** develops and maintains the laboratory facilities necessary for research and fieldwork, and builds the databases and archives of past and ongoing research. The **Division of Communication** decides how the fruits of research may be best communicated in appropriate academic and popular fora. Several recent activities are described in the pages on Research Communication (pages 57-58). The CCPC also collaborates with the research department and administrative office to coordinate the task forces, working groups and administrative units involved in RIHN's day-to-day operation.

Professor AKIMICHI Tomoya, Director of the CCPC



Key Research Tasks

In RIHN's second phase, the Core Research Hub will be established within the CCPC. Its immediate tasks are the continuing definition of the Futurability Initiatives introduced on pages 4-6, and facilitation of the research projects adopted within them. These tasks will require it to maintain a high level of coordination with RIHN's many partner institutes and to draw upon the collective wisdom of the wider environmental research community.



Building Research Data Networks

Elementary students visit RIHN

The CCPC plays a key role in facilitating RIHN's environmental networking and communication, especially between academic institutions, cultural institutions, and the general public. It is involved in the creation and maintenance of Asian environmental databases and project archives. It also supports the development of environmental studies curricula in Japan's public elementary, junior high and high schools.

The CCPC promotes cooperation between RIHN and research institutes both at home and abroad. One such activity is the Regional Environmental Information Network, a project to create environmental information networking nodes among twenty-four research centers at nineteen universities in the greater Asian region.

SEEDer, the newsletter of the Regional Environmental Information Network

Facilities and Equipment

The Division of Promotion maintains eighteen laboratories in the ground level of its main building, including specialized facilities for DNA and stable isotope analysis and mass spectrometry, as well as several rooms for chemical and biochemical analysis, microscopy, incubation, hazardous materials, fieldwork preparation, sample preparation and cold storage (please also see pages 60-61).

Laboratory technicians in a "clean room"

C Circulation Program

Program Director **TANIGUCHI Makoto**

What is circulation and how does it relate to global environmental problems? Two concepts of circulation are considered in this program. One is the circulation of energy and matter at the earth's surface. Matter includes air, water, chemical components and the living organisms they contain. Such circulations of energy and matter are caused by solar radiation absorbed by the earth's surface systems. In a broad view, the migration of humans around the planet can be considered as a kind of circulation, as can the great amount of material people move from place to place. Circulation describes large-scale spatial and temporal movements that in small-scale may look like flows. The critical issue in regards to global environmental problems is that current change in the biogeochemical circulations that sustain the biosphere is so sudden; it may be irreversible, though this is difficult to predict, as it depends in part on human thought, action and culture.

The recurrent interaction between humanity and nature can also be considered as a kind of circulation. Through economic and technological development, and through its sheer numbers, humankind has gradually transformed the surface of the planet. It has altered existing environments and created wholly new environments, which have in turn become new sites of human-environmental interaction in which new societies have emerged.

Individual research projects in the RIHN Circulation Program are conceptualized and carried out within the above conceptual framework. They cumulatively improve human understanding of the ceaseless motion that composes the biosphere.

Completed Research	Leader	Title
C-04	**SHIRAIWA Takayuki**	Human Activities in Northeastern Asia and their Impact on Biological Productivity in the North Pacific Ocean
Full Research	**Leader**	**Title**
C-05	**TANIGUCHI Makoto**	Human Impacts on Urban Subsurface Environments
C-06	**KAWABATA Zen'ichiro**	Effects of Environmental Change on the Interactions between Pathogens and Humans
C-07	**INOUE Gen**	Global Warming and the Human-Nature Dimension in Siberia
C-08	**MURAMATSU Shin**	Megacities and the Global Environment

Human Activities in Northeastern Asia and their Impact on Biological Productivity in the North Pacific Ocean

How do continental forests and wetlands affect life in the sea? Adapting the traditional Japanese concept *uotsukirin*, or "fish-breeding forest", this project investigated the ecological linkages between the Amur River basin and primary marine productivity in the Sea of Okhotsk and Oyashio region of the northern North Pacific Ocean. In particular, the project documented how dissolved iron from the Amur River supports ocean primary production and how this iron discharge is affected by human activity in the Amur River basin. Finally, by studying the underlying causes behind the land-use changes in the basin, the project proposed how this continental-scale terrestrial-marine linkage—the giant fish-breeding forest—can be sustained.

Project Leader: **SHIRAIWA Takayuki** Institute of Low Temperature Science, Hokkaido University (RIHN until March 2010)

Achievement of the project

The Sea of Okhotsk and the neighboring Oyashio current region compose one of the richest marine environments in the world. This project investigated the source of this productivity. Iron is an essential element for phytoplankton, but iron's insolubility usually limits its availability in open water. In the Sea of Okhotsk region, however, we hypothesized that thermohaline circulation caused by sea ice production would increase the amount of iron available to phytoplankton. We supposed that the original source of this iron was upstream, in the forests and wetlands of the Amur River basin.

In the last five years, our intensive field activities in the Amur River basin and the Sea of Okhotsk/Oyashio region validated these initial ideas. We found that 40% of the annual phytoplankton productivity in the Oyashio region depends on iron from the Amur River; the remaining 60 % depends on iron recycled through a microbial loop.

In the Amur River basin, the highest concentration of iron was recorded in the wetlands extending through the middle reaches of the basin. In the latter half of the 20th century, however, this wetland has often been converted into upland and paddy fields. In order to determine the effect of this land conversion on primary productivity in the Sea of Okhotsk, we reconstructed basin-scale land-use maps for 1930 and 2000 and developed a hydrological model designed to compare the potential iron flux from the Amur River in each period. The results suggest that iron flux in the 1930 was 20% higher than in 2000, and will decrease further as wetland conversion or forest burning continues (Fig. 1). The project results motivated us to establish an epistemic community, the Amur-Okhotsk Consortium, to discuss sustainable use of the Amur-Okhotsk ecosystem.

Photo **The Amur-Okhotsk Consortium was established for the futurability of the Amur-Okhotsk Ecosystem including the giant fish-breeding forest.**

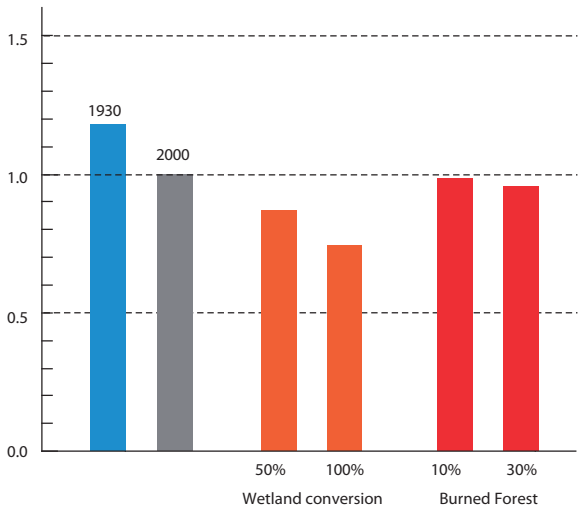


Figure 1 **Simulated results of land cover conversion in the Amur River Basin on iron flux**
Iron flux in 2000 (■grey bar) is compared to that estimated in 1930 (■blue bar) and under several land change scenarios. ■Orange bars show potential decrease with 50% or 100% decrease in wetland area; ■red bars show potential decrease with 10% or 30% increase in forest burning.

Human Impacts on Urban Subsurface Environments

This project assesses the effect of human activities on urban subsurface environments, an important but largely unexamined field of human-environmental interactions. Subsurface conditions merit particular attention in Asian coastal cities where population numbers, urban density and use of subsurface environments have expanded rapidly. The goals of this project are to evaluate the subsurface environments of seven Asian coastal cities for such problems as subsidence, groundwater contamination and thermal anomalies, and to suggest how they can be addressed or avoided.

Project Leader
TANIGUCHI Makoto
RIHN

Professor Taniguchi earned his doctorate in hydrology from the University of Tsukuba. In addition to his work at RIHN he is a leader of the UNESCO-GRAPHIC Project "Groundwater Resources Assessment under the Pressures of Humanity and Climate Change", and vice president of the International Committee of Groundwater of the IAHS/IUGG. He has published several books and journal articles on hydrology, geophysics and environmental science.

Core Members

YOSHIKOSHI Akihisa	College of Letters, Ritsumeikan University
YAMANO Makoto	Earthquake Research Institute, The University of Tokyo
KANEKO Shinji	Graduate School for International Development and Cooperation, Hiroshima University
ONODERA Shin-ichi	Graduate School of Integrated Arts and Sciences, Hiroshima University
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SHIMADA Jun	Faculty of Science, Kumamoto University
NAKANO Takanori	RIHN
ENDO Takahiro	University of Tsukuba
SIRINGAN, Fernando	University of the Philippines
DELINOM, Robert	Indonesia Institute of Science
WANG Chung-Ho	Academia Sinica, Taiwan
BUAPENG Somkid	Ministry of Natural Resources and Environment, Thailand
LEE Backjin	KRIHS, Korea

Project background and objectives

Most environmental research focuses on above-ground environments. Subsurface environments, though they are involved in biogeochemical circulations and are critical to overall environmental quality, attract little attention, perhaps because they are invisible and difficult to evaluate. Subsurface environmental problems such as subsidence and groundwater contamination occur repeatedly in major Asian cities, though there is often a time lag between the "stage" of urban development and the point at which negative subsurface conditions are recognized. Improved understanding of the subsurface environmental changes associated with past and present urban growth should improve overall urban environmental quality in the future.

This project investigates subsurface environmental conditions in Tokyo, Osaka, Bangkok, Jakarta, Seoul, Taipei and Manila. It also assesses the degree to which groundwater resources may improve these cities' resilience to increasingly variable sources of surface water. Each city's historical development will be assessed through socio-economical analyses and historical records. Hydrogeochemical and in-situ/satellite-GRACE gravity data will describe groundwater flow and storage systems, and indicate where significant problems in subsurface environments exist. Chemical analyses of subsurface waters, sediments and tracers will allow us to evaluate contaminant accumulation and transport from land to ocean. Finally, we will use urban meteorological analyses to reconstruct surface temperature histories in the seven cities and to examine the impact of the urban "heat island" effect on subsurface thermal contamination.

Progress in 2009

Subsurface environments in the seven cities have been surveyed, and monitoring continues.

Natural and social data have been assessed in each city and compiled into a GIS database. Based on historical maps, land use/cover maps of 0.5 km mesh were composed for each city at three development stages (1930s, 1970s, and 2000s).

RIHN project members organized the 3rd RIHN international symposium, on Urban Subsurface Environments. A volume based on the symposium entitled "Human Impacts on Urban Subsurface Environments" will be published in 2010 (Springer Publishers).

Several cross-cutting themes, such as the relation between groundwater and religious sites and beliefs in Bangkok and Jakarta, have been identified and investigated.

Fifteen indices of urban social and environmental change and six indices of natural capacity were compiled.

Future works and challenges

We must continue analyzing how water use and quality is affected by water rights and regulation of surface and groundwater in each of the cities under study.

We will combine our social and ecological data and our subsurface ennvironmental model in order to analyze the impact of water resources, environmentalloads, economic processes and public policies on subsurface environments.

Land use/cover data taken in the 1930s, 1970s and 2000s will be used to evaluate the rate of groundwater recharge, thermal storage in aquifers, and subsurface contamination. Based on the above, we will develop several scenarios describing how better relationships between subsurface environment and society can be established.

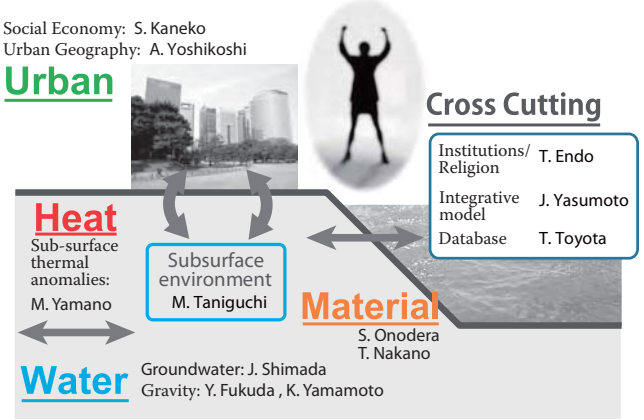


Figure 1 **Research Structure**

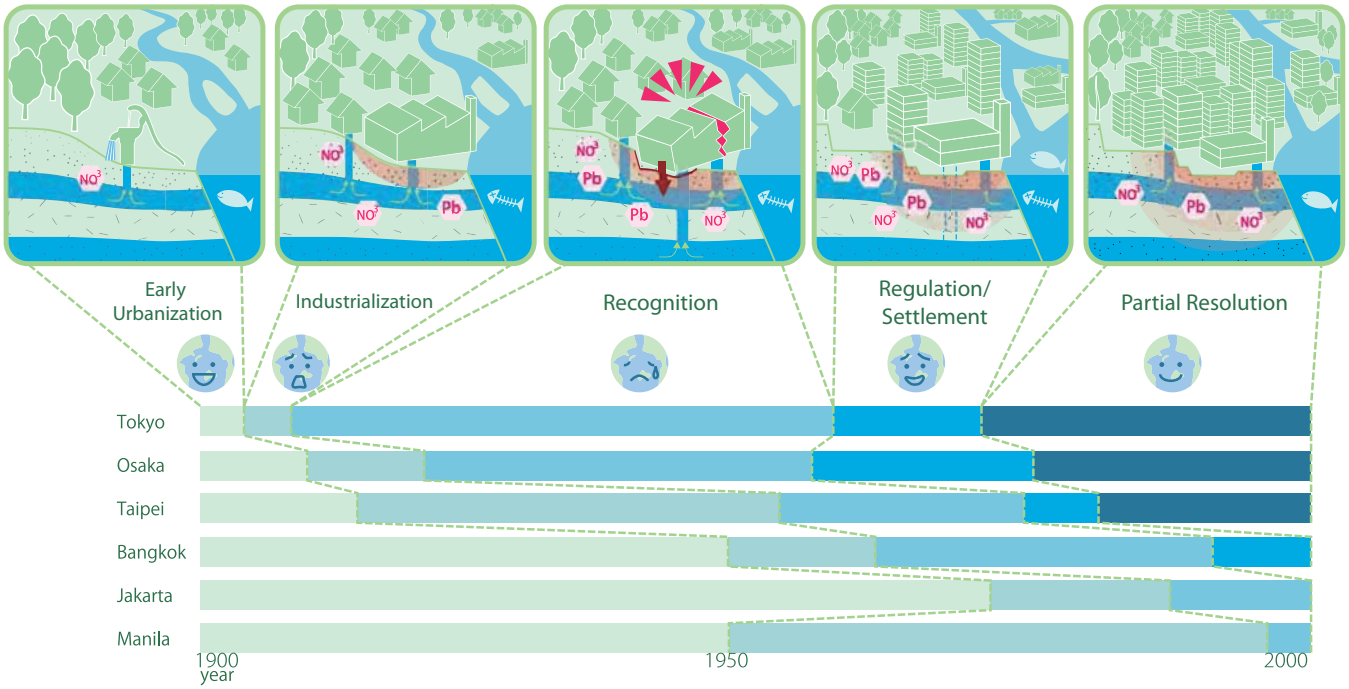
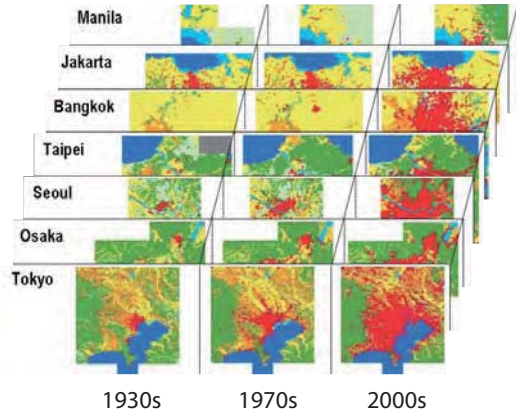


Figure 2 **Cross Cutting : Integrated Model**

Observed and statistical data are compared in seven cities based on five stages of development. The bar figure shows the stages of land subsidence at each city in comparison with Tokyo.



Historical changes in land use/cover in the seven cities. Residential areas have expanded along with urban development.

- forest
- grassland,wasteland
- rice field
- other agricultural lands
- industrial site
- other urban area
- water area wetland
- others
- ocean

Groundwater models are used to estimate the total impact of natural and human processes on subsurface environments.

Groundwater storage and flow patterns are quantitatively modeled.

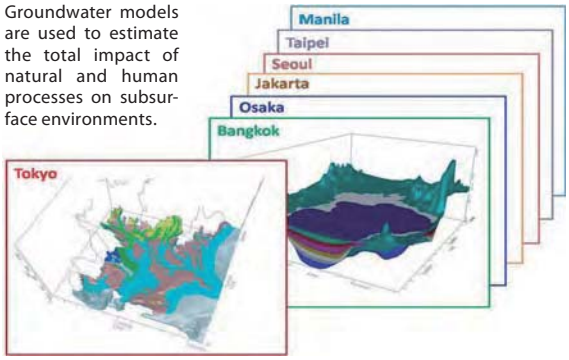


Figure 3 **Cross-cutting analysis: Integrated groundwater models/GIS**

Integrates observed and GIS data and constructs a framework for comparative analysis of the seven cities.

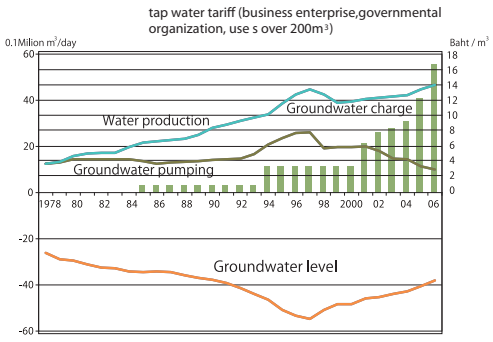
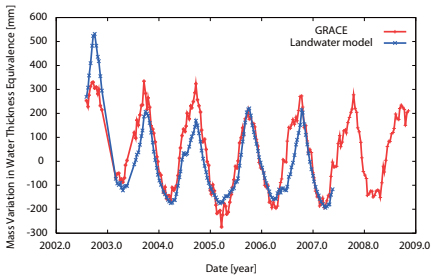


Figure 4 **Cross-cutting themes: Legal institutions**

In Bangkok, excessive groundwater pumping in the late 1970s led to land subsidence. The problem was solved through expansion of surface water infrastructure and the imposition of a charge for use of groundwater, which is now more costly than tap water.
Beyond 200m³/month, a special tariff of 15.81 Baht applies to each unit of water used.



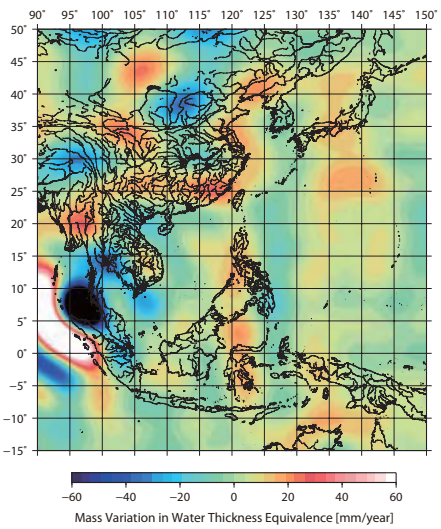
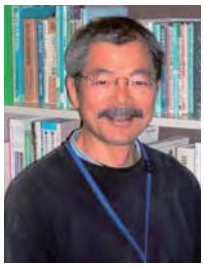


Figure 5 **Gravity GRACE**

Right: Inter-annual Earth mass trend observed by GRACE (2002 to 2009). Variations in mass over the land area correspond to changes in total terrestrial water storage, including groundwater. Mass is decreasing in and around the Bangkok area.
Above: Time series of GRACE-derived mass variation and model-derived terrestrial water storage over the Chao Phraya river basin. The two variables show good correspondence.

Effects of Environmental Change on the Interactions between Pathogens and Humans

There is an important environmental component to infectious disease. While pathological studies inform effective disease treatment, study of disease ecology – the interactions between pathogen, host and human actions that may create or eliminate 'fertile' disease environments – is necessary for prediction and prevention of new disease outbreaks. This project intensively examines the ecological and social causes and effects of Koi Herpes Virus disease in Japan and China in order to develop a model of pathogen-human interactions. Based on our experiments and observations of interactions between pathogen, environments and humans, we will suggest ways to prevent or minimize the emergence and spread of infectious diseases.



Project Leader
KAWABATA Zen' ichiro
RIHN

Zen'ichiro Kawabata previously held professorships at Kyoto University and Ehime University, and an assistant professorship at Tohoku University. His research field is microbial ecology and aquatic ecosystem ecology.

Core Members

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MINAMOTO Toshifumi	RIHN
NASU Masao	Environmental Science and Microbiology, Graduate School of Pharmaceutical Sciences, Osaka University
OKUDA Noboru	Center for Ecological Research, Kyoto University
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WU Deyi	School of Environmental Science and Engineering, Shanghai Jiao Tong University, China
YAMANAKA Hiroki	Department of Environmental Solution Technology, Ryukoku University

Objectives

Infectious disease has become a significant global environmental problem. This study investigates the emergence and spread of Koi Herpes Virus (KHV) in Lake Biwa, Japan. KHV is a pathogen responsible for episodic mass mortality of common carp (*Cyprinus carpio carpio*) (Photo 1) since the late 1990s. The common carp is the original domesticated aquaculture species, and an important source of protein today (Photo 2).

This study has three main objectives: (1) To describe Koi Herpes Virus disease ecology, including: the specific links between anthropogenic changes to freshwater ecosystems and the emergence and spread of KHV disease; the impacts of KHV disease on local ecosystem services; the social and cultural attempts to address KHV disease; and the environmental changes associated with human adaptation (Fig. 1); (2) To describe a general model of linkage between environments, pathogens and humans (Fig. 3); (3) To suggest how interactions between pathogen and humans may be modified in order to mitigate the human and environmental damages associated with infectious diseases.

Research methods and organization

Fields surveys are conducted at Lake Biwa, Japan, and Lake Erhai, China. Laboratory work is undertaken at RIHN. Our project is organized into five research groups, plus executive and advisory groups, as follows:

The Human Alterations Group investigates the effects of anthropogenic environmental alteration on the emergence and spread of KHV and the behavior of its host *Cyprinus carpio carpio*.

The Pathogen and Host Ecology Group defines the biology and ecology of KHV and carp, and so describes the environmental factors involved in KHV infection and transmission.

The Ecosystem Impacts Group examines the process of infection and the effects of KHV disease on ecosystem functions such as material cycling.

The Economics and Culture Group investigates the losses associated with KHV disease, including of ecosystem services or other economic and cultural phenomena, and describes the social attempts to redress those losses.

The Feedback Group examines the human response to losses caused by KHV disease, and the environmental change associated with this response.

Photo 1 ***Carp* killed by KHV disease**

Photo 2 **Carp dishes: Carp is an important ingredient in many food cultures**

Photo 3 **Survey of water temperature in Lake Erhai, China**

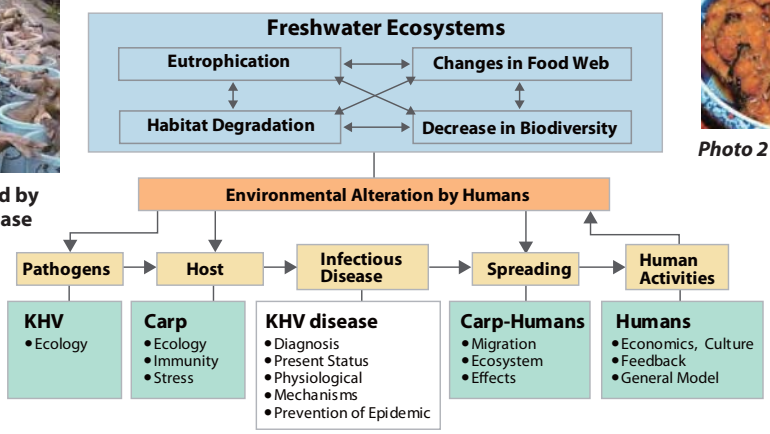


Figure 1 **Case studies: Interactions between KHV disease and humans**

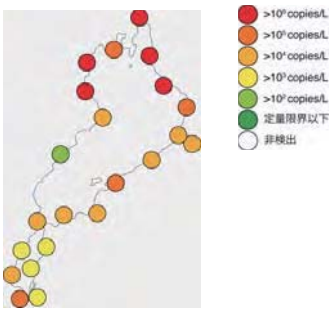


Figure 2 **Spatial distribution of KHV in Lake Biwa (Minamoto et al., 2009b)**

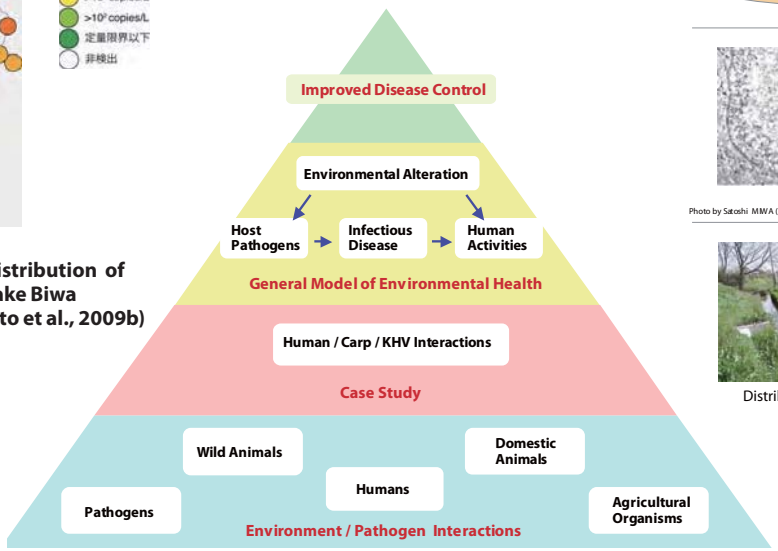


Figure 3 **Relationship of our model to a general human pathogen model**

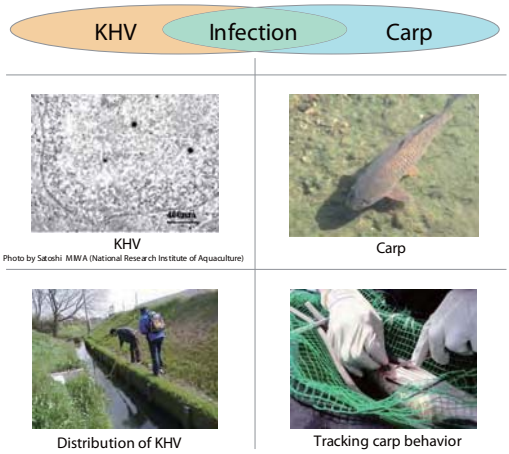


Figure 4

Survey of distribution of KHV and behavioral range of carp to predict the outbreak of infectious diseases.

The Executive Group coordinates the activities of each group and develops the model of pathogen-human interactions.

Finally, an Advisory Group composed of recognized experts in relevant fields makes suggestions in order to improve the research.

Main results to date

1) We found that water temperature on gentle gradient lakeshores is more spatially and temporally variable than on steep banks constructed by humans. This result suggests that gentle shores can provide a wider range of thermal conditions that allows fish to fine-tune their (everyday) thermoregulatory behavior, acclimate efficiently to (longer-term) changes in water temperature, and generally alleviate stresses associated with unfavorable water temperatures and so reduce susceptibility to KHV (Yamanaka et al. 2010).
2) We established a method to measure KHV presence in natural water (Minamoto et al., 2009a; Honjo et al., 2010) and found that in the five years since its presence was first documented, KHV has spread throughout Lake Biwa (Fig. 2) (Minamoto et al., 2009b).
3) Telemetry tracking of carp behavior revealed that carp favor warmer water temperatures. This finding was incorporated into our mathematical model predicting KHV disease outbreaks.
4) We found no evidence of KHV antibodies in carp smaller than 30cm, while 54% of carp larger than 30cm were KHV positive. Of antibody-positive individuals, 44% contracted KHV by polymerase chain reaction (PCR), strongly suggesting that those surviving carp become KHV carriers. A few individuals were positive by PCR but negative for antibodies, indicating recent infection. These results suggest that transmission of KHV is still occurring within the native common carp population in Lake Biwa (Uchii, et al., 2009).
5) We developed a non-invasive method (i.e. a method that does not require handling fish) to quantify how water conditions stress carp. This method indicates that changes in water temperature do stress carp.
6) In Lake Erhai we found gradient and water temperature conditions similar to those of Lake Biwa, indicating that KHV may find an advantageous habitat there.
7) At national and international conferences, we have presented our findings on the linkages between environment, pathogen and humans, and emphasized their importance to the prevention and control of infectious disease.

Scheduled research objectives in 2010

1) Develop a method to quantitatively detect KHV in sediment, organisms and other elements in aquatic ecosystems.
2) Clarify the distribution of infectious KHV in Lake Biwa.
3) Develop a micro-device to measure the quantity and infectivity of KHV in situ.
4) Determine the environmental factors involved in KHV dynamics and infectivity.
5) Use outdoor experimental tanks to define optimum water temperature for carp.
6) Describe the environmental characteristics of the places where KHV and carp interact, and clarify the behavior of the KHV-infected carp in order to reveal the locations where infection likely occurs (Fig. 4).
7) Conduct controlled experiments to reveal the relationship water temperature and carp stress and susceptibility to KHV.
8) Demonstrate the ecological effects of carp on species composition in experimental ponds.
9) Evaluate the cultural and nutritional value of carp as a human food.
10) Assess the economic and cultural impact of carp die-offs.
11) Create a preliminary model of the interactions between environmental change, KHV and humans.
12) Survey the spatial and temporal distribution of water temperature in Lake Erhai in order to establish the applicability of Lake Biwa findings to Lake Erhai (Photo 3).
13) Describe the common parameters of KHV and other infectious diseases.
14) Promote collaboration with the DIVERSITAS program of international biodiversity science.
15) Develop a set of recommendations to prevent or minimize the emergence and spread of infectious diseases.

Global Warming and the Human-Nature Dimension in Siberia: Social Adaptation to the Changes of the Terrestrial Ecosystem, with an Emphasis on Water Environments

Global warming will likely transform Siberian environments. Early evidence indicates that the hydrological, carbon, and methane cycles are undergoing rapid change, with potentially grave impact on Siberian flora and fauna. Human inhabitants, who have adapted to great changes in social structure and environment in the past, will be forced to adapt again, but to a cascading series of environmental changes whose dimensions are understood only in outline. This project uses multiple satellite and surface systems to track changes in the carbon and hydrologic cycles and the cryosphere, and assesses their likely interactions and significance for human inhabitants of the region. The project is jointly conducted by Japanese and Russian universities and research institutes.

Project Leader
INOUE Gen
RIHN

Professor Inoue's specialties are laser spectroscopy of chemical reactions and monitoring of greenhouse gases, mainly CO_2 and CH_4. He is interested in terrestrial ecosystems as sinks for atmospheric carbon and has developed ground-, aircraft- and satellite-based atmospheric observation systems. He proposed and led the Greenhouse gases Observing SATellite (IBUKI/GOSAT) project for five years, and now serves as its Chief Scientist. He has conducted field-based monitoring of greenhouse gases in Siberia for twenty years.

Core Members

YAMAGUCHI Yasushi	Nagoya University
SASAI Takahiro	Nagoya University
OHTA Takeshi	Nagoya University
HIYAMA Tetsuya	RIHN
TAKAKURA Hiroki	Tohoku University
OKUMURA Makoto	Tohoku University

Background and project objectives

Climate models predict that evidence of climate change will appear early in Siberia and, as it is located in the high latitudes and in a continent whose climate is determined by radiative cooling, that its effects will be more significant than in other places. In fact, there is already clear evidence of declining ice-content, forest degradation associated with wet environments, and increasing flood frequency and intensity.

Rising temperatures can trigger drastic change in ice, snow and permafrost environments, increase the incidence and intensity of extreme weather events, including flood and forest fires, and alter the structure of interactions between principal biophysical elements. The immediate effect of these changes is likely to increase the concentrations of carbon dioxide, methane and water vapor in the atmosphere, all of which contribute to further warming (Fig. 2) Warmer environments also present new opportunities for large-scale resource extraction, which in turn increases the risk of environment damage, including natural gas leakage from gas pipelines.

Research takes place in the Lena Basin in East Siberia, an area characterized by a fragile symbiotic relationship between permafrost and forest. Permafrost provides moisture to the forest by preventing soil water from draining into deeper soil, while the forest shadows the permafrost from sunlight. A significant change in this relationship could release into the atmosphere an enormous amount of carbon that is currently stored in trees and soil. Our research in the area is conducted by three interrelated groups.

The Siberia bird's eye group

This group combines "bottom-up" and "top-down" observation of the Siberian carbon cycle. Surface spectral ASTER or MODIS data are combined with a terrestrial carbon-energy-water budget model (BEAMS) developed by our group to examine changes in land cover. This data will be supplemented by monitoring of greenhouse gases in Siberia enabled by Japan's launch of the GOSAT (Greenhouse gases Observing SATellite) in January 2009. GOSAT data should rectify the scarcity of ground-based monitors of greenhouse gases in Siberia. This data will improve our understanding of the CO_2 and CH_4 budget in Siberia and track greenhouse gas emissions due to forest fires and malfunctioning natural gas pipelines. Spectral surface data also allows measurement of flood extent and frequency, area of forest degradation or loss, and change in reindeer habitat, phenomena which are also of relevance to the human ecology group.

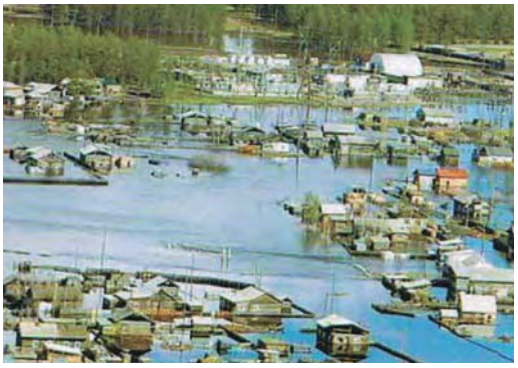


Photo 1 **Flooding of the Lena River in Yakutsk overtakes a village**

Photo 2 **Forest degradation caused by a wet environment**

Figure 1 **Past field research area in Siberia**
Red: natural science, Yellow: socio-ecology

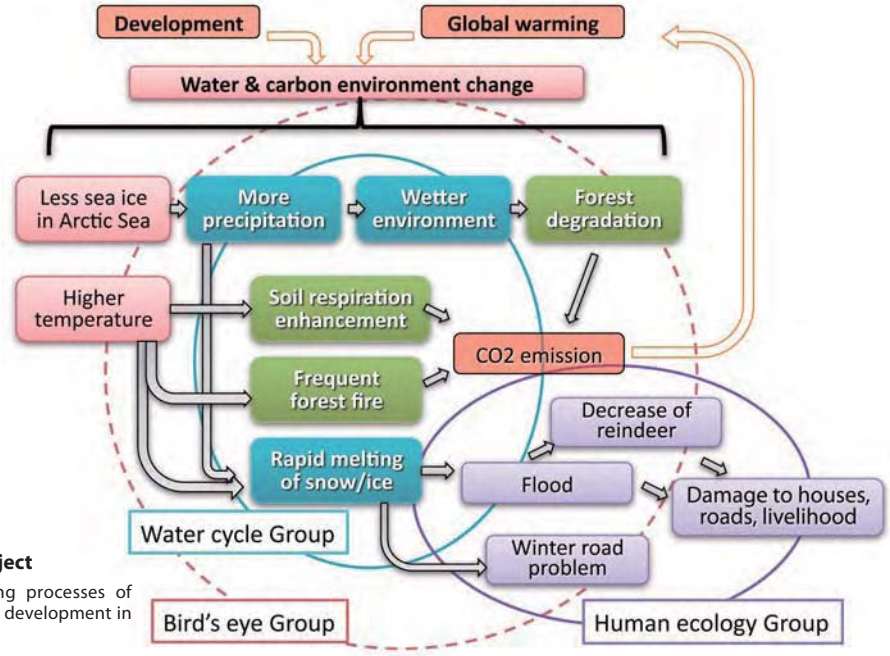


Figure 2 **Flow chart of Project**
Flow chart depicting processes of global warming and development in Siberia

The water cycle and ecosystem interactions study group

Ice cover in the Arctic Sea is decreasing more rapidly than predicted; atmospheric water vapor will be supplied year round and precipitation will increase in Siberia. How will Siberian forests respond to a wetter environment? There is evidence of sudden forest die-off (Photo 2), perhaps due to soil moisture surpassing a critical threshold. Isotope analysis of tree rings provides insight into the past conditions of forest-tundra growth. We have constructed a new monitoring tower at Us'tmaya, located about 500km to the south of the existing monitoring tower at Yakutsk, to measure water vapor, carbon dioxide and heat budget. Precipitation at the new site is 1.5 times greater than at Yakutsk.

The human ecology group

Siberia's human inhabitants have adapted to the cold environment, but current environmental changes affect their life patterns in unprecedented ways. Field studies have revealed that availability of drinking water (stored as ice in winter), availability of bio-fuels (mainly wood), pasture land productivity, and patterns of animal reproduction and hunting are now changing. The number of wild and domestic reindeer has dramatically declined in recent years. Climate warming has led to wetter environments which negatively affect reindeer range and breeding and grazing grounds. There may also be some linkage between decreasing reindeer populations and recent economic conditions. We are going to investigate these changes by interviewing famers and hunters in villages, and by mounting tracking devices on wild reindeer.

Climate change and social change intersect in complex ways and are often difficult to predict. We believe that the human dimension of climate change in Siberia is a very important factor, as human reaction to changing environments has the potential to exacerbate, or perhaps mitigate, negative impacts. We begin by analyzing different actors' perceptions of contemporary change, emphasizing perception of abnormal conditions and of what constitutes a "natural disaster". Analysis of difference in social response to environmental change will improve understanding of social-ecological fragility and vulnerability.

Megacities and the Global Environment

Over half of humanity now lives in cities. By 2020, it is estimated that one in four people will live in *megacities*—cities with a population of more than 10 million—many of which will be located in the developing world. Cities can provide rich sites for individual and community life, but they also impose tremendous burdens on earth environments. This project approaches the great question of how to make megacities earth-friendly while also increasing the present and future welfare of their inhabitants.

Project Leader
MURAMATSU Shin
RIHN

Shin Muramatsu has studied Asian architectural and urban history and is now interested in developing new methods that can shed light on urban futures. His previous publications include "Shanghai: The City and Its Architecture", "Addicted to China", "Keeping an Elephant", and "Asian Architectural Studies". He is the founder of mAAN (http://www. maan.org), an NPO involved in the evaluation, conservation and revitalization of modern architecture in Asia.

Core Members

OKABE Akiko	Faculty of Engineering, Chiba University
KAGOTANI Naoto	Institute for Research in Humanities, Kyoto University
KATO Hironori	Department of Civil Engineering, the University of Tokyo
TANIGAWA Ryuichi	Institute of Industrial Science, the University of Tokyo
HAYASHI Kengo	RIHN
FUKAMI Naoko	Organization for Islamic Area Studies, Waseda University
MURAKAMI Akinobu	Graduate School of Systems and Information Engineering, University of Tsukuba
YAMASHITA Yuko	Graduate School of Commerce and Management, Hitotsubashi University

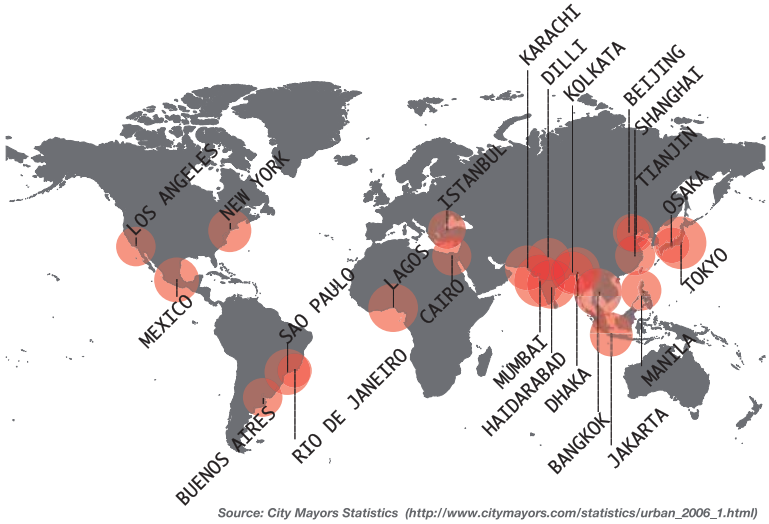
Megacities and "new eco-urbanity"

Population growth and increasing economic wealth is transforming Jakarta, Indonesia (Photo 1), into a megacity of expanding consumption and waste. This project investigates the developmental factors driving this transformation and the kinds of governance that can address, in a unified manner, the urban ecosystem and the key human institutions affecting it. In order to do so, we seek to identify the potential practical advantages in being a "latecomer" megacity (i.e. fast growing and without long-established urban patterns), and the relevance of customary patterns of behavior and urban life to contemporary social processes and ecological problems. Finally, on the basis of the above analyses, we intend to propose specific policies than can support a kind of *eco-urbanity*.

Project methods 1: A diverse but integrative examination of cities

Historically, people have gathered near lakes and rivers, sources of water and life. Early peoples fished, hunted and later cultivated land in these areas. In time, they produced surpluses, developed trade relationships and constructed buildings, industries and infrastructure, and such areas became centers of social organization and political power. In cities people, things, information, and capital have mixed together in unprecedented and unpredictable ways. Cities continue to increase in size and number (Fig. 1, 2); their success depends on humanity's ability to increase its archive of 'urban knowledge'. Meanwhile, the cumulative wisdom that enabled humankind to coexist with ecosystems, what we here call 'eco-knowledge', has been gradually buried deep within the collective human memory.

In this project, we use the phrase "urban sphere" to describe the entirety of human-made elements, human inhabitants, and natural features (subsurface and surface environments and atmosphere) that create and support cities. We focus our study of the urban sphere on the **3E-ICH** elements: the Environment, social Equity; and Economy, which are examined in relation to Institutions, Culture, and History.



Source: City Mayors Statistics (http://www.citymayors.com/statistics/urban_2006_1.html)

Figure 1 **Megacities of the world (2006)**
Megacities—cities of more than ten million people—are emerging all over the world. They tend to be concentrated in developing countries, and as more of these countries see economic growth, their impact on the global environment has increased.

Photo 1 **Landscape of Jakarta**
Jakarta, the primary megacity of Southeast Asia, where skyscrapers and traditional houses coexist.

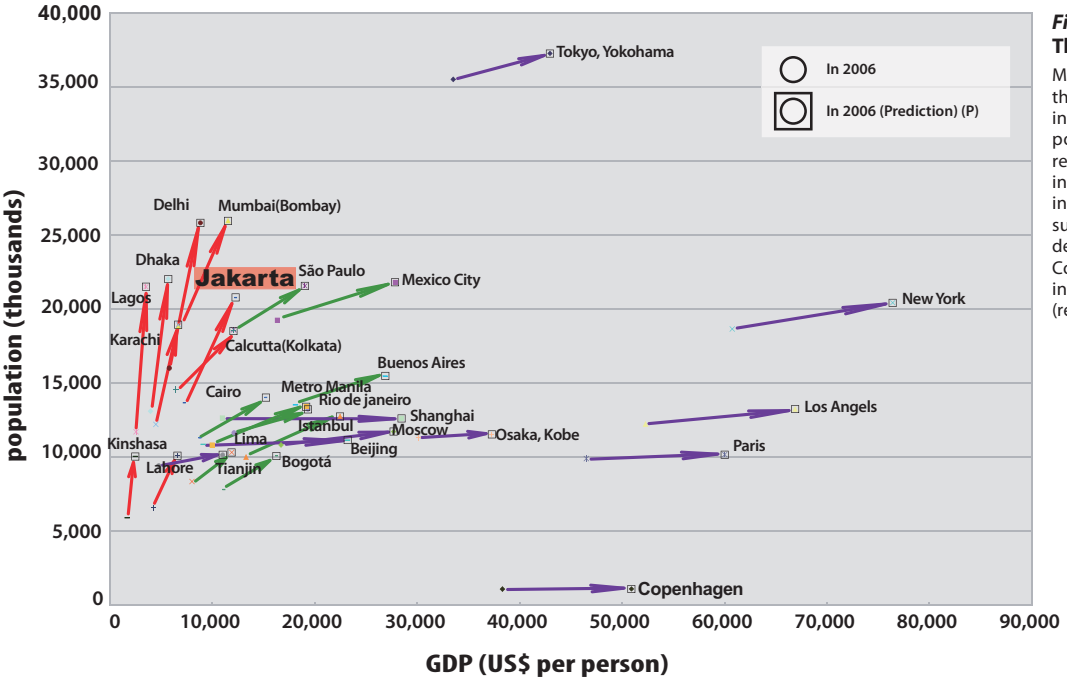


Figure 2
Three types of Megacities

Megacities can be classified into the following three types depending on economic growth rate and population growth rate: Mass resource consumption megacities in advanced countries (indicated in purple); Mass resource consumption megacity followers in developing countries (green); and Coexisting poverty megacities in the least developed countries (red).

Population increase and economic growth forecast in megacities
Source:CITYMAYORS,The world's largest cities and urban areas in 2006. The world's largest cities and urban areas in 2020
Muramatsu FS project baced on http://www.citymayors.com/statistics/urban_2006_1.html,
http://www.citymayors.com/statistics/urban_2020_1.html

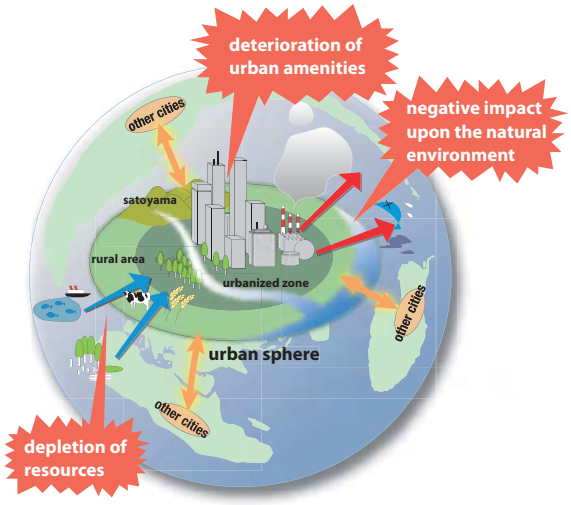


Figure 3 **Environmental problems associated with cities**

Cities have a large impact on the global environment but they also provide great benefits to humanity. They do not simply cause problems, but also contain solutions.

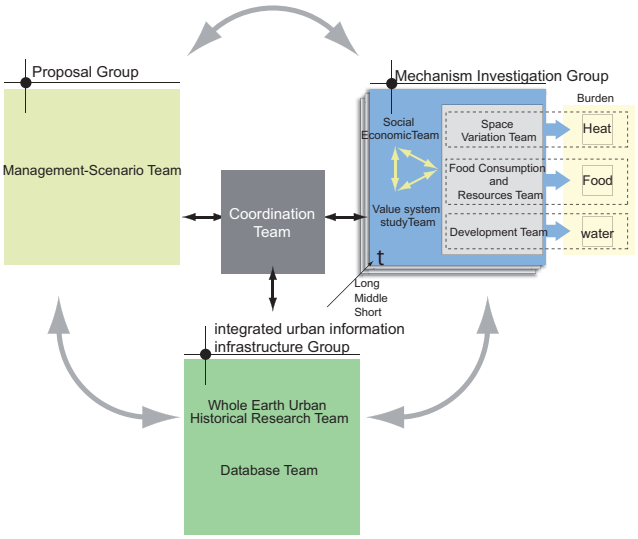


Figure 4 **Organization of the project**

The project consists of three groups to go with our three objectives. Each group is comprised of several teams with specific goals.

Project methods 2: Integration of traditional and contemporary eco- and scientific-knowledge

Addressing the contemporary problems of megacities (Fig. 3) requires scientific and technological measures as well as greater understanding of the local and everyday knowledge, practices and patterns that have historically enabled urban life in particular places and environments. This project seeks solutions to contemporary urban problems through synthesis of urban studies from the social and natural sciences and engineering. It also uses existing literature and social observations to identify the specific customs and patterns of life that have enabled the coexistence of large numbers of people in dense settlements. We will document not only such elements as housing style and local living practices (such as sprinkling water on the streets, and moderating activity in hot parts of the day), but also describe their deeper roots in local philosophical, religious, and aesthetic traditions.

Rich fruit year after year: 2010 objectives

We expect this project to bear rich fruit in each of the coming years. In 2010 we have four main goals: 1) to improve our qualitative description of megacities and to develop a method for graphically representing their principal characteristics; 2) to formalize the specific criteria we will use to assess *3E+ICH* issues; 3) to rapidly collect and organize the 3E data; and 4) to describe and propose explanations of how exhaustion of resources, deterioration of natural environment, and degradation of amenities are related in Jakarta. To achieve these goals, project members need to collaborate closely and deepen their personal knowledge and experience of the study sites (Fig. 4). Each of the project members should walk around the city, observing deeply and thinking flexibly of the pleasures and practical necessities of life in Jakarta, and in urban areas around the world.

"One thousand white rice terraces",
Wajima, Noto Peninsula, Japan
Photo by SHINDO Kenji

Rice terraces in Nepal
Photo by ABE Ken-ichi

Paddy rice cultivation was introduced recently to this area of Arunachal Pradesh, India
Photo by KOSAKA Yasuyuki

Diversity Program

D

Program Director **YUMOTO Takakazu**

The diversity program addresses the loss or degradation of biological diversity—from single species to entire ecosystems— and human cultural diversity, including language, social structure, religion and cosmology. Biological diversity composes the planet as we know it; it is the foundation of all society and human reliance on it is inestimable. Meanwhile, all contemporary societies are the inheritors of past cultural diversity: ideas, technologies, ways of living and systems of belief have been passed from people to people, and have enriched human quality of life and understanding of the cosmos. In recognizing this role of cultural diversity we recognize the basic human rights to safe, healthy, fulfilling lives and peace of mind. These are the essential conditions in which the individual can live with hope and pride.

In a historical context, the current loss of cultural diversity should be seen as part of a large-scale process that threatens biological diversity on Earth, and as an expression of humankind's relationship with nature since the last century. Humanity faces a situation in which the cultures and languages that embrace the thinking that have caused today's global environmental problems are expelling from the world the cultures and languages that have embraced "wise use" and harmony with nature.

The RIHN Diversity Program aims to clarify the formation, maintenance and functions of biological and cultural diversity in various environments. It seeks to identify ways to re-vitalize the idea and practice of "wise use" of nature—to prevent exhaustion of resources and preserve ecosystem services—in order to enhance human well-being and ecological integrity.

Full Research	Leader	Title
D-02	**YUMOTO Takakazu**	A New Cultural and Historical Exploration into Human-Nature Relationships in the Japanese Archipelago
D-03	**OKUMIYA Kiyohito**	Human Life, Aging and Disease in High-Altitude Environments
D-04	**YAMAMURA Norio**	Collapse and Restoration of Ecosystem Networks with Human Activity

A New Cultural and Historical Exploration into Human-Nature Relationships in the Japanese Archipelago

The Japanese Archipelago has been densely populated since the Neolithic Age, and its natural environment has been greatly influenced by human activities. In spite of intensive human intervention in the natural environment, the area is still rich in biota. More recent patterns of interaction between humanity and nature have placed many plants and animals in danger of extinction. This project describes the historical evolution of human-nature relationships in the Japanese Archipelago in order to suggest concrete measures for preventing species extinction in the near future.

Project Leader
YUMOTO Takakazu
RIHN

Professor Takakazu Yumoto is Program Director of the RIHN Diversity research agenda. He is an ecologist with a doctoral degree from Kyoto University, and has been studying plant-animal relations in the tropical regions. At RIHN he expands his research field into human-nature relations, including ethnobotany and ethnozoology, mainly in the Japanese Archipelago.

Core Members

ABE Hiroshi	Graduate School of Human and Environmental Studies, Kyoto University
ANKEI Yuji	Faculty of International Studies, Yamaguchi Prefectural University
IINUMA Kenji	Faculty of Humanities, Beppu University
IKEYA Kazunobu	National Museum of Ethnology
IMAMURA Akio	Faculty of Bioenvironmental Science, Kyoto Gakuen University
MATSUDA Hiroyuki	Graduate School of Environment and Information Sciences, Yokohama National University
MURAKAMI Noriaki	Graduate School of Sciences and Engineering, Tokyo Metropolitan University
NAKAI Sei'ichi	Faculty of Humanities, Toyama University
NAKANO Takanori	RIHN
OSUMI Katsuhiro	Forestry and Forest Products Research Institute
SATO Hiroyuki	Graduate School of Humanity and Sociology, The University of Tokyo
SHIROUZU Satoshi	The Law Faculty, Chuo-Gakuin University
SUKA Takeshi	Nagano Environmental Conservation Research Institute
TAJIMA Yoshiya	Faculty of Economics, Kanagawa University
TAKAHARA Hikaru	Graduate School of Life and Environmental Sciences, Kyoto Prefectural University
TAYASU Ichiro	Center for Ecological Research, Kyoto University
YAHARA Tetsukazu	Graduate School of Sciences, Kyushu University
YONEDA Minoru	Graduate School of Frontier Sciences, The University of Tokyo

Project objectives

The main objective of the project is to describe the history of human-nature relationships in the Japanese Archipelago. Project researchers examine how the area's physical environment and biota have changed since the late Paleolithic Age, when human presence was first established. Archaeological, historical and folkloric materials are used to indicate past human perception, knowledge and skills regarding nature in general, and the human effect on key plant and animal species. This combination of biophysical and human cultural history will enrich appreciation of human-environmental history in the archipelago.

Study area and methods

Six regions and seven sites (in parentheses) have been selected for intensive field study: Hokkaido (Shiribeshi), Tohoku (Kitakami), Chubu (Akiyama), Kinki (Kyoto-Tanba), Kyushu (Kuju-Aso), Ryukyu (Okinawa Island and Amami-oshima Island), with some additional evidence

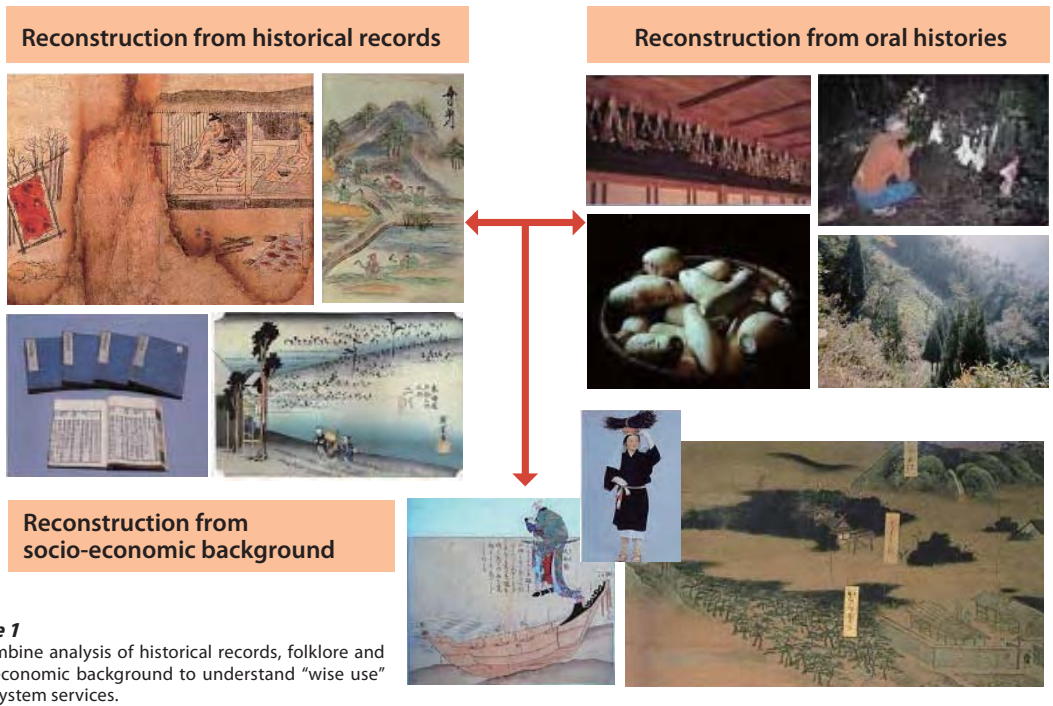


Figure 1
We combine analysis of historical records, folklore and socio-economic background to understand "wise use" of ecosystem services.

taken in Sakhalin. Each site consists of an area measuring about 100 km^2, and includes agricultural land, forested land, and mountains, as well as the characteristic climate, vegetation, flora and fauna, and human culture of its area. Three method-based working groups focus on investigation of the paleo-ecosystem, plant-geography, and analysis of human remains. Principal data is gathered from pollen samples, and DNA and stable isotope analysis, as well as a range of archaeological artifacts, historical documents and folkloric materials.

The project foci are: 1) analysis of ancient vegetation and changes in the distribution of plants and animals; 2) reconstruction of human ecology based on population estimates and diet; 3) description of principal patterns of human-nature interactions in the past and of the social systems associated with these patterns; and 4) theoretical modeling of human-nature relations.

The above data and analyses will be used to compile an environmental history chart (depicting vegetation change, human population, and historical epochs) for each site. The use of proxy and tracer analyses (pollen, DNA and stable isotope analysis), will enable comparative analysis of the driving causes and effects of changing human-nature relations in different places and epochs.

Results

For each study region we are compiling a series of environmental history charts that indicates major environmental issues and resource management policy changes. The charts will be completed by adding data of estimated vegetation and population change. These charts have allowed us to examine the parallel histories of human and environmental change in the archipelago, and to relate changes in environmental knowledge and skill to the disappearance, or new abundance, of particular flora or fauna.

We have also examined the concept of "wise use", which we have defined as the application of environmental knowledge and skills in such as way as to utilize (or otherwise take benefit from) renewable natural resources and ecosystem services without exhausting them. Examples of "wise use" and "unwise use" from each district are being distinguished and categorized by scale of governance (e.g. household, community, local government, national government, international organization) and system of incentive employed. This analysis will indicate variations in the approach to environmental governance and time- and place-specific perceptions of "wise use" of environmental resources.

Future plans

In integrating and analyzing the findings of the different working groups, we try to understand the processes that have led to plant and animal extinction in the Japanese Archipelago, and how the extinction ratio in the future can be reduced. At the same time, we seek to emphasize examples in which culture, religion and governance encouraged wise use of natural environments. In 2010 when the 10th Conference of the Parties of the Convention on Biological Diversity will be held in Nagoya, Japan, we will prepare a strong message of how the preservation of biodiversity and cultural diversity contribute to human wellbeing and ecological integrity.

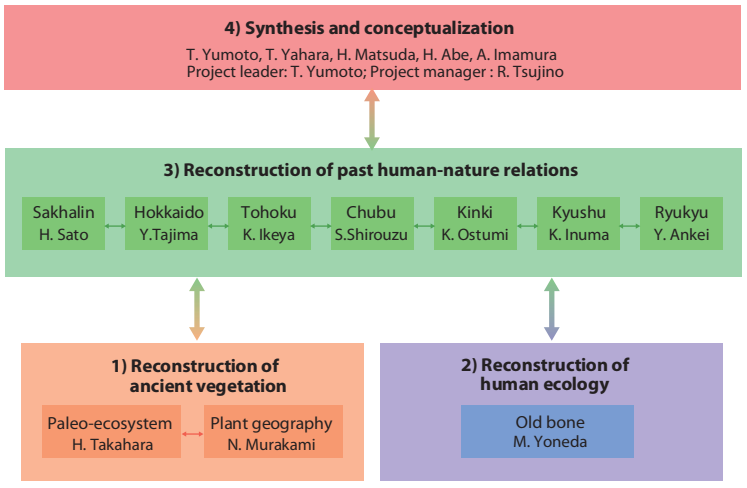


Figure 2
Our project structure is based on 7 area-based working groups, 3 method-based working groups and an integrating working group.

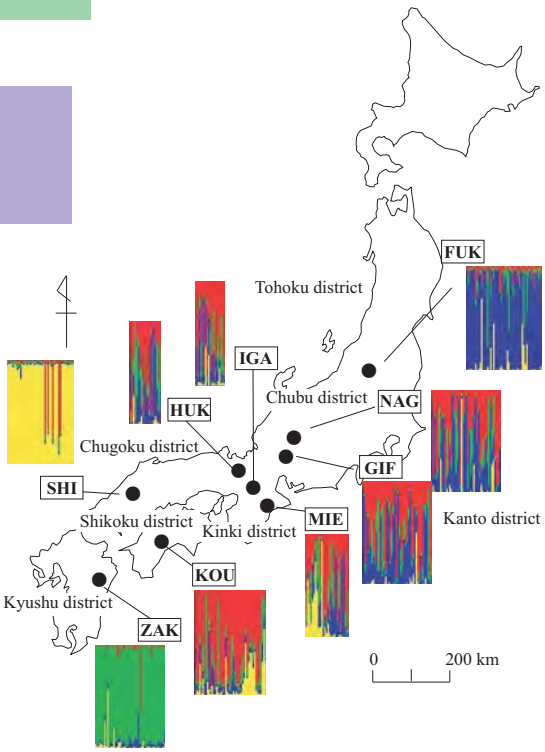


Figure 3
Genetic structure of an endemic tree species, *Sciadopitys verticillata*. *S. verticillata* has been used to make coffins and pillars for more than 2000 years. The species' low genetic variation in several localities indicates overuse in the past.

Human Life, Aging and Disease in High-Altitude Environments: Physio-Medical, Ecological and Cultural Adaptation in "Highland Civilizations"

This project examines how humans have adapted to high-altitude environments physiologically, ecologically and culturally. Project researchers document the health status of elderly highlanders, and explore possible factors associated with lifestyle-related diseases in this population. Finally, we investigate the impact of modern development over the past 50 years on high altitude lifestyles and environments, and assess how these changes affect the quality of life (QOL) of elderly highlanders. Study sites have been selected from three areas in the Himalaya-Tibet region, the Ladakh region in India, the Arunachal Pradesh State in India, and the Qinghai Province in China, each of which has distinct ecological and socioeconomic conditions. Findings from the Himalaya-Tibet region will also be compared with medical research conducted in Bhutan and Nepal.

Project Leader
OKUMIYA Kiyohito
RIHN

Dr. Okumiya is a medical doctor with a degree from Kochi Medical College. He has adopted a novel approach to field medicine, including cultural and environmental factors in the study of community-dwelling. He has published journal articles on field medicine, geriatrics, and neurology.

Core Members

ANDO Kazuo	Center for Southeast Asian Studies, Kyoto University
INAMURA Tetsuya	School of Foreign Studies, Aichi Prefectural University
KAWAI Akinobu	Faculty of Liberal Arts, The Open University of Japan
KOSAKA Yasuyuki	RIHN
SAKAMOTO Ryota	RIHN
SHIGETA Masayoshi	Graduate School of Asian and African Area Studies, Kyoto University
TAKEDA Shinya	Graduate School of Asian and African Area Studies, Kyoto University
TSUKIHARA Toshihiro	Faculty of Education and Regional Studies, University of Fukui
MATSUBAYASHI Kozo	Center for Southeast Asian Studies, Kyoto University

Project Objectives

We intend to explore new perspectives regarding how people live in high-altitude environments where oxygen levels are low and natural resources are limited. We focus on aging problems and lifestyle-related diseases because we regard these as manifestations of global environmental issues in the human body. We aim to clarify "highland civilization", as defined by ecological and cultural adaptations to high-altitude environments, physiological adaptations, and how recent changes in lifestyle have affected quality of life (QOL) amongst the elderly.

Progress to Date

Research findings indicate the following.

1) High altitude environments speed up the senescence process of the human body.
2) Recent lifestyle changes have brought about increases in the prevalence of lifestyle-related diseases and change of aging phenomena.
3) Incidence of lifestyle-related diseases is strongly influenced by adaptation methods to high altitude environments.
4) High subjective QOL assessments were found in Tibetan people, even though they experience a higher prevalence of disabling conditions compared with Japanese populations.

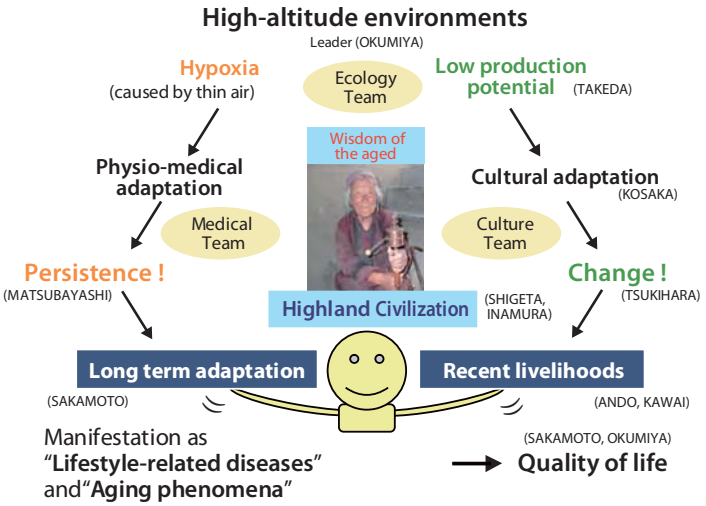


Figure 1 **Framework of the project**
How does recent livelihood change affect long-term cultural and physio-medical adaptation to highland environments?

The three study agenda streams
Human physiological, ecological and cultural adaptation to high-altitude environments

We examined oxygen saturation, hemoglobin concentration (the primary conveyer of oxygen in the blood), Cardio Ankle Vascular Index (atherosclerosis), pulmonary blood pressures (as indicators of dilatation and blood flow to promote oxygen circulation), respiratory functions (intake of oxygen) and oxidative stress in elderly residents in the study areas. Han people had higher hemoglobin concentration compared with Tibetans in Qinghai. Increasing prevalence of diabetes mellitus was strongly associated with increases in hemoglobin levels related to adaptation to hypoxia in Ladakh (Fig. 3).

The following five variables are identified for consideration in cultural adaptation and they will be intensively studied in Ladakh and Arunachal. First, the form of agricultural activity and the land-holding system have been described in terms of wise use of limited natural resources. Second, household attributes will be recorded through a household survey on population, sex ratio and marriage system, labor distribution, and economic conditions. Third, dietary habits have been identified and the amount of nutrition intake will be evaluated. Fourth, local knowledge on traditional medicine will be recorded. Fifth, the role of religious beliefs will also be considered as an important factor that supports daily life by promoting mental well-being.

Figure 2
We set up weather monitoring stations at Domkhar village and installed five temperature/humidity sensors in the Ladakh area beginning in June 2009. We developed a fine resolution climatological profile in the region using a combination of local meteorological and satellite data (Yatagai *et al.* 2008. SPIE).

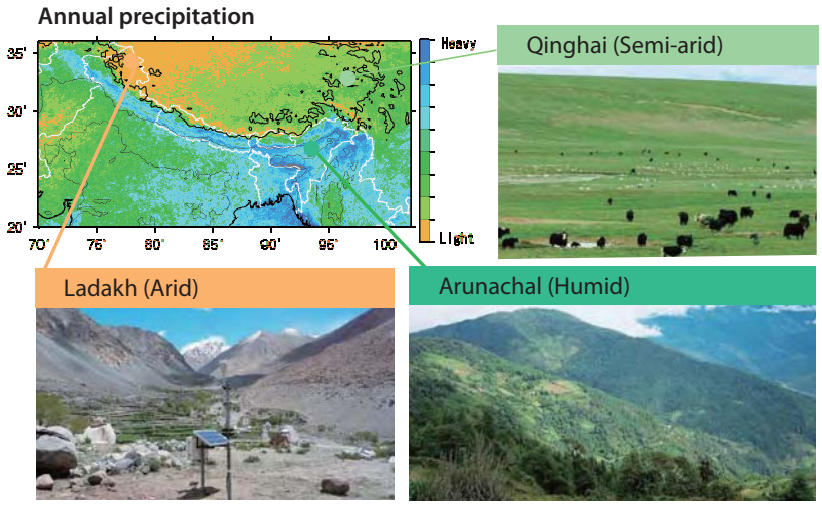


Photo 1 **Ladakh, Domkhar January 2009 (3800 m)**
We explore the physiological and cultural adaptations of people living in low-oxygen and limited-natural resource high-altitude areas.

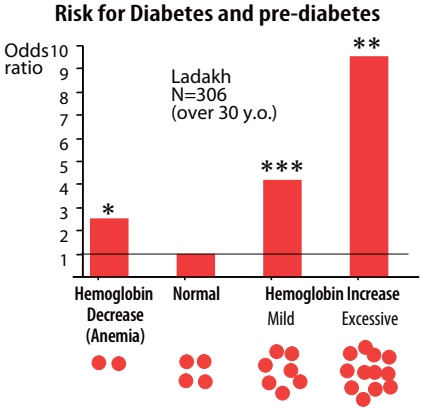


Figure 3
Increase in the prevalence of diabetes mellitus was strongly associated with increases in hemoglobin levels caused by adaptation to hypoxia (Okumiya *et al.* 2010. J Am Geriat Soc).

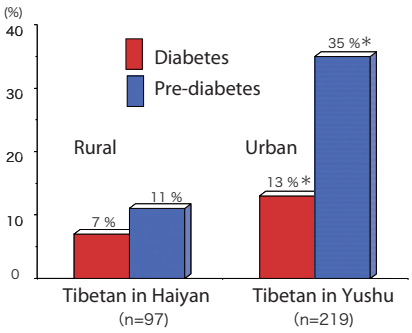


Figure 4 **High prevalence of diabetes and pre-diabetes in Yushu (urban) and Haiyan (rural), Tibet.**
Changes in lifestyle patterns associated with settlement and urbanization may accelerate prevalence of lifestyle-related diseases (Okumiya *et al.*, 2010. J Am Geriat Soc., in press).

Health status of elderly highlanders and possible factors associated with lifestyle-related diseases

Han people had greater rates of hypertension and obesity than Tibetan people. The conditions are associated with higher hemoglobin concentrations in Han populations, which in turn is regarded as an adaptation to hypoxia. Even within the Tibetan population, there was a strong association between glucose intolerance (diabetes/pre-diabetes), obesity, and polycythemia (increased hemoglobin), an indicator of hypoxic maladaptation (Fig. 3). Obesity, hypertension, atherosclerosis and high pulmonary blood pressure were more prevalent in people with higher hemoglobin in both Ladakh and Yushu.

The prevalence of glucose intolerance and hypertension were much higher in Yushu than Haiyan, Qinghai. Changes in lifestyle patterns associated with settlement and urbanization may be associated with the increased prevalence of the two conditions (Fig.4).

The prevalence of diabetes mellitus (DM) in Ladakh was as low as in Haiyan, but pre-diabetes was as high as in Yushu and higher than in Haiyan. The "thrifty gene/phenotype" hypothesis may help to explain some of the observed difference. In Ladakh, we found that there were higher rates of diabetes in people with high economic status and non-traditional food habits. In high altitude Himalaya regions, after rapid changes in lifestyle, adaptation mechanisms to hypoxia and low nutrition may have accelerated the onset and aggravation of diabetes. This is "the Himalaya model of lifestyle-related diseases" -"diabetes acceleration hypothesis"-.

Impact of modern developments on lifestyle and environment at high-altitudes and their relation to elderly QOL

People with glucose intolerance had high risk of losing independence of daily activity, which is a very important contributor to subjective QOL scores. Subjective QOL was higher in Tibetan people in rural Haiyan people than in people in urban Yushu. Even elderly people in Yushu had higher QOL scores notwithstanding higher prevalence of disabling conditions than their counterparts in Japan. High subjective QOL scores seemed to be associated with Tibetan Buddhism, family relationships and living conditions in the community. The healer of Tibetan medicine took responsibility for primary care of sick people especially in Arunachal. Social networks and Tibetan Buddhism may support high QOLs in the Highland Civilizations. Such mechanisms should be further explored.

Schedule in 2010/2011

In linking medical problems with cultural and ecological backgrounds in each study site, we will be able to evaluate the "Himalaya model of lifestyle-related diseases" hypothesis of diabetes acceleration not only in Himalaya/Tibet, but also in the Andes and the Ethiopian highlands. The "Himalaya" model of lifestyle may be renamed as the "Highland" model if our hypothesis holds true in multiple highland environments.

Collapse and Restoration of Ecosystem Networks with Human Activity

Many ecosystems have been seriously degraded by human activities and are now in critical condition. Nevertheless, most research on ecosystem degradation has focused only on its direct cause and effect in a particular place. This project applies new network sciences to the problem of ecosystem deterioration and collapse, and to the prospects of ecosystem restoration. The project examines social-environmental interactions in two distinct ecosystems where humans are dramatically altering ecosystems, and attempts to identify general properties of productive and destructive ecological change.

Project Leader
YAMAMURA Norio
RIHN

My research field is mathematical ecology. I have studied various theoretical problems in population and evolutionary ecology. I am now trying to construct mathematical models on socio-ecological systems, for example, modeling population migration between urban and rural areas, and differences in the use of private and common lands. I like football, and am still playing on the small RIHN field sometimes.

Core Members

SAKAI Shoko	RIHN
ISHII Reiichiro	Frontier Research Center for Global Change
FUJITA Noboru	RIHN
ICHIKAWA Masahiro	Graduate School of Agriculture, Kochi University
KAMIMURA Akira	Tokyo University of Foreign Studies
ITIOKA Takao	Graduate School of Human and Environmental Studies, Kyoto University
MATSUOKA Masayuki	Graduate School of Agriculture, Kochi University
HYODO Fujio	Center for New Technology, Okayama University

Objectives

Degradation of ecosystems, including loss of biodiversity and ecosystem functions, is widely viewed as a serious global environmental problem. To date, most research on the problem has focused on the direct causes and effects of ecological degradation in a particular place. Few studies have adopted network-based analytical frameworks capable of describing the indirect and cascade effects characteristic of human-driven ecosystem change. Still fewer studies incorporate a social science perspective on ecological networks, even though environmental problems occur as a consequence of interactions between nature and human society.

This project uses new network sciences to clarify the social and ecological patterns of exchange that lead to degradation of two endangered ecosystems in Asia. Recent advances in computer science and in theoretical studies on networks (i.e. complex system sciences, complex adaptive systems) have dramatically increased our ability to describe interactions between ecosystems and human societies. Complex system science can now lend important insights to the fields of sociology, economics, and ecology, and can offer richer description of the processes of ecological degradation and restoration.

Research sites

Field research takes place in tropical rainforests in Sarawak, Indonesia, and the grasslands of Mongolia (Photo 1). Export of raw materials is central to both economies. In the last few decades, social and environmental conditions in both places were profoundly affected by resource extraction, which has recently intensified in relation to demand from China. Though their ecological characteristics, such as the regeneration time of vegetation and position of humans in the food web, are quite different, the livelihoods of many inhabitants of these regions are dependent on natural ecosystems, and ecosystem destruction dramatically affects their practices and prospects.

Research methods

The most important concept of this project is the "ecosystem network"; it describes a nested series of interactions among and within subsystems, including human societies, as shown in Figure 1. In both Sarawak and the grasslands of Mongolia, we are conducting research in three core steps: (1) identification of area-specific problems and the possible ecosystem network structures that can be related with them; (2) use of field survey, remote sensing and literature surveys to hypothesize and evalu-

Photo 1 **Recent environmental problems in Mongolia and Sarawak**
A. The number of livestock, especially goats, is increasing rapidly, leading to degradation of pastures (photo by A. Maekawa).
B. The number of oil-palm plantations is increasing all around Sarawak, and palm oil products are increasingly available (photo by S. Sakai).

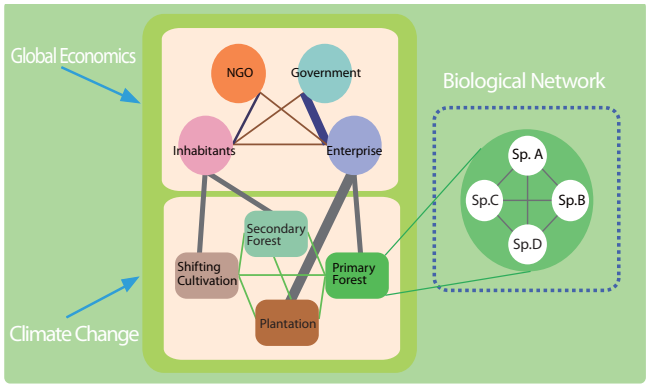


Figure 1 **Example of an ecosystem network in Sarawak**

In the ecosystem network, the subsystems (e.g. primary forests, secondary forests, lands for shifting cultivation), each of which consists of several networks of biological interactions, form an interacting network. We treat human society as a subsystem within the ecosystem network and regard human activities as another field of ecosystem interactions.

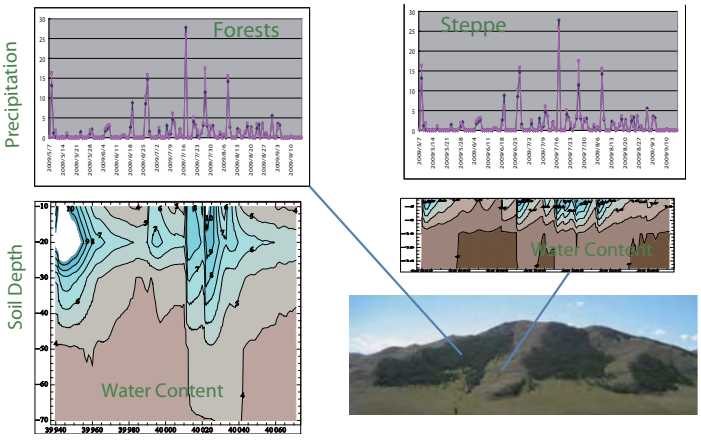
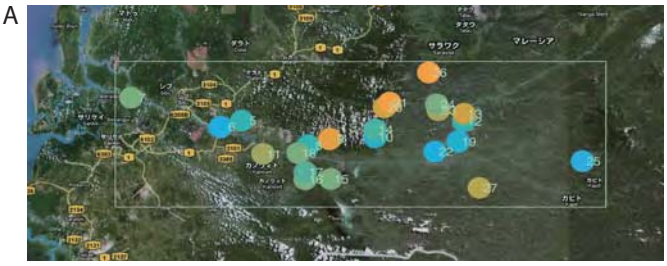
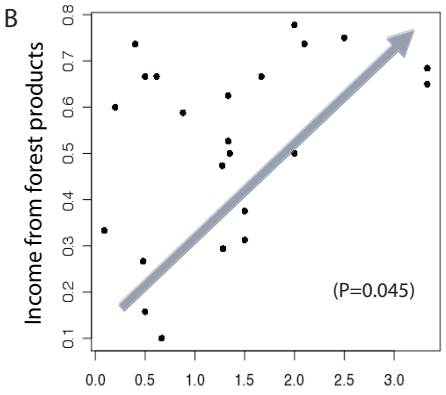


Figure 2 **Data from automated weather systems set at intensive research sites in Mongolia**

Precipitation and soil water levels in forests and grasslands in the forest-steppe area. Forest soils are deeper than those in the grasslands, and hold more water for a longer period of time. We believe that forests contribute to the growth and maintenance of grasses.





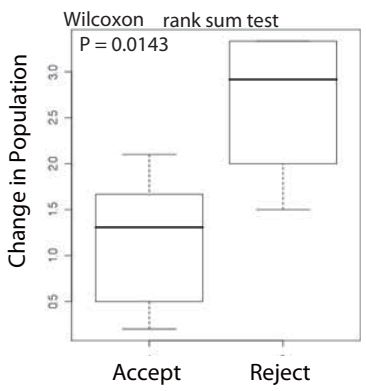


Figure 3 **Preliminary results of a survey conducted in 23 villages along Rajang River, Sarawak**

A. Orange (blue) circles represent villages with population increase (decrease)
B. Population is increasing in the areas where income from forest products is significant
C. In those villages, local governments tend not to allow plantations

ate network links; and (3) scenario analysis of constructed networks, in which ecosystem and social outcomes are evaluated according to several indices. In integrating these results, we use the concept of ecosystem networks to establish a general theory of conservation. The core of the theory will indicate which network structures are likely to lead to environmental problems and how they can be mitigated.

Progress to date

In Mongolia, we: (1) found the most serious environmental problem to be increased degradation of pastures, especially near Ulan Bator, caused by overgrazing by an increasing number of livestock, especially goats (Photo 1A); (2) studied the social patterns leading to concentrations of livestock to urban areas; (3) analyzed climate data in order to clarify the roles of forests and shrubs in maintaining sustainable pastures (Fig. 2); and (4) conducted scenario analysis of the effects of several variables, such as improvement of transportation and protected areas, on pasture degradation.

C

In Sarawak, we: (1) found the most serious environmental issues to be the expansion of palm plantations and their negative effect on biodiversity and forest resources available to inhabitants; (Photo 1B); (2) conducted questionnaire surveys along the Rajang and Baram rivers, two main rivers in Sarawak, in order to identify the reasons (Fig. 3); (3) analyzed the effectiveness of, and problems with, institutions and systems such as forest certification and bioprospecting in regulating rapid plantation developments.

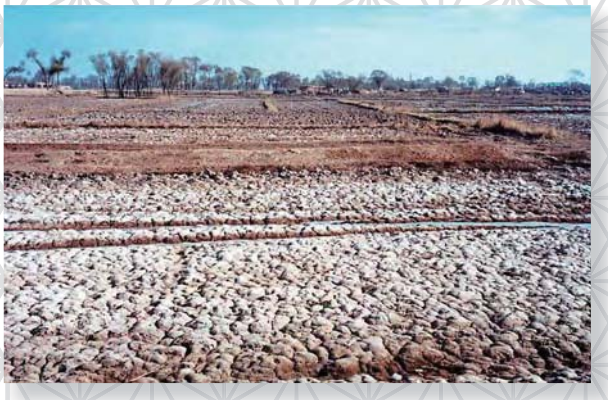
Finally, on the basis of the Mongolia and Sarawak case studies, we have begun to develop a general theory of conservation of ecosystem networks. In this process we have identified two important network effects: ripple effects that spread through the spatial structure, and positive feedback interactions between ecosystems and human behaviors.

Future issues to be addressed

The scenario approach has become popular in recent years. Well-known examples include those proposed by the Intergovernmental Panel on Climate Change (IPCC) to describe the significance of different levels of CO_2 emissions, and those of the Millennium Ecosystem Assessment. In both cases, the scenarios assume a set of conditions according to a particular story line. We will use a similar approach. In the next two years, we will identify several plausible scenarios and evaluate them with several indices. Three provisional scenarios are: (1) business as usual; (2) infrastructure investment and development; and (3) changes in institutions.

Desert wisdom: long-term use of oasis waters in the Sahara
Photo by ISHIYAMA Shun

Fields under the influence of climate change, Zambia
Photo by MIYAZAKI Hidetoshi



Arid land damaged by seawater intrusion, Inner Mongolia
Photo by KUME Takashi

The scene of a camel race in Riyadh, Saudi Arabia
Photo by NAWATA Hiroshi

Resources Program

R

Program Director **WATANABE Tsugihiro**

The Resources Program investigates problems deriving from humankind's use or conservation of renewable and non-renewable resources. Humans have always made use of plants and animal species, and have succeeded in domesticating some of these wild resources. Through time, humans were able to increase the amount of food available to them, and to increase their own numbers. At the same time, however, the exploitation of land for agricultural production and for pasture has dramatically decreased forest cover and wild biodiversity.

Formerly, most food was produced and consumed locally; gradually transportation technologies have enabled long-distance trade. At the same time, energy consumption has increased along with "food miles," and imposed serious environmental loads through the emission of CO_2.

Such facts raise the question of how much of a certain resource exists, how much is consumed, what is involved in its extraction, processing, transport, and consumption, what rates of resource "throughput" are ecologically sensible and best promote human wellbeing, and what alternatives may exist. The Resources Program takes an integrated, transdisciplinary approach to such questions.

Full Research	Leader	Title
R-03	**KUBOTA Jumpei**	Historical Interactions between Multi-Cultural Societies and the Natural Environment in a Semi-Arid Region in Central Eurasia
R-04	**MOJI Kazuhiko**	Environmental Change and Infectious Disease in Tropical Asia
R-05	**NAWATA Hiroshi**	A Study of Human Subsistence Ecosystems in Arab Societies

Historical Interactions between Multi-Cultural Societies and the Natural Environment in a Semi-Arid Region in Central Eurasia

This project examines the historical interactions of humanity and nature in the semi-arid region of Central Eurasia. Textual, archaeological and biophysical evidence is used to examine the effect of human boundaries on environments, ethnic groups, dominant patterns of subsistence, and relations between cities and their surrounding areas. The findings of this project will improve understanding of how past human activities cumulatively affected ecosystems in Central Eurasia, and how semi-arid regions can best be managed in the future.

Project Leader
KUBOTA Jumpei
RIHN

Professor Kubota earned a doctorate in forest hydrology from Kyoto University (1987). He was previously Assistant Professor at Kyoto University (1987-1989), Assistant Professor (1989-1996) and Associate Professor (1997-2002) at Tokyo University of Agriculture and Technology. He joined RIHN in 2002 and now directs the RIHN-China initiative. His major research fields are hydrology, water issues in arid regions and human impacts on the hydrological cycle.

Core Members

UYAMA Tomohiko	Slavic Research Center, Hokkaido Univ.
MATSUYAMA Hiroshi	Graduate school of Urban Environmental Sciences, Tokyo Metropolitan Univ.
TAKEUCHI Nozomu	Graduate School of Science, Chiba Univ.
FUJITA Koji	Graduate School of Environmental Studies, Nagoya Univ.
SUGIYAMA Masaaki	Graduate School of Letters, Kyoto Univ.
FUNAKAWA Shinya	Graduate school of Agriculture, Kyoto Univ.
SOHMA Hidehiro	Faculty of Letters, Nara Women's Univ.
KONAGAYA Yuki	National Museum of Ethnology
YOSHIKAWA Ken	Graduate School of Environmental Science, Okayama Univ.
YOSHIDA Setsuko	Department of Applied Sociology, Shikoku Gakuin Univ.
KATO Yuzo	RIHN
CHENGZHI	RIHN

Background and objectives

Nomads were once the principal inhabitants of semi-arid Central Eurasia. Following the rise and fall of various ethnic groups and empires, the Yuan Dynasty took nominal control of much of Eurasia in the 13th and 14th centuries. In the 18th century, however, a national border was drawn across the region, definitely distinguishing Russia from Qing China. The inhabitants of the area subsequently experienced a great change of lifestyle, as the border and national settlement policies forced nomadic peoples out of their traditional patterns of livelihood.

This project combines analysis of historical documents, archaeological remains and natural proxies such as ice cores, lake sediment samples, tree rings and wind-blown deposits in order to describe how nomadic peoples and nation-states affected the natural resources and climatic conditions in the Ili River watershed in Central Eurasia. Project researchers also investigate human activities on both sides of the Russia/China border in order to describe its potential effect on contemporary environmental conditions.

Research area and groups

Research centers on the Ili River watershed area, which extends from China to Kazakhstan, and surrounding areas, including Kyrgyzstan and Uzbekistan. Throughout human history, Central Eurasia has been a key site of interaction between individual ethnic groups inhabiting or passing through the area, and a longtime crossroads for the civilizations of East and West. In more recent times, the development policies of modern states have led to severe environmental degradation.

This project consists of two research groups. The first group uses historical documents and natural proxies to describe historical changes in both human and natural systems. The second group investigates current human activities and natural systems in order to interpret the long term significance of past human and environmental change.

Progress to date

Initial analysis of data from Lake Balkash indicates that lake level began to decrease in the 10th century, and at the turn of the 13th century reached its lowest level in the past 2000 years. After this regression, the lake level showed rapid recovery, and remained relatively high until the modern regression beginning in the 1960s. Other lakes in Central Eurasia, such as the Aral Sea and Lake Issyk-Kul,

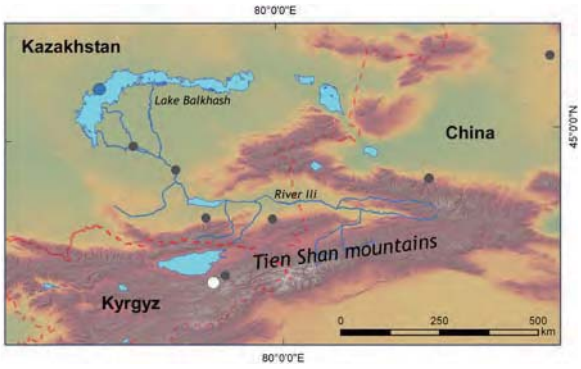


Figure 1 **The Tian Shan Mountains and Ili River**

● Lake sediment core ○ Ice core ● Other study sites

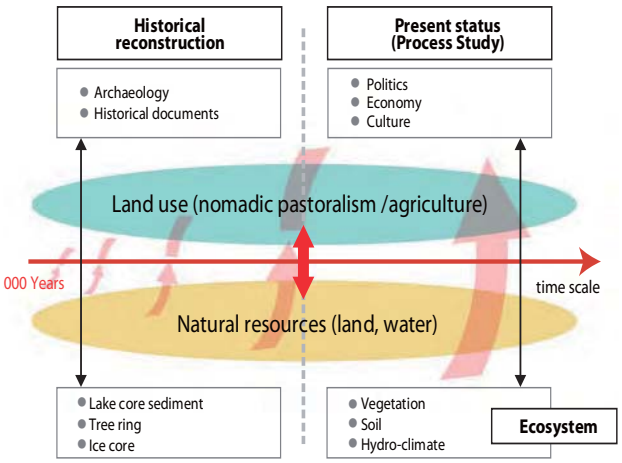


Figure 2 **Outline of the project**

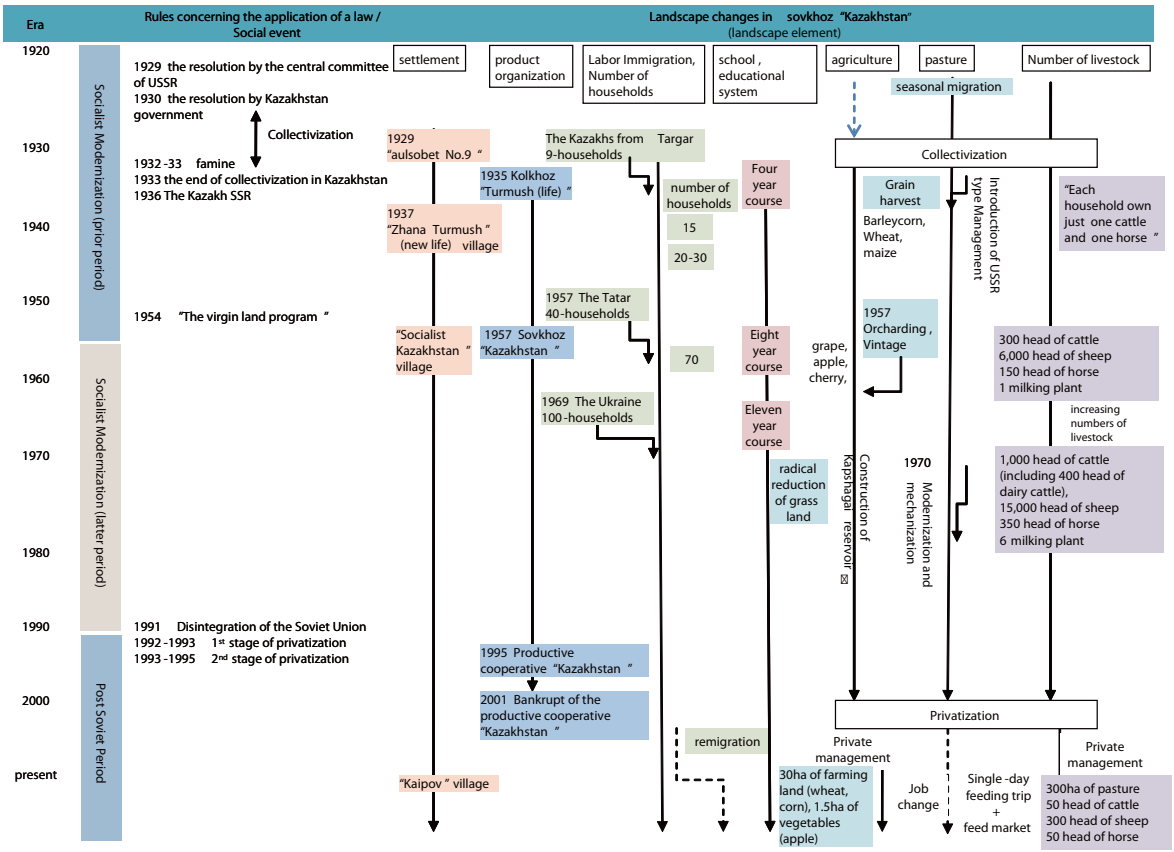


Figure 3 **Transition of social systems and subsidence in Kazakhstan**

experienced a similar regression in medieval times, suggesting the climate then was cooler and drier. Increased human reliance on lake waters in this period could also be associated with their lower levels.

We find evidence that the establishment of a clear border between Russia and the Chinese Qing Dynasty shifted patterns of human-environmental interaction in the region. The border exposed certain areas to concentrated human activity, which, along with increasing technological capacity, clearly demonstrate human potential to cause dramatic environmental change.

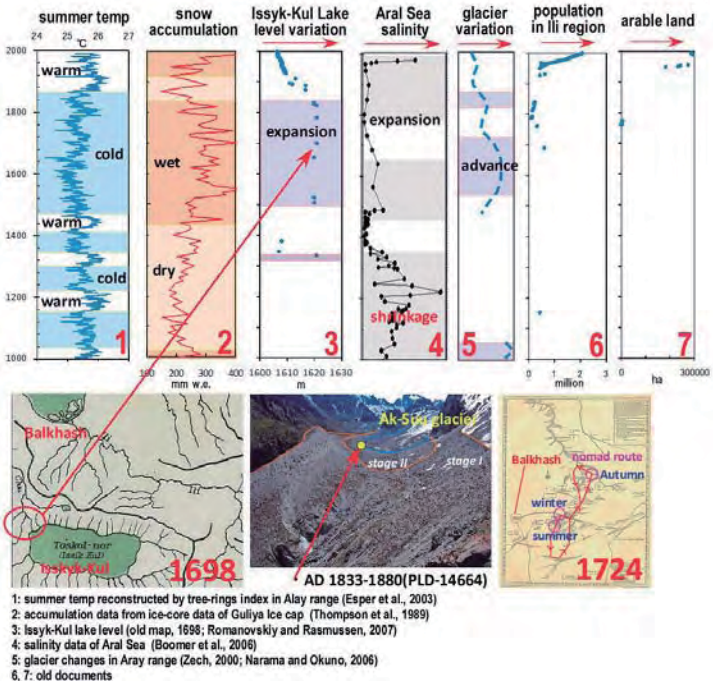


Figure 4 **Long-term reconstruction of climate and environmental change in Central Eurasia**

The most dramatic change in long-term patterns of human and environmental interaction in semi-arid Eurasia was the shift from nomadic to sedentary societies accompanying the establishment of modern agriculture. Russia's expansion into Kazakhstan in the late 19th century, agricultural collectivization in 1929, and Khrushchev's Virgin Lands Program gradually converted Kazakhstan into a major agricultural zone. Agricultural production was pursued with little regard for environmental capacity or impact. With the collapse of the Soviet Union many farms were abandoned, reducing pressure on natural resources, and allowing some ecosystem recovery.

In China, modern development did not begin in earnest until the 1950s. China's dramatic recent growth, however, is increasing demand for natural resources and the western provinces may again be subject to centrally planned development.

Cooperation with research institutions in Kazakhstan, China and Russia has facilitated collection of a number of unusual historical documents, maps and images of the region. Several documents describe the locations and populations of different nomadic groups, and the number of animals kept by each. Of these documents and maps, those written in Manchurian have not been previously investigated because few researchers can understand the Manchurian script; we are currently engaged in their translation and analysis.

We are also compiling information obtained from historical texts, archaeological sites and images into a chronological GIS database that will demonstrate in graphic manner the long-term human and environmental transformations in Central Eurasia.

Environmental Change and Infectious Disease in Tropical Asia

The RIHN Ecohealth Project examines the effects of social and environmental change on the ecology of human disease in tropical monsoon Asia. Key drivers of ecological change in this area include population increase, deforestation, resettlement, urbanization, expansion of wet rice cultivation, changes in water management, economic development and lifestyle changes. Prevalent diseases associated with such ecological change include malaria and liver fluke infection. Project researchers also investigate the relation between climatic change (e.g. temperature, rainfall, and flood) and infectious disease, mainly in Bangladesh. The study will offer new ecologically-based insights for the evaluation and control of infectious disease in relation to both local and global environmental changes.

Project Leader
MOJI Kazuhiko
RIHN

Kazuhiko Moji has been at RIHN since 2007. He received his MA (1978) and Ph.D. (1987) in Health Sciences at the University of Tokyo. He was Research Associate at the Department of Human Ecology at the University of Tokyo (1983-1987). In 1987 he moved to Nagasaki University, where he served as Associate Professor in the Department of Public Health (1987-1999) and Professor in the School of Allied Medical Sciences (1999-2001), Faculty of Health Sciences (2001-2002), and Research Centre for Tropical Infectious Diseases of Institute of Tropical Medicine (2002-2007). He was a visiting Takemi Fellow of International Health at Harvard School of Public Health (1991-1992) and a visiting researcher in the Department of Bio-anthropology, Cambridge University (1998-2000).

Core Members

MASCIE-TAYLOR, Nick	Cambridge University, UK
KOBAYASHI Shigeo	Kyoto University
IJIMA Wataru	Aoyama Gakuin University
KOBAYASHI Jun	National Center for Global Health and Medicine
TOMITA Shinsuke	The University of Tokyo
ASAKURA Takashi	Tokyo Gakugei University
YAMAMOTO Taro	Nagasaki University
KANEKO Satoshi	Nagasaki University
HASHIZUME Masahiro	Nagasaki University
SUNAHARA Toshihiko	Nagasaki University
AHMED, Kamurddin	Oita University
BOUPHA, Boungnong	National Institute of Public Health, Lao PDR
KOUNNAVONG, Sengchanh	National Institute of Public Health, Lao PDR
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ISLAM, Sirajul	ICDDR,B, Bangladesh
HUNTER, Paul	University of East Anglia, UK
MOAZZEM, Hossain	Sylhet M.A.G. Osmani Medical College
RAHMAN, Mahmudur	IEDCR, Bangladesh
ZHANG Kong-Lai	Peking Union Medical College
ZHANG Kaining	Kunming Medical College
ICHIKAWA Tomo	Shanghai Jiao Tong University
CAI Guoxi	RIHN
TOJO Bunpei	RIHN
NISHIMOTO Futoshi	RIHN

Project background

The health profile of a human population can be seen as a product of the human ecosystem—an ecosystem comprised of both biophysical and human elements. The construction and conservation of sound human ecosystems, therefore, is essential to the health and survival of human populations. The field of ecohealth considers human health and disease in relation to environmental conditions; it can improve attempts to address disease and local and global environmental problems.

Research objectives

Several research groups comprise our project. The Lahanam Study Group's research in Savannakhet Province, Laos, examines patterns of liver fluke infection, a parasital infection associated with consumption of raw freshwater fish. In 2010 the principal objectives of this group are to:

1) Introduce an appropriate IT-based communication system in order to improve the Lahanam Health and Demographic Surveillance System (HDSS) and build a database allowing longitudinal health study;
2) Study the relation between modern irrigation/wet-rice cultivation and liver fluke infection;
3) Study fish and snail ecology, fishery ecology, and consumption of fish, and;
4) Determine feasible educational, behavioral, and/or environmental control of liver fluke infection.

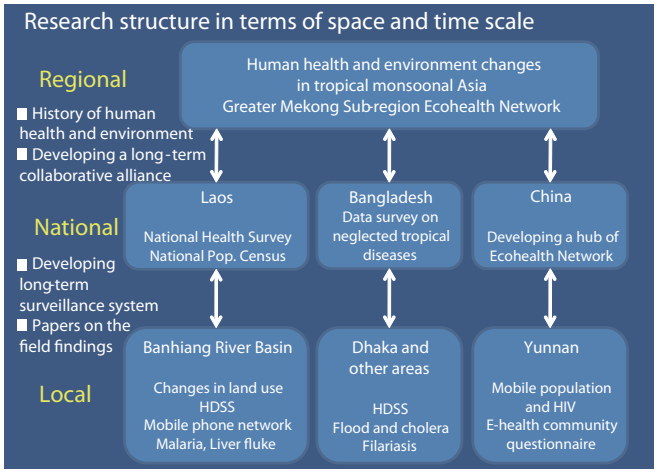

Figure 1 **Research Framework of the Ecohealth Project**

Studies on child and school health and nutrition are also under way. Project researchers found a decrease in the prevalence of liver fluke infection among school children since beginning our surveillance.

The Sepone Study Group's work in Savannakhet Province, Laos, is developing an integrated ecological and medical approach to malaria control and elimination in Southeast Asia. Their work focuses on malaria in the border regions of Vietnam and on new human malaria, *Plasmodium knowlesi*. In 2009 this group established a mobile phone-based health information network system covering all 158 villages in Sepone. Land-cover studies and satellite image analysis (ALOS) were conducted in Lahanam and Sepone.

Further goals of the group are to:

1) Strengthen the Sepone Health Information Network in

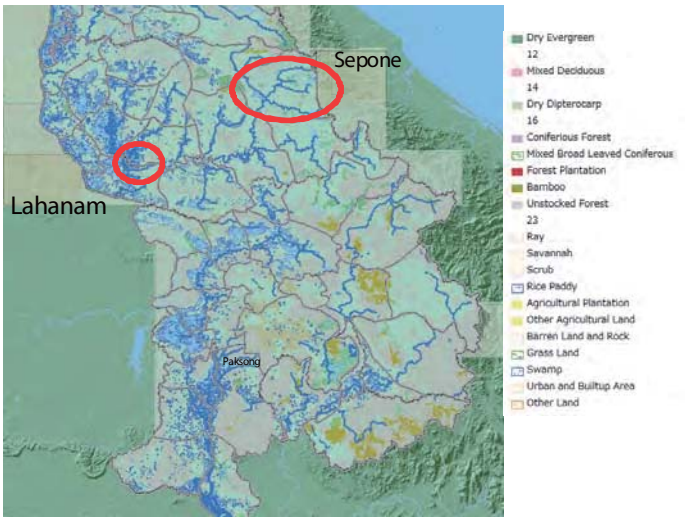

Figure 2 **Location of Lahanam and Sepone in Lao (GIS Base Map Data for Lao PDR, 1998-2003)**

Variables associated with reporting

Variables		N	Uni-variate		Multi-variate *	
			Odds	95%CIs	Odds	95%CIs
Distance (km)	<5	52	1.00		1.00	
	5-10	48	1.01	0.43-2.37	0.72	0.27-1.91
	>10	38	0.33	0.14-0.81	0.21	0.07-0.63
Education (yrs)	<3	48	1.00		1.00	
	3-5	69	2.45	1.09-5.49	2.89	1.12-7.48
	>5	21	3.30	1.12-9.69	3.23	0.90-11.61
Number of received training	<3	74	1.00		1.00	
	3-5	38	3.00	1.32-6.80	2.85	1.13-7.14
	>5	26	3.15	1.25-7.95	3.81	1.30-11.15

*: adjusted by age, VHV experience years, possession of vehicle, and satisfaction on incentive

Figure 3 **Variables associated with reporting by village health volunteers to the health center in Sepone** ***(Pongvonsa, Nonaka, Kobayashi et al., 2009)***

Photos 1 and 2 **Flood-prone areas of Matlab, Bangladesh**

order to better monitor monthly incidence of malaria and other diseases;
2) Analyze the relation of forest cover change, settlement, subsistence, mosquito population/ecology with malaria endemiology/epidemiology;
3) Analyze the environmental and societal changes within the Banhiang River catchment area (a tributary of the Mekong River), including rainfall, flood, land- cover/use, and water quantity and quality.

The Lao and Great Mekong Subregion (GMS) Study Group analyses the changes of environment, society, culture, subsistence, wellbeing and health of specific communities in the GMS, especially in Laos and Yunnan. It employs both intensive village study and extensive group interviews and ecohealth questionnaire. Its objectives are to:
1) Conduct multivariate analysis of national level census data, including the Lao National Health Survey of 2000 and 2005, and National Census of 2005;
2) Analyze current health and environmental education in Laos in order to design appropriate ecohealth campaigns;
3) Study the history of health systems in the area since the colonial period;
4) Make a Laos (or GMS) water map of minerals and stable isotopes.

The Bangladesh Study Group is primarily dedicated to improving the disease knowledge base on which sensible ecohealth campaigns—especially those related to flood and health—can be based. Its efforts include:
1) Developing a database for meteorological, hydrological and health data in Bangladesh;
2) Quantification of the relationship between climate and disease, including the long-term effects of flood on morbidity and mortality (in collaboration with the International Centre for Diarrhoeal Disease Research, Bangladesh), and the effect of the Indian Ocean Dipole on the incidence of cholera in Matlab and Dhaka;
3) Conducting a pilot study in order to improve national statistics on neglected tropical diseases such as filaria, leishmaniasis, and rabies (also, in Sri Lanka, rota virus induced diarrhoea). Data on the effects of the 2004 flood were collected in Matlab.

The China Study Group investigates how social and environmental change affects vulnerability to HIV in the GMS. It conducts interviews among vulnerable populations, including male and female commercial sex workers, IV drug users, truck drivers and international migrants in Yunnan and Laos. It also:
1) Conducts molecular biological analyses to understand HIV transmission routes and evolution of pathogens in relation to specific human behaviors;
2) Considers relevant measures to improve ecohealth and community development (it is collaborating with the ecological anthropology group at Kunming Medical College/Yunnan Health and Development Research Association/Yunnan University);
3) Constructs a historical database of malaria, schistosomiasis, liver fluke and other diseases in East and Southeast Asia.

A Study of Human Subsistence Ecosystems in Arab Societies: To Combat Livelihood Degradation for the Post-oil Era

This project examines life support mechanisms and self-sufficient modes of production among Arab peoples who have survived in dryland environments for more than a millennium. Research results will be used to propose a scientific framework to strengthen subsistence productivity and combat livelihood degradation in local Arab communities as they face the post-oil era.

Project Leader
NAWATA Hiroshi
RIHN

Hiroshi Nawata received his Ph.D. in Human and Environmental Studies (Cultural Anthropology) at Kyoto University (2003). He was assistant professor at Division of Comprehensive Measures to Combat Desertification, Arid Land Research Center, Tottori University (2004-2007). His major fields of interests are camel pastoral systems, Muslim trading networks, and indigenous (traditional) knowledge for rural development in the Middle East and Africa.

Core Members

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KAWATOKO Mutsuo	Research Institute for Islamic Archaeology and Culture
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MIYAMOTO Chiharu	Action for Mangrove Reforestation
SAKATA Takashi	Faculty of Science and Engineering, Ishinomaki Senshu University
YOSHIKAWA Ken	Graduate School of Environmental Science, Okayama University
HOSHINO Buhe	Faculty of Environment Systems, Rakuno Gakuen University
ABDEL GABAR E. T., Babiker	Sudan University of Science and Technology
ABDALLA M. A., Abu Sin	Gezira University
LAUREANO, Pietro	Traditional Knowledge World Bank
BENKHALIFA, Abdrahmane	Centure National de Dévelipment des Ressources Biologiques, Algeria

Background and objectives of the project

Japan and the oil-rich countries of the Middle East have put excessive pressures on the earth's energy, water, and food resources. In prioritizing their own economic prosperity, these countries have exploited irreplaceable resources, such as fossil fuel and fossil water. Schemes to plant alien species have also placed stress on local ecosystems. Such practices have increased social and economic differences between the peoples of the Middle East at a time when the region faces a turning point in modern oil-based industrialization. The current fossil fuel-based interdependencies must be transformed into new relations that can support viable future societies.

Our project focuses on human subsistence ecosystems, namely the life-support mechanisms and self-sufficient modes of production (such as hunting, gathering, fishing, herding, farming, and forestry) based on low energy resource consumption. We will also re-examine the potential of advanced technology, economic development, and comprehensive measures to combat desertification. Based on our research results, we will propose a scientific framework for strengthening subsistence productivity and rehabilitating daily life in Arab societies in the post-oil era.

Field survey of mangrove forest along the Egyptian Red Sea coast

We collaborated with the Nature Conservation Sector, Egyptian Environmental Affairs Agency, in order to conduct eco-physiological field research of mangrove forest dynamics, including stomatal conductance and transpiration rate, and to assess recent methods of mangrove afforestation. We also assessed the impact of human activity, including the influence of human livestock and managed fisheries, on mangrove ecosystems. Upon receiving permission to remove samples from the site, DNA analysis (using CTAB and RAPD techniques) was

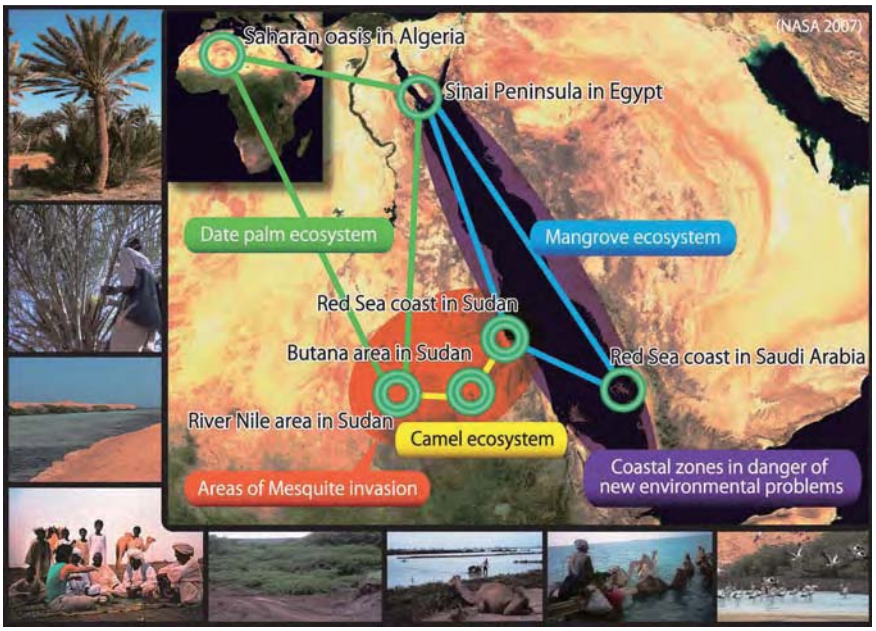

Figure 1 **Area of field surveys**

Photo 1
RS/GIS research on the alien invasive species mesquite to make its distribution map in eastern Sudan.

Photo 2
Research on the architecture and restoration of coral buildings in the Sinai Peninsula, Egypt.

Photo 3
Collecting leaf samples for eco-physiological study of mangroves in southern Res Sea, Egypt.

Photo 4
Field survey of traditional water use and oasis agriculture in Algerian Saharan oases.

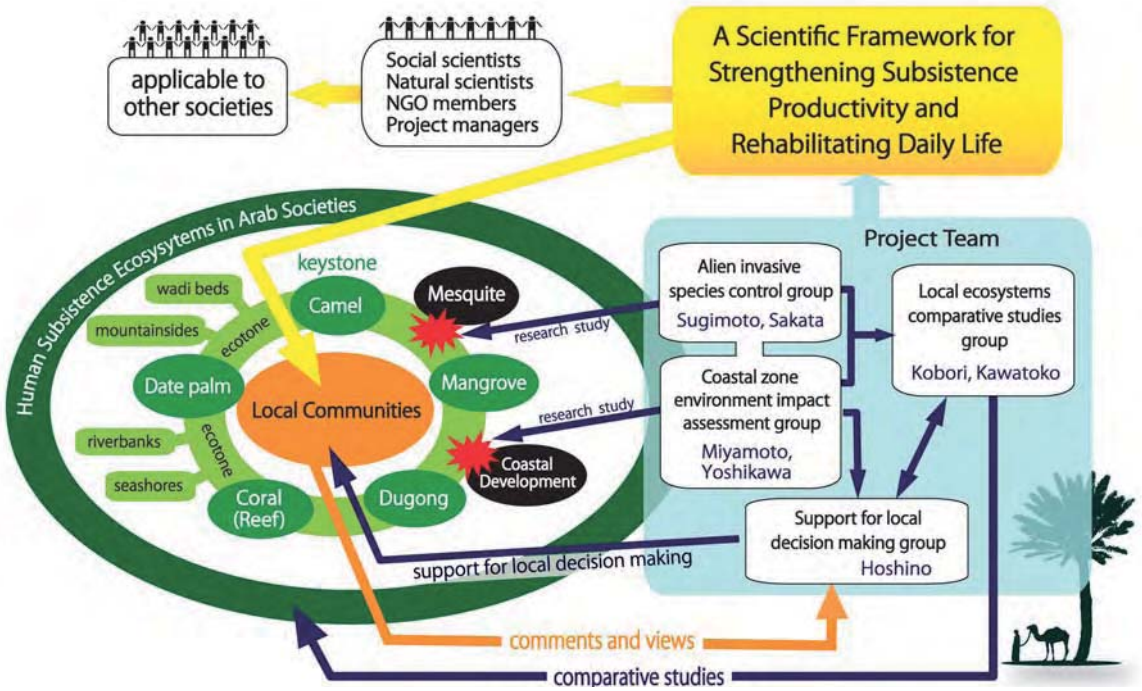

Figure 2 **Research methods, approaches, and organization**

used to determine the genetic diversity and mass of *Avicennia marina* and to quantitatively analyze the relationship between geographical and genetic diversity.

Conservation of traditional coral buildings in the Sinai peninsula, Egypt

At the request of the office of Islamic-Coptic Antiquities in the Supreme Council of Antiquities, Ministry of Culture, Egypt, we are now engaged in the conservation of traditional coral buildings in the Sinai Peninsula. Based on several archival sources of data concerning the architectural structure and foundation of the buildings and in collaboration with the Research Institute for Islamic Archaeology and Culture, we have drawn up a five year plan for the buildings' restoration and maintenance. This restoration project can serve as a future model of coral building cultural heritage conservation areas in the future.

Preparation for field survey in Algeria

Project members from RIHN and the Centre National de Développement des Ressources Biologiques (CNDRB) in Algeria met on 15 December, 2009, and agreed to a Memorandum of Understanding. The main objective of this collaboration is to improve description of oasis date palm ecosystems in the Algerian Sahara.

Further issues

We continue with full-scale field surveys in each research area. Further issues of our project in the second year (FR2) are described below.

In Sudan, according to an implementation agreement concluded with Sudan University of Science and Technology in 2008, we will initiate full-scale field survey on the alien invasive species mesquite (*Prosopis* spp.) especially on possible biological, chemical, manual and mechanical methods for its control. We will investigate how this species may impact pastoral ecologies and will monitor its root systems and water uptake, the nutritional status of ruminants and the metabolites of their gut bacteria, and how mesquite pods and leaves may be used as human food and supplemental livestock feed.

Along the Red Sea coast of Saudi Arabia and Egypt, we will start to integrate the eco-physiological study of mangroves, architectural study of coral buildings, and anthropological studies on camel herding, fishing, and hunting dugongs, in order to unveil the characteristic of human subsistence ecosystems in coastal zones of the arid tropics.

In the Saharan oases in Algeria, studies will be conducted on the human subsistence date palm ecosystems in the oasis, including their history and change, and related ecological footprints.

Zyndan Glacial lake outburst flood
in the Tian Shan mountains, Kyrgyzstan
Photo by NARAMA Chiyuki

Water for humans and animals, Mongolia
Photo by MAEKAWA Ai (National Museum of Ethnology)

Ecohistory Program

Program Director **SATO Yo-Ichiro**

The Ecohistory Program investigates circulation, diversity, and resources in terms of historical time. Behind every problem (or phenomenon) there lies, in some measure, the issue of historical causality; this fact underscores the need to comprehend the present through investigation of the past (in Japanese this idea is described by the phrase *onko chishin*). As its specific goal, this program contributes its long-term historical and civilizational perspective contemporary and future societies. Like all RIHN research programs, it should elucidate global environmental issues, propose solutions and deepen understanding of human-environmental potential.

Focusing on different regions and a range of historical moments, current projects in the Ecohistory Program address the environmental histories of two distinct areas, what might be called the "Asian Green Belt" and the "Eurasian Yellow Belt". In the former, generally speaking, communities managed to maintain sustainable livelihoods for a period of approximately 10,000 years. In the latter area, many civilizations collapsed within this same period of time. But is this reading of history correct? What distinguishes the conditions of productivity and sustainability between these two regions? This latter question is, ultimately, at the core of this research program; its answer is surely indispensable to human futurability.

Full Research	Leader	Title
H-02	**SATO Yo-Ichiro**	Agriculture and Environment Interactions in Eurasia: Past, Present and Future
H-03	**OSADA Toshiki**	Environmental Change and the Indus Civilization
H-04	**UCHIYAMA Junzo**	Neolithisation and Modernisation: Landscape History on East Asian Inland Seas

Agriculture and Environment Interactions in Eurasia: Past, Present and Future
——A ten-thousand-year history

This research project examines the history of interactions between agricultural activities and the environment in three Eurasian climate zones: the 'Monsoon Agriculture Zone', 'Mugi Agriculture Zone' and 'Vegeculture Zone'. It takes an interdisciplinary approach to the concept of 'genetic diversity' in agriculture and its role in agricultural development in the last 'ten-thousand years'.

Project Leader
SATO Yo-Ichiro
RIHN

Professor Yo-ichiro Sato is Deputy Director-General of Research at the Research Institute for Humanity and Nature. He was born in 1952 in Wakayama prefecture and received his Ph.D. from the Department of Agriculture, Graduate School of Kyoto University, specializing in plant genetics. Since arriving at RIHN in 2003 he has conducted DNA analysis of rice remains excavated from numerous archaeological sites in order to describe the origin and diffusion of rice agriculture across Asia. He has published extensively on this subject, including *Yomigaeru Midori no Silk Road*, (Reviving the Green Silk Road, Iwanami Junior Books, 2006).

Core Members

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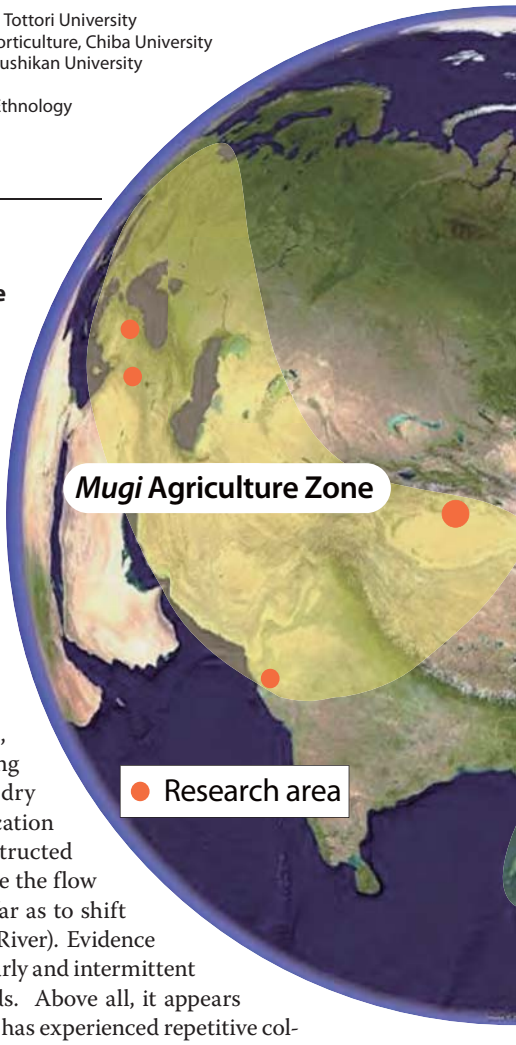
KIMURA Emi	RIHN
KURATA Takashi	RIHN
SHINODA Ken-ichi	Department of Anthropology, National Science Museum
JONES, Martin	Department of Archaeology, University of Cambridge
TANAKA Katsunori	RIHN
TSUJIMOTO Hisashi	Faculty of Agriculture, Tottori University
NAKAMURA Ikuo	Graduate School of Horticulture, Chiba University
HARADA Nobuo	School of Asia 21, Kokushikan University
HOSOYA Leo Aoi	RIHN
MATTHEWS, Peter	National Museum of Ethnology

Objective of the project research

It is said that environmental destruction began with agriculture. Agriculture has indeed transformed environments wherever it has been practiced. In Eurasia between the Central Asian desert, where it is now almost impossible to conduct any agricultural activity, and the monsoon region, where vegetation and water are still abundant, there are large differences in the degree of environmental destruction or modification that can be associated with agriculture. The goal of our project is to grasp how agriculture emerged within, contributed to, and was affected by, wider patterns of environmental change in the last ten thousand years. In particular, we focus on the relationship between genetic diversity, agriculture, and environmental transformation, including degradation and collapse.

Project structure and findings

The project is comprised of three principal working groups, each of which investigates the history of human agricultural activities in one of three climate zones: the Monsoon Agriculture Group, the Mugi Agriculture Group (focusing on annual winter crops), and the Vegeculture Group. Their descriptions reveal that agricultural developpment has not been constant and that collapses were frequent. In addition, the Swidden Agriculture Group investigates modern farming techniques and those that may be sustainable in the future.



● Monsoon agriculture zone group

Excavation at Ikeshima Fukumanji prehistoric site in Osaka, Japan, has revealed that early peoples employed various adaptive techniques in the face of flood, drought and other environmental hazards. They adapted agricultural systems by introducing new cultivar species or cropping methods (as, for example, in developing *Shimabata*, or mounded dry fields), adjusted the location of cultivation, and constructed canals in order to manage the flow of water (even going so far as to shift the course of the Yamato River). Evidence suggests that there was early and intermittent cultivation of paddy fields. Above all, it appears that Japanese agriculture has experienced repetitive col-

Photo 1 **The scene of the Xiaohe Tomb site (2008)**
After traveling through the desert for eight hours, the Xiaohe graves came into sight.

Photo 2 **Excavated timber used as grave markers and coffins at the Xiaohe site (2007)**

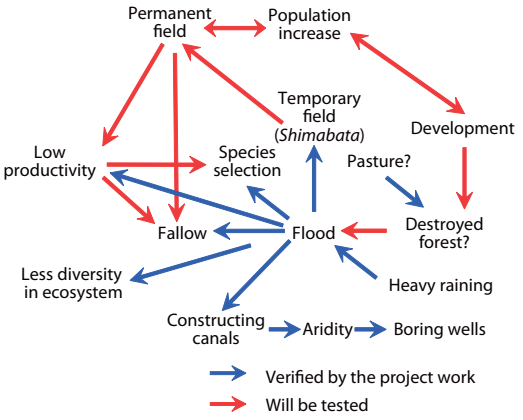


Figure 1
This conceptual outline of possible past human-environmental interactions is based on archaeological excavations undertaken at the Ikeshima Fukumanji site, Osaka

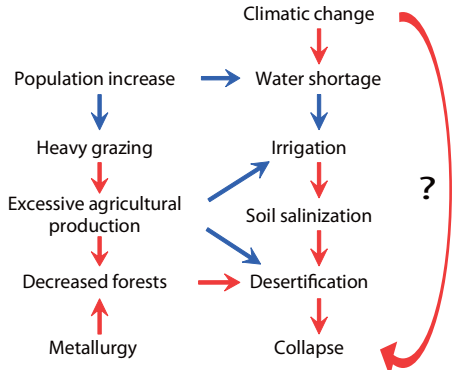
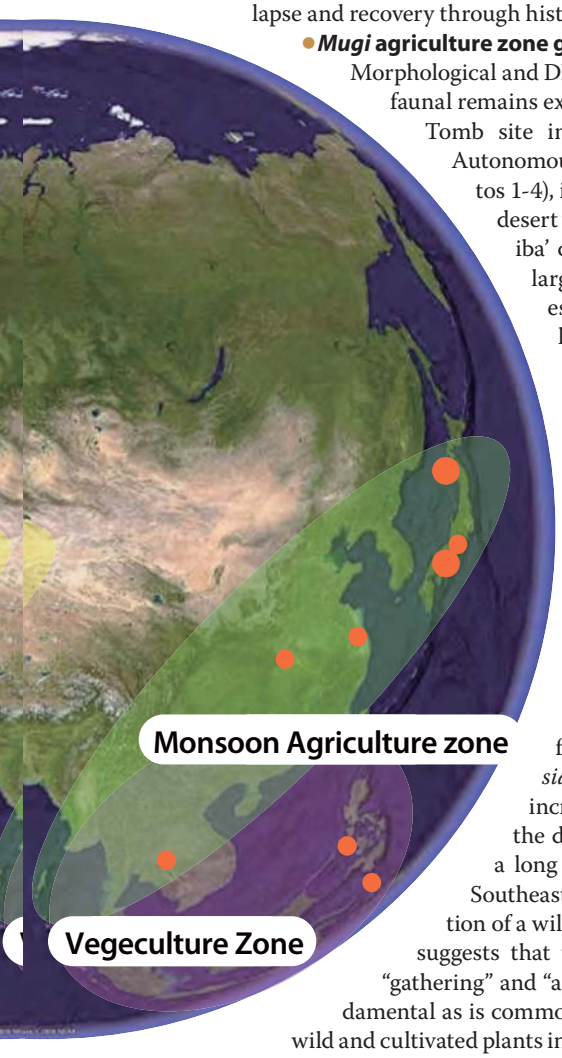


Figure 2
This conceptual outline of past human-environmental interactions is based on excavations at the Xiaohe Tomb site in the Xinjiang Uyghur Autonomous Area. Arrows have the same signifiance as in Figure 1.



lapse and recovery through history (Fig. 1).

● *Mugi* agriculture zone group

Morphological and DNA analyses of plant and faunal remains excavated from the Xiaohe Tomb site in the Xinjiang Uyghur Autonomous Region of China (Photos 1-4), indicate that what is now desert was formerly of the 'makiba' climate zone, containing large-scale wheat fields, forests and meadows. Pollen analysis reveals that there were also wetlands in the area. The theoretical model of such environmental transformation describes a sequence of cultivation activities → soil salinization → desertification (Fig. 2).

● Vegeculture zone group

Discovery of previously unreported wild forms of taro (*Colocasia spp.*) in the Philippines increases the likelihood that the domestication of taro has a long and complex history in Southeast Asia. Intensive utilization of a wild form with edible leaves suggests that the distinction between "gathering" and "agriculture" is not as fundamental as is commonly thought. The use of wild and cultivated plants in humanly-modified habitats invites reconsideration of the formal definition of agriculture.

● Swidden agriculture group

In addition to ethnographic research of modern swidden agriculture in Japan, project members carried out archival research on Edo period land-use at the site of old Shiramine Village, Ishikawa prefecture (presently Shiramine, Hakusan city). This research has clarified the state of swidden agriculture, which was often not recorded in official documents. Project members also organized "The 3rd Swidden Agriculture Summit", held in Oita, in order a forum for discussion of modern agricultural problems in Japan, particularly in relation to hilly and mountainous areas, and the significance of swidden agriculture in these areas.

Future research plan

In our final year of project research, we will use our historical description of agriculture-environment interactions in the three climate zones in order to suggest how agricultural production and food consumption can be better arranged in the future.

The Monsoon Agriculture, Mugi Agriculture and Vegeculture groups will analyze each factor in our theoretical model of agriculture-environment interactions, identifying key production characteristics and describing how ecosystems and the genetic diversity of cultivars were transformed in each climate zone. The Swidden Agriculture group will develop its discussion of the significance of swidden agriculture for future agriculture and lifestyle, especially in relation to its distant history in Japan and decline in the modern period.

A public exhibition of all project results is planned at the National Museum of Nature and Science (Tokyo) in autumn 2010, as is the publication of several monographs and edited volumes.

Photo 3
The coffins contained grains of wheat—probably funerary gifts—still in very good states of preservation (2005)

Photo 4 **Landscape of the Xiaohe site area (2006)**
An area of ancient fields, forests and meadows is now white with accumulated salt.

Environmental Change and the Indus Civilization

The Indus Civilization (2600 BC – 1900 BC) is one of the four great ancient civilizations. It is known for its cultural and technological achievements — its characteristic seals and scripts, fortified settlements and sewerage systems — and also for its brief tenure. The Indus civilization spread over an area of 680,000 km^2 along the Indus and Ghaggar rivers and into Gujarat in Western India, but its urban phase lasted only 700 years, much shorter than any of its contemporaries. Drawing on archaeology, Indology, and paleo-environmental investigation, this project reconstructs the social and environmental histories of several Indus cities, and attempts to determine whether and how environmental factors contributed to their short life and rapid decline.

Project Leader
OSADA Toshiki
RIHN

I am a linguist and have worked among the Munda people of Jharkhand, India. I spent more than six years in India in the 1980s. The Munda appear to be one of the longest resident peoples of India (their linguistic roots may be traced back to the Indus civilization, the earliest civilization on the subcontinent). I joined RIHN in 2003 and proposed this project shortly thereafter in order to apply the combined insights of linguistics and archaeology to the mystery of Indus civilization decline.

Core Members

GOTO Toshifumi	Tohoku University
KHARAKWAL, Jeewan Singh	Rajasthan Vidyapeeth, India
MALLAH, Qasid	Shah Abdul Latif University, Pakistan
MASIH, Farzand	Punjab University, Pakistan
MAEMOKU Hideaki	Hiroshima University
ONISHI Masayuki	RIHN
OHTA Shoji	Fukui Prefectural University
SHINDE, Vasant	Deccan College, Deemed University, India
UNO Takao	International Research Center for Japanese Studies

Project structure and objectives

This research project examines the social character and environmental context of the Indus civilization, and attempts to determine how they are related to the civilization's short life and rapid decline. In particular, we aim to evaluate the impact of environmental change on the subsistence economy and trade network that sustained the Indus civilization's urban system. Our research will also provide data on the long-term processes of climate change in South Asia. Such data will help us develop historical perspective on, and practical understanding of, contemporary environmental problems in the region.

Our project is divided into four research groups: (1) the Palaeo-Environmental Research Group (PERG); (2) the Material Culture Research Group (MCRG); (3) the Subsistence System Research Group (SSRG); and (4) the Inherited Culture Research Group (ICRG) (Fig. 1). They integrate cultural and biological data obtained from archaeological excavations and other field activities, palaeo-environmental data obtained from satellite imagery and field study, and original accounts obtained from ancient texts. Important subjects of study investigated so far include: ancient climate change; avulsion of the Ghaggar River; the palaeo-coastline of Gujarat; and palaeo-seismic activity.

Major achievements

In 2009 our project achieved great advance in the study of the natural environment surrounding the Indus civilization. Most substantially, PERG successfully obtained sediment core samples from the Rara Lake in Nepal (Photo 1), which will allow us to reconstruct climate change in South Asia in the last 7500 years (Fig. 2).

PERG conducted field research and analysis of satel-

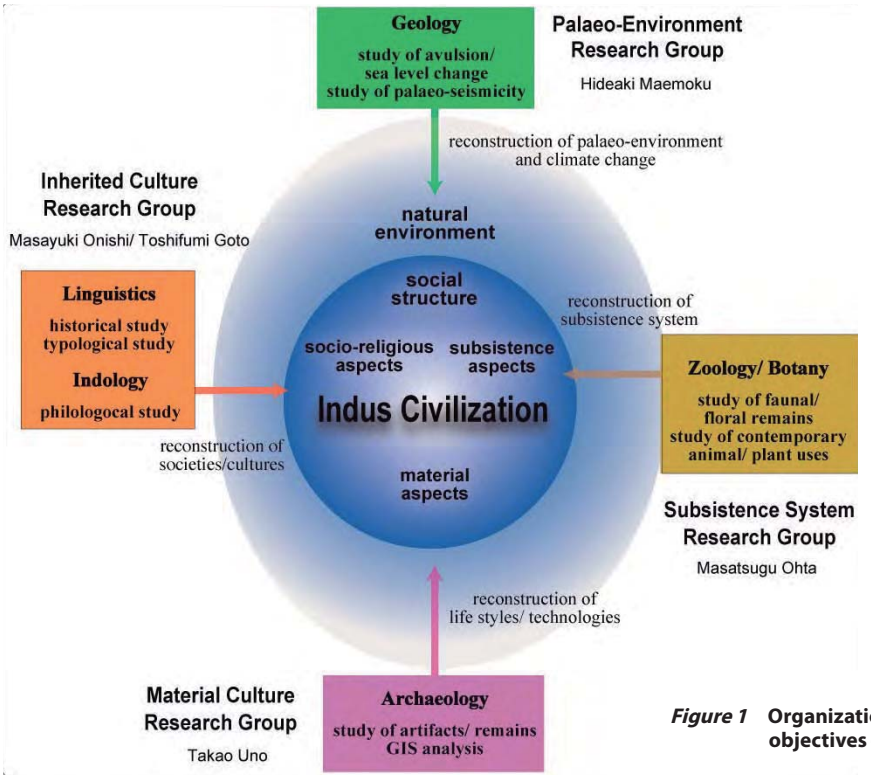


Figure 1 **Organization and objectives of research**

Photo 1 **Coring survey at Rara Lake, Nepal**

Photo 2 **Graves at the Farmana site**
We have discovered many well-preserved human bones.

Photo 3 **Pendants excavated from the Kanmer site**
One side of each pendant is stamped with an identical seal; different lettered script is found on the reverse sides.

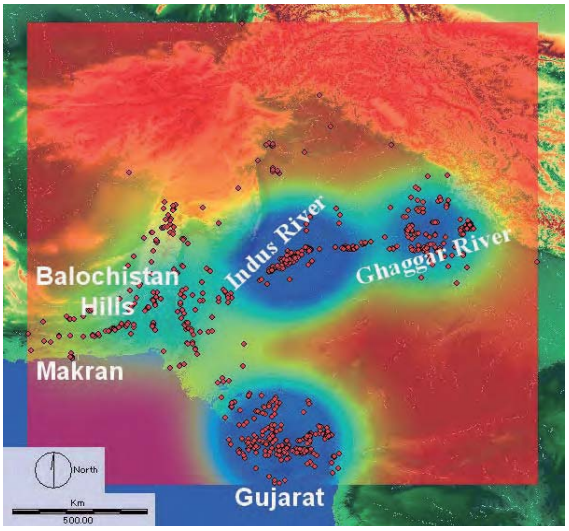


Figure 2 **Distribution and concentration of the Indus sites**
(adapted from Teramura and Uno 2006)

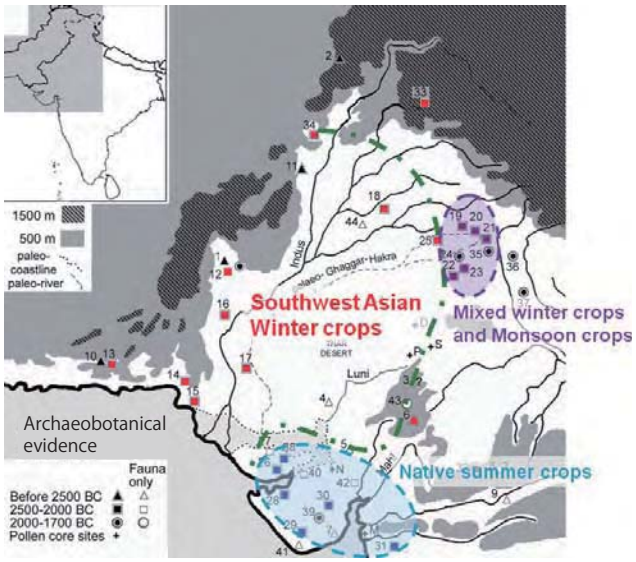


Figure 3 **Geographical distribution of annual crap**
(adapted from Fuller 2006)

lite imagery to identify the former course of the Ghaggar River (the old Saraswati River) and determine the causes and the dates of its avulsion. Contrary to its description in the Rig-Veda text (transliterated by ICRG), field evidence demonstrates that the Ghaggar was not a large river, but a small one capable of providing water for agriculture only during the monsoon season. This finding indicates that the Indus civilization was not as dependent as the three other great ancient civilizations on large rivers. MCRG analysis of archaeological artefacts from the Farmana site continues to improve our description of the Indus civilization resource base, society and economy.

Archaeological data obtained at the Kanmer site and geological and topographical data obtained through field research and satellite imagery are being combined to describe ancient sea level change along the coast of Gujarat. Simulation based on bathymetric data suggests that the Indus period sea level was about two meters higher than in present-day Gujarat. If correct, the ancient cities currently found inland would have earlier been located along the coast. We believe that these cities would have been an important base for trade with Mesopotamia. ICRG has been studying cuneiform texts for evidence relevant to our hypothesis.

Excavation at Farmana and Kanmer has concluded. The MCRG uncovered a number of important structures, artefacts, and plant and animal remains (Photos 2, 3), and analysis of these materials continues. Palaeo- and ethno-botanical research conducted by SCRG and philological research conducted by ICRG has allowed us to gradually reconstruct the ancient environment, subsistence systems and trade network of the Indus civilization. The geographical distribution of cultivated plants and archaeological sites during the Indus period (Fig. 3) suggests that climate change may have affected the monsoon pattern and triggered major agricultural change in the region.

The study of ancient sea temperatures through coral sampling in the Maldives and former monsoon rain temperature through the analysis of fossilized otoliths is also underway. In addition, a new study group was formed to conduct DNA analysis on the human bones discovered at the Farmana site.

Future activities

MCRG will continue analysing and preparing for publication the data obtained from excavations at Kanmer and Farmana. PERG will analyse the core samples obtained from the Rara Lake and Gujarat sites to reconstruct the palaeo-environment of Ghaggar and Gujarat regions. They plan to present their findings at the 2010 conference of the American Geophysical Union, and subsequently publish academic papers on climate change of ancient South Asia. SSRG will carry out pollen and phytolith analysis on data obtained from the excavations, while ICRG will continue its philological and linguistic research.

In sum, our efforts are now directed towards spatial and temporal synthesis of the findings of the individual research groups in order to develop a robust description of environmental change and cultural systems during the Indus period.

Neolithisation and Modernisation: Landscape History on East Asian Inland Seas

This project aims at reconstructing historical landscape change in the Japan Sea and East China Sea areas. Our research concentrates on two periods of revolutionary landscape change, Neolithisation and Modernisation. The present project uses a holistic human sciences perspective to explicate the formative history of the present-day landscape and to offer new insight into the concept of the "cultural landscape".

Project Leader
UCHIYAMA Junzo
RIHN

Junzo Uchiyama is an environmental archaeologist. He received his MA from Durham University, UK in 1996 and his Ph.D. from the Graduate University for Advanced Studies (Japan) in 2002. He is particularly keen on investigation of landscape changes in the Jomon period and assessing land use patterns based on the analysis of zooarchaeological assemblages.

Core Members

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HOSOYA Aoi	RIHN
IIDA Taku	National Museum of Ethnology
IKEYA Kazunobu	National Museum of Ethnology
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KIM Jangsuk	Department of History, Kyung Hee University
KOYAMA Shuzo	Suita City Museum
LINDSTRÖM, Kati	Institute of Philosophy and Semiotics, University of Tartu
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NAKAI Seiichi	Faculty of Humanities, Toyama University
NAKAJIMA Tsuneo	Lake Biwa Museum
NAKAMURA Oki	RIHN
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SEGUCHI Shinji	Shiga Prefecture Cultural Properties Protection Association
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ZEBALLOS VELARDE, Carlos Renzo	RIHN

Research background and objectives

Project focuses on the landscape change in the East Asian Inland Seas (Fig. 1a), a region of rich cultural and landscape diversity, from the end of Ice Age up to the present day, with particular emphasis on the processes of Neolithisation and Modernisation. We hope to develop a more subtle and profound understanding of landscape and environmental issues in this region, and so to inform a solid landscape protection and development agenda.

Earlier described as a static composition, landscape is now considered as an evolving, recursive process of interaction between the physical environment found in a certain place and the culture and the value system of the people who inhabit it (Fig. 2). In the course of their everyday activities, people apply their environmental perceptions and skills to change their environment according to their values and beliefs. The resulting landscape will become the nexus of identity for the next generation, which will in turn alter its environment according to its abilities and imagination. Since landscapes are the stages of everyday life, landscape study can reveal how and why environmental issues arise and can best be addressed. Understanding the historical and cultural processes involved in landscape formation will help contemporary societies to address the disappearance of landscape diversity and design well-grounded landscape protection policies for the future.

Results to date

The project has eight regional work groups, each carrying out research in a key area of the East Asian Inland Seas (Fig.1b). Research focuses on four umbrella topics: (1) The birth and expansion of agriculture; (2) Water-

Figure 1a East Asian Inland Seas and Eight NEOMAP Research Areas

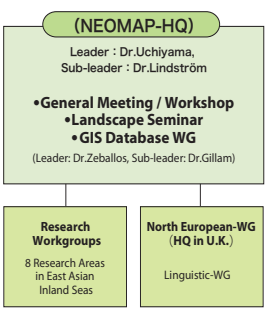


Figure 1b NEOMAP Organization

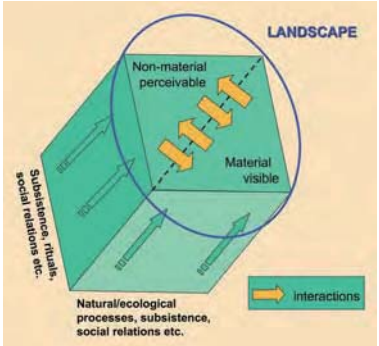


Figure 2 Concept of Landscape

Photo 1 **Shirakawa Village, Japan**

Photo 2 **Research at Boisman Shell Mound in Primorye, Russia**

fronts, including water bodies, waterways and rice paddies; (3) Migration and colonisation as forces of landscape change; (4) Travel and creation of mental landscape images. Special attention has been paid to three following major aspects of landscape formation in the region.

(1) Modernisation as seen from Neolithisation

What do the landscape changes associated with Modernisation have to do with Neolithisation? It was previously thought that the "Neolithic revolution," when agricultural societies and large-scale settlements emerged and the basic elements of modern landscapes were established, was an event that occurred in a relatively short period of time. If, however, we refer to humankind's increasing capacity to exploit their environments compared to earlier hunter-gatherer societies, "Neolithisation" should be defined as a process of human adaptation to the natural environment since the end of the last Ice Age. As aggressive resource use and increasing regional interdependency are characteristic of the present day as well, the period of Modernisation can be seen as a climax—or intensification of—Neolithisation.

(2) The cultural functions of inland seas

Seas have an immeasurable impact on their surrounding landscapes. Our Hokkaido workgroup describes how inland seas enable migrations and new colonisations, transforming indigenous spiritual and sustenance landscapes and imposing new settler landscapes. Okinawa, in contrast, was positioned as an outpost of trade between Japan and China. Its extensive coastlines and marine environments have shaped the regional landscapes from within, bringing about specific regional sustenance patterns and religious world views. At times, the maritime and continental influences interact, as in the Primorye Region, where the continental influence of Korean settlers blended with that of the new European settlers who arrived across the sea.

(3) The creation of mental landscape images

What is the impact of culture's mental structures on landscapes? What do great cultural systems like religion have to do with landscape and environmental issues? We explore one instance in Japan. With the rise of Buddhism in the Nara period (AD 710-794), the killing of living beings, including animals and fish, was prohibited. Since the Middle Ages, hunting and fishing were strictly prohibited within 2 li (roughly 1.3 km) of the temples, but this area was gradually redefined according to the area directly visible from the temple. Both the ban and its gradual redefinition, have had a large impact on resource use and the natural environment of the Japanese archipelago.

Topics for the future

NEOMAP researchers participate in many public events designed to increase public awareness about landscape and environmental issues. As visualization is a useful tool for making specific historical data accessible to non-academic audiences, in the next years our publications will emphasize the creation of landscape database and atlas. Superimposing the landscapes of Neolithisation and Modernisation on one single map can lead us to new discoveries about historical human-nature interrelationships and enhance consciousness about environmental issues.

We also hold regular seminars in and outside RIHN and present our results at international worskhops and symposia. NEOMAP is active in international collaboration, and has organised joint activities with scholars from Estonia, Belgium, Holland, UK and Germany.

Taking ice cores at Fedchenko Glacier,
Pamir Mountains, Tajikistan
Photo by TAKEUCHI Nozomu (Chiba University)

Monitoring the impact of climate warming
on the Sea of Okhotsk
Photo by KIMURA Noriaki (Ehime University)

Rising sea levels in Tuvalu, Polynesia
Photo by NAKADA Satoshi

Ecosophy Program

Global Area Studies

E

Program Director **ABE Ken-ichi**

Climate warming is one of the truly *global* environmental problems. It affects almost all systems of the world, including sea-level, hydrological regime, vegetation, agricultural production, marine life, and so on. On the other hand, most environmental problems are described as specific phenomena — as declining water quality or loss of forest or biodiversity in a particular place — yet these can also be viewed in global perspective. In arid regions, for example, the construction of large reservoirs and irrigation systems has greatly enhanced agricultural productivity. Such transformations of hydrology and landscape have clear local effects, yet as humankind comes to view the biophysical phenomena found in a place as *iterations* of larger processes, we recognize that the world is characterized by linkage and connection. Water shortage or soil degradation in one area may lead to food shortage or air pollution in another.

Humans have created new global cycles and scales of interaction with nature. The exchange of people, ideas and materials can stimulate human creativity, yet at present there is little agreement of how to establish patterns of exchange that will simultaneously enhance human wellbeing and ecological integrity. This is the fundamental problem of our time.

Projects in this domain examine the manner in which contemporary environmental problems both contribute to and result from global phenomena and processes. These research projects focus on specific social and environmental contexts in which environmental problems are found, the linkages of these problems to social and material phenomena in other places, and on the conceptual models used to describe such interconnection.

Completed Research	Leader	Title
E-02	**SEKINO Tatsuki**	Interaction between Environmental Quality of the Watershed and Environmental Consciousness
E-03	**TAKASO Tokushiro**	Interactions between Natural Environment and Human Social Systems in Subtropical Islands
Full Research	**Leader**	**Title**
E-04	**UMETSU Chieko**	Vulnerability and Resilience of Social-Ecological Systems

Interaction between Environmental Quality of the Watershed and Environmental Consciousness:
With Reference to Environmental Changes Caused by the Use of Land and Water Resources

This project examined the relationship between environmental perception, environmental attitudes and values—or environmental consciousness—and the quality of a forested watershed ecosystem. Theoretical analysis and empirical surveys were used to identify the environmental factors that affect formation of environmental consciousness. We then developed response-prediction models and used a choice experiment to identify people's preferences in several scenarios of environmental change.

Project Leader: SEKINO Tatsuki RIHN

Project findings

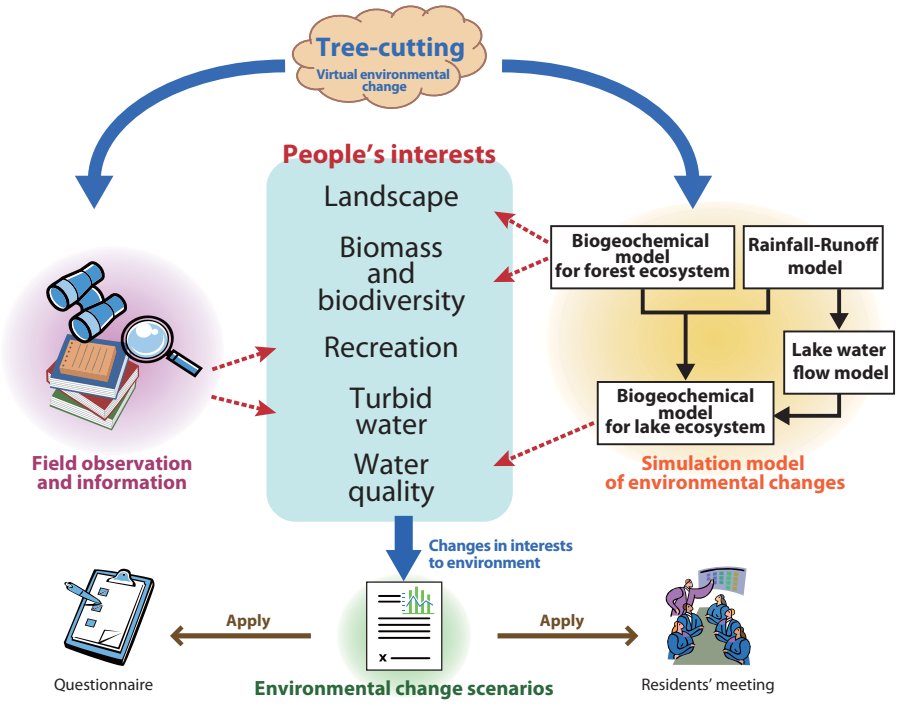
This project examined the relationship between people's environmental consciousness and the environmental quality of a forested watershed ecosystem. Using response-prediction models, which can simulate environmental changes in a forest-river-lake ecosystem caused by artificial environmental modification, project researchers analyzed popular perception of environmental change around Lake Shumarinai, the largest reservoir in Japan, in Horokanai, Hokkaido. We conducted a choice-experiment with members of the Lake Shumarinai and other watershed communities in which people were asked to indicate their preferred of several model-generated virtual scenarios of environmental changes accompanying different forest management plans. Results of the "Scenario questionnaire" indicated that people preferred area tree-cutting that does not negatively affect water quality. The most common next concern was for "Decreases in plant biomass and diversity". Surveys also suggested that people distinguished between the direct, indirect and non-use values of forested watershed environments.

Contribution to global environmental studies

Human beings enjoy the benefits of nature; their perception of these environmental benefits affects their attitudes toward and values concerning their surrounding environments. Environmental perception, attitudes and values together indicate environmental consciousness, an important, but often overlooked, dimension in the consideration of appropriate interactions between humanity and nature. How do people evaluate human-caused environmental change? Environmental values should be a key factor in environmental decision-making. The methods developed in this project can enhance public involvement in environmental impact assessment and city and regional planning.

Communication of research findings

A scenario workshop was held in Horokanai town, Hokkaido. Residents described their ideas and visions of future natural environments and social life. Social and natural scientists contributed to the workshop as interpreters and facilitators. As an outcome of the project, we conducted an open symposium in Horokanai in November, 2008 and published a book (in Japanese), entitled "A Method for Analyzing Environmental Consciousness with Environmental Scenarios". A number of original papers for academic audiences have also been published.



Analysis of environmental consciousness

People's interests in an environment were first revealed through social research (questionnaires). Simulation models and field observations were used to query desirable and undesirable kinds of environmental change (especially in relation to different patterns of tree cutting and afforestation). Several environmental change scenarios were generated from the results and follow-up questionnaires and discussion group meetings were conducted to develop further description of individual and community perceptions of positive and negative land cover and ecosystem change.

Interactions between Natural Environment and Human Social Systems in Subtropical Islands

A variety of environmental problems have arisen on islands around the world, leading to the deterioration of precious natural environment and the disappearance of local cultures. In order to resolve environmental issues on islands, thorough understanding of interactions between islands' unique natural environments and social systems is necessary. Using Iriomote Island in Okinawa Prefecture as a model, this project will help to resolve these issues. Further, we have provided some guidelines for building island human social systems that are sustainable in the future.

Project Leader: **TAKASO Tokushiro** Tropical Biosphere Research Center, University of the Ryukyus

The purpose of the project

Throughout the world, islands are faced with ongoing deterioration of their precious natural environment due to water shortages, industrial development and other factors. Along with this, local cultures are at risk of disappearing. To solve these problems, it is important to fully understand interaction between natural environment and human social systems on islands. As islands are geographically limited areas, their natural environment and human social systems tend to be different from other areas, and more vulnerable to change. The main subjects of this project were environmental issues related to the unique features of islands. Iriomote Island, a typical subtropical island located in Okinawa Prefecture, was an ideal model, as it is rich in natural resources such as water and virgin forests, as well as traditional art and culture.

Research

1) We built a water balance model of Iriomote Island based on the estimated amount of precipitation, river flow, and evapotranspiration. The model is used as a standard for future water usage. We also assessed the human impact on rivers.
2) We clarified the functions and maintenance mechanisms of broadleaf evergreen and mangrove forests while studying biodiversity and interaction among organisms. We took a closer look at the dynamism of forests and assessed the human impact on forests on Iriomote.
3) We looked into the background of human activities causing deterioration of natural environment, including industrial development, demographic structure and government policies. In particular, we explored how the main industry of the island changed from traditional agriculture to tourism and how the social system changed during the transfer period.
4) Regarding the decision-making process in communities, we studied how local people understand the impact of human activities on the natural environment and how local common rules were modified according to changes in the use of natural resources.

Field school on seagrasses

Progress status, achievements, and future challenges

1) To clarify the water balance on Iriomote Island, we placed (and are still placing) monitoring devices on the island. The database was built up to help us make more accurate predictions about the quantity and quality of water that will be available in the future. Our observations have indicated that rain on the island is acidic throughout the year. We have more or less identified the origins of the substances that cause the acid rain and estimated the total amount of such substances falling on the island.
2) Our studies have shown that typhoons affect turnover in broadleaf forests. We have been keeping track of production/circulation of substances in forests and mangroves while monitoring the impact of human activities. We have provided information on effective maintenance and management of forests.
3) We have gathered a variety of reference materials including demographic statistics, administration policies and information on local industries, and categorized them for further analysis. We use these materials to develop measures to promote networking of small-scale industries in the island economy. In this process, we have focused on tourism, agriculture, health and education.
4) We have been in close contact with the islanders by participating in various local events and educational programs designed for schools and communities. As a result, we have learned that community centers on the island play a large role in the community decision-making processes.

In order to solve environmental problems on Iriomote Island, local people need a solid economic infrastructure to build self-esteem and become independent. To achieve this, it is important to share useful information with the islanders. We are still proceeding with the project so that the findings can contribute to promoting local industries and growing new ones. We take part in education at schools and in communities from the planning stage, and would like to help locals promote the island's traditional culture and transmission of its performing arts to younger generations.

http://www1.gifu-u.ac.jp/~kawakubo//iriomote/index01.html

Vulnerability and Resilience of Social-Ecological Systems

A cycle of poverty and environmental degradation is a principal cause of severe global environmental problems. Forest degradation and desertification are prevalent throughout the semi-arid tropics, including in Sub-Saharan Africa and South Asia, where the majority of the world's impoverished people live. People in the semi-arid tropics depend on rain-fed agricultural production systems that are vulnerable to climate variability. Environmental resources such as vegetation and soil are also vulnerable to human activities. A key factor in preventing such problems lies in the ability of human societies and ecosystems to recover from social or environmental shocks, or in social-ecological resilience. This project examines the factors affecting social-ecological resilience in rural Zambia and the ways in which it can be enhanced.

Project Leader
UMETSU Chieko
RIHN

Dr. Chieko Umetsu's specialization is in Resource and environmental economics. She received a M.A. from the International University of Japan, and a doctorate from the University of Hawaii at Manoa, Honolulu, U.S.A. Her publications include "Basin-wide water management: A spatial model" in Journal of Environmental Economics and Management (2003) and "Efficiency and technical change in the Philippine rice sector: A Malmquist total factor productivity analysis" in American Journal of Agricultural Economics (2003).

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Research objectives: Building rural household and community resilience

In the past, poverty in the developing world was seen principally as a social, not environmental, problem. As a consequence, disaster relief and environmental conservation were undertaken as entirely separate endeavors; there was little consideration of human livelihood and wellbeing as products of interacting social and ecological systems, or of the manner in which humans are involved in environmental change.

This project uses the concept of social-ecological resilience in order to evaluate the attempts of agricultural peoples in Sub-Saharan Africa to adapt to environmental change, population increase and rural social collapse. We investigate how households and communities recover from specific social and environmental perturbations, the factors influencing their capacity to adapt, and the role of institutions in strengthening the overall resilience of social-ecological systems. Such analysis can inform policies intended to improve human security, productive livelihoods and social wellbeing in developing countries.

Research methods and target areas: How do agricultural households cope with shocks?

The project is organized into four research themes. In **Theme I**, ecological resilience is examined in relation to soil and forest resources. In **Theme II**, we conduct intensive interviews of farm households/communities and identify the factors affecting social resilience. **Theme III** considers how government policies have historically affected land tenure systems and use of the natural environment. Theme III also considers the social and political factors that cause vulnerability and collapse, and that can aid in community recovery. In **Theme IV**, statistical analysis, remote sensing data and aerial photographs are used to describe long-term changes in land cover, rainfall and temperature. In combination, the four themes should allow us to develop robust methods for assessing social-ecological resilience.

The main field site is in Zambia, where subsistence farmers depend on rain-fed agriculture. Such agricultural systems are extremely vulnerable to environmental variability. Food security, poverty and environmental conser-

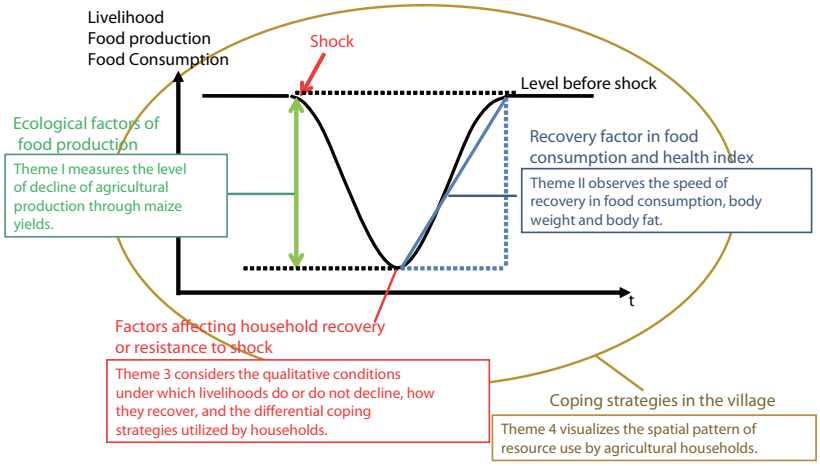

Figure 1 **Approaches to the study of resilience**

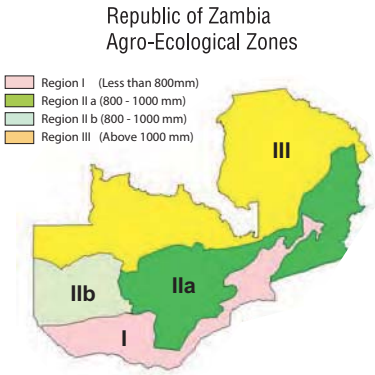

Figure 3 **Agro-ecological zones of Zambia classified by annual rainfall**

Photo 1 **Taking anthropometric measurements, Southern Province**

Photo 2 **Household field measurement using GPS, Southern Province**

Photo 3 **A house garden in the dry season, Southern Province**

Photo 4 **Communication of project findings to local farmers, Eastern Province**

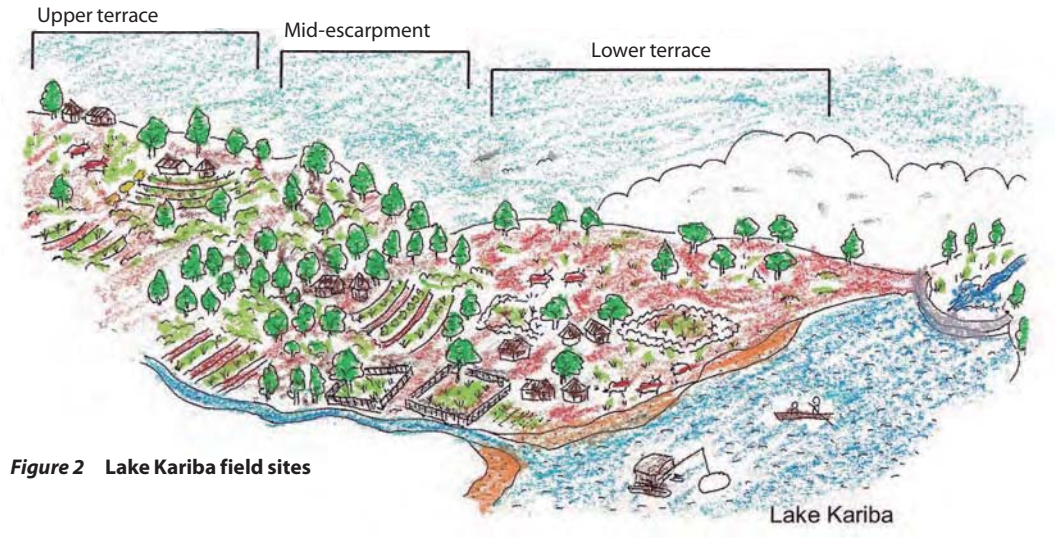

Figure 2 **Lake Kariba field sites**

vation are thus highly interrelated. The concept of social-ecological resilience can provide integrative assessment of how biophysical conditions support human livelihood and wellbeing.

Research outcomes to date and expected results

- We approach the resilience of agricultural households empirically by examining how, and how quickly, food consumption recovers from shocks such as drought and flooding (Fig. 1). Key indicators of household resilience include decline in agricultural production, especially in yield of maize (Theme I) and the speed of recovery in food consumption, as indicated by body weight and skinfold thickness (Theme II). We also make qualitative assessment of the conditions affecting livelihood vulnerability or resilience, including household coping strategies and recovery (Theme III). Theme IV describes the spatial pattern of resource use by agricultural households.
- Rainfall in Southern Province in 2007/08 was extraordinarily heavy, but according to our record of rainfall, its impact on agricultural yields depended on field topography. GIS analysis of damaged fields during the 2007/2008 rainy season indicated that flood damages were concentrated in poorly-drained fields in lower terrace areas (Site A), steep fields in mid-escarpment (Site B), and valley bottom fields in the upper terrace area (Site C). We also measured the area of damaged fields for each household.
- Field experiments confirmed that in high rainfall years, fields in the upper terrace (Site C) produced better yields than those at the bottom of the slope (Site A). Similarly, our household survey and anthropometric measurements found a significant reduction of food consumption and body weight among households with fields in lowland areas.
- Households adopted a variety of methods to cope with flooding. In order to compensate for lost income, farmers replanted maize, planted potato and beans in place of maize, sold livestock for cash, or engaged in other seasonal activities such as fishing and wage labor.
- Field experiment in Eastern Province revealed that the pattern of soil nutrient release and weed growth differed according to the number of years a field had been cultivated, which in turn affected maize yield.
- The Resilience Project organized two sessions at the International Human Dimensions Programme 2009 Open Meeting in Bonn in order to present our latest work to the wider 'resilience' research community.
- Project reports, working papers and a Japanese translation of a resilience workbook are all available at the project web site.

Future plans: Enhancing rural community resilience

We will continue with data collection from the household survey, body measurements, and anthropological survey. Further integration of field and survey data will improve our qualitative and quantitative description of the factors that create vulnerability and the mechanisms enabling household and community resilience.

Coastal Area Capability in Southeast Asia

Coastal area ecosystems are very complex, containing some of the highest levels of biodiversity and primary productivity on earth, but they are also subject to intensive human use and easily degraded. This project uses advanced methods of ecological and social analysis to develop a comprehensive account of how people in several areas of Southeast Asia use coastal resources. It will promote dialogue of how rational and appropriate measures to for social and ecological sustainability can be established.

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Purpose of the project

This study investigates the biodiversity and productivity of Southeast Asian coastal ecosystems, their vulnerability in relation to human activities, and assesses how social practices and ecological processes can be better aligned. We reconsider the existing regime of resource management, centering on "optimal" production (or maximum sustainable yield), and propose the concept of "area capability" as a framework for assessing ecosystem-livelihood linkages in complex and uncertain future environments.

Research approaches

The study is developed in three components:

1) Ecosystem mechanisms and dynamism

Specimens, including organisms, water, sand, soil and suspended materials, are collected from marine, mangrove and terrestrial ecosystems, entered into a Geographical Information System (GIS) and subjected to stable isotope analysis in order to evaluate ecosystem features and food web structures and geographical ranges. Mitochondrial DNA sequence analyses and AFLP analyses of the organism specimens will describe genetic biodiversity and clarify the reproducible units of each species within the ecosystems. Chemical analyses will be performed in order to estimate pollution of land and waters. Biomass is evaluated by several methods, including through satellite image analysis and acoustic estimations.

2) Local livelihoods and adaptive management

Anthropological, social and economic research methods are used to describe the relationship between human action and ecosystem structure and services. Such data and analyses will be used to establish dialogue between project members and local people, and to amplify, concentrate or improve data collection and methods of evaluation as necessary.

3) Environmental governance and local community development

Household interviews and observation surveys are used to gather data on local livelihoods, ethnicity, kinship, employment and educational backgrounds, and use of ecosystems. Logbook surveys will be conducted in order to collect data related to fishing and other key ecosystem-related livelihood activities. Conjoint and CVM analyses describe different viewpoints regarding ecosystem services and values. The key elements necessary for consensus building are clarified, and appropriate policies are proposed.

Expected outcomes

This project will establish a robust database of ecological and social data that can be subject to extensive scientific analysis. By facilitating public access to the database and to information regarding key resource problems in coastal Southeast Asia, many people directly involved in coastal resource management will be able to discuss their understanding of the problems they face, and exchange ideas regarding potential solutions. The idea of "area capability", a synthesis of coastal ecosystem- and livelihood-resilience under uncertain and complex environmental conditions, will be proposed for popular and academic debate.

Photo 2 **Over-exploited fishing grounds at Batang Bay, Panay Island, Philippines**

Photo 1 **Set-Net at Rayong area in Thailand**

The Effect of Local Governance on Incentive Programs for Forest Ecosystem Service Conservation

This project examines forest degradation and possible recovery in two states of Malaysia. It examines the scope of deforestation and its effect on forest ecosystem services, and the potential of several international incentive mechanisms, such as carbon and biodiversity offsets, for reducing emissions of greenhouse gases from deforestation and forest degradation, protecting the pristine forests, slowing deforestation and securing forest ecosystem services. We will investigate local community response to the incentive mechanisms in order to describe how local governance systems can facilitate good and sustainable use of forest ecosystem services.

Principal Investigator
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YAMADA Toshihiro Graduate School of Integrated Arts and Sciences, Hiroshima University
SAKAI Shoko RIHN

Objectives of the study

This project examines the process of deforestation in two different states of Malaysia. It documents the background spatio-temporal dynamics associated with forest degradation and deforestation. It also examines the local governance structures that can maintain the ecosystem services and natural resources provided by tropical forests. With this goal, we adopt two approaches to the question of forest governance. First, we examine local governance and the extent to which local people respond to locally-adopted initiatives. Second, we examine the effect of forest protection/development measures adopted by state and federal administrations. Comparative analysis of the two approaches will allow description of the best opportunities in forest preservation policy, and the challenges that remain to be addressed.

Methodology and approach

Field study takes place in Negeri Sembilan, and either Sabah or Sarawak, Malaysia, all of which have experienced significant deforestation and are now targeted for reforestation. Background study in these areas will include:

- spatio-temporal analysis of forest cover and of variable definitions of "forest land";
- The history of deforestation caused by timber exploitation, and associated degradation of forest ecosystem services;
- Simulation focusing the future possible changes of ecosystem services of the target area.

A second component of field study examines the response of local people to the new incentive mechanisms intended to reduce deforestation and forest degradation. It includes:

- Local reaction and response to forest degradation;
- Description of the different forest ecosystem service programs adopted or planned;
- Assessment of how incentive mechanisms have been or may be accepted and utilized by local communities.

Significance

The proposed study will thus contribute interdisciplinary evaluation of contemporary schemes to enhance biodiversity, and of the significance of local actors in long-term governance of forest ecosystems.

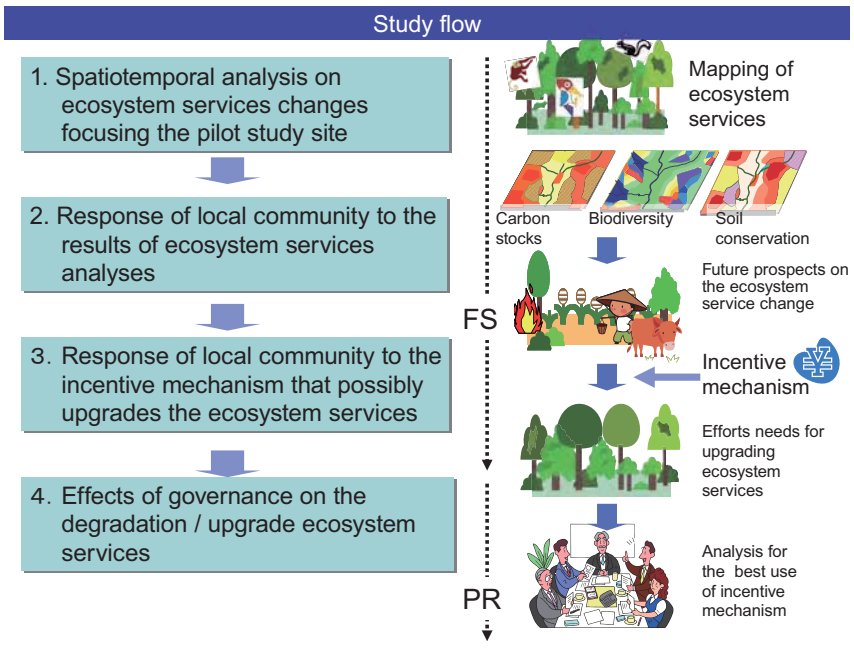

Figure 1 **Flow of the study (FS: Feasibility Study; PR: Pre-Research)**

Managing Environmental Risks to Food and Health Security in Asian Watersheds

This study examines the sources, diffusion and impact of environmental contaminants in the Laguna Lake Watershed, Philippines. The Laguna Lake Watershed area is heavily but unevenly populated; it includes urban and industrial areas of Metro Manila, rural agricultural communities, and many areas undergoing land conversion. Drawing on the methods and insights of the natural, medical and social sciences, project researchers trace heavy metal and chemical pollutants from their sources through surrounding ecosystems and into the human food chain. Based on assessment of the impact of these contaminants on public health in several communities dependent on agriculture and marine food resources, the project will recommend socially and ecologically acceptable watershed management policies.

Principal Investigator

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SANTOS-BORJA, A.C.	Lake Laguna Development Authority, Philippines

Project overview

As it undergoes rapid economic development and urbanization, the Lake Laguna area faces three major challenges: pollution, disposal of solid waste, and maintaining food quality and nutrition as the foundation of public health. Addressing these challenges requires recognition of the interconnections between people and environment. Sustainable economic development in the region will depend on a healthy environment, especially for the people who are directly dependent on the Lake Laguna Watershed ecosystem.

This research project has four principal objectives. First, it documents the current levels of heavy metals (lead, mercury, and cadmium) in the aquatic resources of Lake Laguna, the routes of this pollution and its impact on public health. Second, it analyzes the presence of chemicals in agricultural fields and their impact on food production and relation to subsequent ecosystem deterioration. Third, it describes land-use change in Lake Laguna area and the impact of this change on groundwater level and water quality. Finally, it combines the social, medical and physical sciences in order to develop strategies of ecological risk management for sustainable food, health security and watershed planning in Southeast Asia.

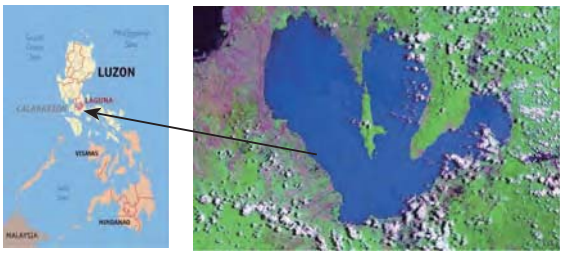


Figure **Expanding Ecological Risks in Lake Laguna Region (Luzon Island, Philippines)**

Rapid urbanization and land use changes are associated with pollution of aquatic resources and food-related health risks.

Research structure

Four research teams are organized and carry out research as follows: the *Environmental Risk Analysis Team* identifies the exact sources of particular pollutants and factors responsible for their presence in the food chain. The *Health Risk Evaluation Team* will collect data on nutrition, history of disease, and life expectancy in relation to socio-economic data. The *Ecosystem Degradation Evaluation Team* will use stable isotope and other analytical techniques to investigate how land use change is associated with downstream pollution. Finally, the *Socio-Economic Evaluation Team* will explore how both market- and non-market-based instruments can be used to improve water quality, food security and public health.

The blessings of nature are endangered by demographic and economic pressures around Lake Laguna. Heavy metals and other pollutants will be analyzed in this research. (Photo taken in December, 2009)

Desertification, Local Husbandry and Livelihoods in Sub-Sahara Africa

Semi-arid Sub-Sahara Africa is known as a front of desertification. The area is home to numerous nomadic and cultivating peoples, each employing various livelihood strategies and husbandry practices. Set in the West African Sahel of Niger and Burkina Faso, this project investigates the socio-ecological conditions of several peoples and their local husbandry systems and livelihood strategies, the processes of their change, and their adaptability to new techniques. Based on this deepened understanding, we will describe practical and feasible techniques to cope with desertification and guide rural development assistance that improves household economy and livelihood security.

Principal Investigator
TANAKA Ueru
Graduate School of Global Environmental Studies, Kyoto University

Core Members

KUCHIKURA Yukio	Faculty of Regional Studies, Gifu University
SHINJO Hitoshi	Graduate School of Agriculture, Kyoto University
KOBAYASHI Hirohide	Graduate School of Global Environmental Studies, Kyoto University
NAKAMURA Hiroshi	Global Environmental Forum
MIURA Rei-ichi	Graduate School of Agriculture, Kyoto University

Research Objectives and Outline

Poverty and environmental degradation are serious problems in semi-arid Sub-Saharan Africa. In ratifying the United Nations Convention to Combat Desertification in 1994, the international community, including Japan, signaled its commitment to solve the problems related to desertification. Although desertification is a global concern, its prevention depends on human-scale activities and conscientious field work.

This project sets three objectives, as described below, with corresponding sub-topics. Dark bullets indicate emphasis in the FS period; open bullets indicate emphasis in Full Research.

A. Socio-ecological characteristics of semi-arid Sub-Saharan Africa

1. Livelihood and local husbandry systems ●
2. Significance of small-scaled livelihood activities on household economy ●
3. Architectural techniques and house environment of different ethnic groups ○
4. Soil fertility mechanism and human-soil interactions ○

B. Local husbandry systems and livelihood strategies of different ethnic groups in the Sahel

1. The "year of crisis" and coping activities for different peoples ●
2. Significance of seasonal and/or periodical migration laboring on livelihood security ○
3. Seasonal interactions of nomadic and cultivating peoples ○

C. Preventing desertification and assisting rural development

1. Comparison of the perception gaps between local people and outsiders regarding desertification ●
2. Adaptability of introduced techniques for desertification prevention and rural development ○
3. Adoption of introduced technique, using the case of the "petit-fallow system" ○
4. Rural development for prevention of desertification ○

Further studies

Our research emphasizes the topics which have received little attention, such as seasonal and/or periodical labor migration, interaction of livelihood activities among different peoples, significance of small- scale livelihood activities, indigenous dissemination channel of knowledge and techniques, and resilience to desertification and shocks. In sum, we reappraise the general state of socio-ecological knowledge of the Sahel and academic and practitioners' specific understandings of appropriate techniques for adoption.

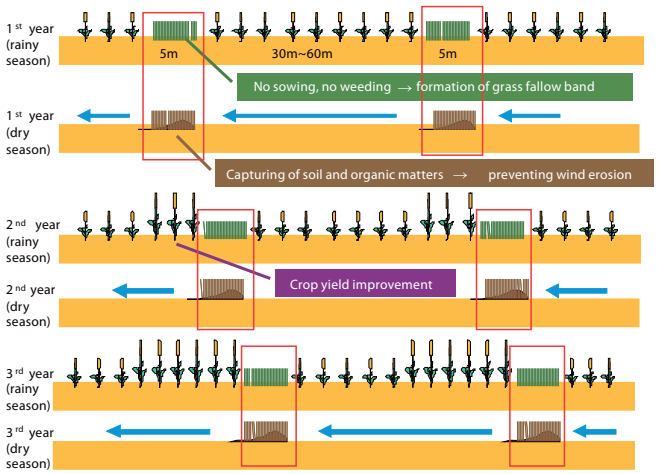


Figure 1 **The petit-fallow system**
Using a shifting "petit-fallow band"—a field area that is not sown or weeded—prevents wind erosion and improves crop yields.

Photo 1 **Wind erosion in Niger**

The Hydrological Cycle and Water Problems in the Changjiang River Basin: Human-Nature Interaction in a Transforming China

China is in a period of rapid economic growth and looming water shortage, even in inland and humid regions such as the Changjiang River basin. This study describes the basin's hydro-ecological conditions, and the potential risk posed by water shortage and pollution. The project also describes the modern history of social development and water management in order to develop realistic socio-economic and ecological system scenarios for proper water management in the Changjiang basin.

Principal Investigator

TANAKA Hiroki
Hydrospheric Atmospheric Research Center, Nagoya University

Core Members

TATENO Ryunosuke	Faculty of Agriculture, Kagoshima University
LIU Yuanbo	Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences
TANAKA Kenji	Disaster Prevention Research Institute, Kyoto University
BAO Weikai	Chengdu Institute of Biology, Chinese Academy of Sciences
HIYAMA Tetsuya	Hydrospheric Atmospheric Research Center, Nagoya University
WANG Huimin	Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences
TANAKA Shigeyoshi	Graduate School of Environmental Studies, Nagoya University
ZHU Anxin	Department of Sociology, Nanjing University
IMIRA Hidefumi	Graduate School of Environmental Studies, Nagoya University
ONISHI Akio	Graduate School of Environmental Studies, Nagoya University
MORISUGI Masafumi	Faculty of Urban Science, Meijo University
ISHIZAKA Joji	Hydrospheric Atmospheric Research Center, Nagoya University
UCHIDA Taro	Public Works Research Institute
MORIMOTO Akihiko	Hydrospheric Atmospheric Research Center, Nagoya University
FURUICHI Takahisa	Center of Education for Leaders in Environmental Sectors, Tokyo University of Agriculture and Technology
YAMADA Hiroyuki	Research Institute for Global Change, Japan Agency for Marine-Earth Science and Technology
FUJINAMI Hatsuki	Hydrospheric Atmospheric Research Center, Nagoya University
ENDO Nobuhiko	Research Institute for Global Change, Japan Agency for Marine-Earth Science and Technology

Project overview

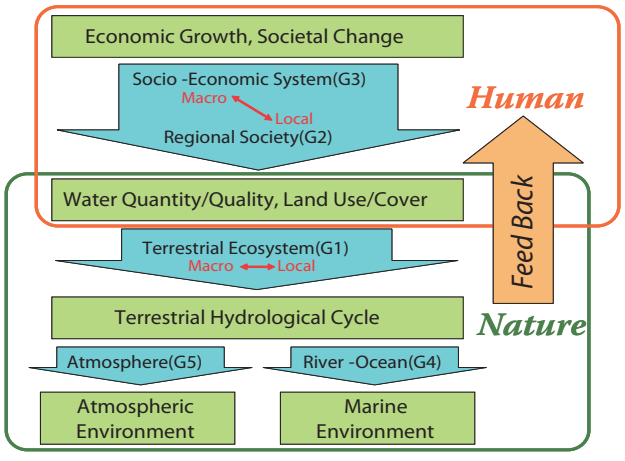
The Changjiang River is the largest river in China, and at the center of China's dynamic economic growth. The rapid pace of change in this region has destabilized human-nature interaction there and caused a number of serious environmental problems. As demand for water increases along with economic growth, the humid Changjiang basin has begun to experience water shortage in and around its large cities. Global climate change, which is expected to affect the hydrological cycle, may further increase the risk of drought and flood in the area.

This study develops realistic socio-economic and ecological system scenarios for proper water management in the Changjiang basin. It investigates spatial and temporal variability of precipitation, spatial distribution and trends of demand for water, spatiotemporal distribution of water capacity in terrestrial ecosystems and the corresponding societal processes in the modern period. Finally, this study evaluates how such processes originating in China may influence Japan and the East Asian environmental region through oceanic and atmospheric circulations

Research methods and expected results

In order to elucidate the mechanism of land use/cover change and change in water quantity and quality, we investigate how economic growth and societal change has influenced demand for water, waste water drainage, agricultural practices, and community life. Second, we elucidate change in the hydrological system through investigation of the changes in the hydrological functions of forest, agricultural, and freshwater ecosystems. The use of on-site field surveys and analysis of satellite data and socio-economic statistics will enable both local-scale and macro-scale description. Information on detailed processes, special distributions, and macro-scale dynamics will then be integrated in order to develop a model of human-hydrological interactions in the Changjiang basin.

This study thus improves human capability to mitigate and adapt to contemporary environmental change in the Changjiang basin, and provides fundamental information for better management of the East Asian environmental region.



Study Frame and Research Groups

Five groups elucidate the mechanisms of four impact flows (light blue arrows). All groups keep close contact to understand how the water-related risks due to environmental changes feed back to human activity.

Atmospheric Methane and Agriculture in Monsoon Asia

This project examines atmospheric methane (CH_4) and agriculture in monsoon Asia. In terms of radiative forcing, CH_4 is the second most significant greenhouse gas (after carbon dioxide [CO_2]). Agriculture, especially paddy rice cultivation and the keeping of ruminant animals, produces large amounts of CH_4. Monsoon Asia, where approximately 90% of the world's rice fields are located, is therefore a major source of CH_4 emissions. Research in this project quantifies CH_4 emissions and attempts to describe a culturally appropriate low-methane food system.

Principal Investigator
HAYASHIDA Sachiko
Faculty of Science, Nara Women's University

Core Members

KAOKI Shuji	Graduate School of Science, Tohoku University
HAYASAKA Tadahiro	Graduate School of Science, Tohoku University
KUJI Makoto	Faculty of Science, Nara Women's University
IMASU Ryoichi	Center for Climate System Research, The University of Tokyo
TAKEUCHI Wataru	Institute of Industrial Science, The University of Tokyo
YAGI Kazuyuki	National Institute for Agro-Environmental Sciences
INUBUSHI Kazuyuki	Graduate School of Horticulture, Chiba University
ENISHI Osamu	National Institute of Livestock and Grassland Science
TAKENAKA Akio	Japan International Research Center for Agricultural Sciences
MATSUMOTO Jun	Faculty of Urban Environmental Sciences, Tokyo Metropolitan University
MATSUEDA Hidekazu	Geochemical Research Department, Meteorological Research Institute
AMANO Koji	Department of Environmental Systems Engineering, Ritsumeikan University
SHIMADA Koji	Department of Economics, Ritsumeikan University

Project objectives

This study combines the methods and insights of meteorology, climatology, atmospheric chemistry, agricultural science, social engineering, and economics in order to examine methane-agriculture linkages in monsoon Asia. It consists of three parts: (1) quantification of CH4 emissions in Monsoon Asia; (2) building a new model toward low-carbon agriculture and evaluating the atmospheric environmental load of agriculture by applying life cycle assessment from the point of view of food lifestyle; and (3) elucidating the interaction between human and nature in the Asian monsoon region through process studies.

Research methods and organization

Research is conducted through field measurements, computer simulations, and analysis of appropriate statistical and remotely sensed data. The project is organized through five groups according to the following subthemes:

1. Satellite data analysis and forward/inverse modeling;
2. Measurement of methane emissions attributable to rice production and livestock in the study region;
3. Interactions of climate change and agriculture in monsoon Asia;
4. Atmospheric methane and isotope measurements over monsoon Asia;
5. Material flow analysis of present and possible future patterns of food production and consumption.

Research significance

This study will improve understanding of the direct environmental impact of food production and consumption in Monsoon Asia and of the global significance of rice and livestock production to global greenhouse gas (GHG) emissions. A final objective is to suggest how methane emissions associated with agriculture can be reduced, and so to contribute to the design of low-GHG societies.

Using the closed chamber technique to monitor greenhouse gas emissions from rice paddies.

Green Earth: Plant, Human and Earth Interactions

The Earth is covered in vegetation. This is generally considered positive for human existence, but in certain places, certain kinds of vegetation may have distinctly ill effects on local environments and human well-being. This study will develop a general index capable of indicating the suitability of specific kinds of vegetation in particular places.

Principal Investigator
FUKUI Kiichi
Graduate School of Engineering, Osaka University

Core Members

TSUCHIMOTO Suguru	Institute of Molecular and Cellular Biosciences, The University of Tokyo
EGASHIRA Hiroaki	Faculty of Agriculture, Yamagata University
OHMIDO Nobuko	Graduate School of Human Development and Environment, Kobe University
KIMURA Toshiaki	Graduate School of Arts and Letters, Tohoku University
KODAMA Kanako	Faculty of Letters, Chiba University
SATO Tadashi	Graduate School of Life Sciences, Tohoku University
SODA Satoshi	Graduate School of Engineering, Osaka University
HOSODA Hisashi (Ret.)	Ministry of Agriculture, Forestry, and Fisheries

Plants are essential in supporting life on earth. Owing to the fact, people are often mistaken that plants are unconditionally beneficial for human survival. This project will develop a general index (tentatively named the Human-Green Index, or HuG index) to evaluate how specific plant species impact the wellbeing of local human populations and affect their surrounding environment.

In order to create the index we must "measure the green", for example the impact of reforestation projects in particular places. We must examine how to "govern the green", as where overgrowth may have negative effects on overall ecological conditions (as in the case of the former Japanese satoyama landscape). Finally, we must think of how best to "utilize the green", for example in tropical zones where vegetation plays an important role in regulating large-scale climatic systems. Case studies will be chosen to illustrate each of the three situations.

The HuG index will include a wide spectrum of variables, including a number addressing human quality of life. We also incorporate parameters that allow us to link genetic diversity of living organisms and LCA (Life Cycle Assessment) to greenhouse gas emissions in different scenarios.


A


B

How do the plants in these pictures affect the global environment and the happiness of local people?
A) popular trees planted in a semiarid area (Uxin Banner, Inner Mongolia)
B) a fallow field with grasses (Okuizumo-cho, Japan)
C) an oil palm plantation behind rice paddies (Sulawesi Island, Indonesia)


C

Award ceremony of the Earth Hall of Fame Kyoto

As a national research institute, RIHN is expected to conduct exemplary science; it also must communicate its research agenda and results to the public and contribute to public awareness and discussion of contemporary environmentalism. A number of public symposia, campaigns, seminar series, and publications are designed to reach specialist and general audiences. Some of the recent activities and publications include:

The Earth Forum Kyoto and the Earth Hall of Fame Kyoto Award

The Earth Forum Kyoto invites world-renowned experts and activists to discuss the environmental and cultural basis of more responsible human societies. The Earth Hall of Fame Kyoto Award given to those who made exemplary contributions to the protection of the global environment. Organizers of the event are the International Institute for Advanced Studies, the Kyoto International Conference Centre and RIHN. The first recipients (2009) of the Earth Hall of Fame Kyoto Award were Wangari Maathai (Republic of Kenya), Syukuro Manabe (U.S.A.), and Gro Harlem Brundtland (Norway).

Kyoto Forum on Environmental Wisdom and Culture

RIHN, Kyoto Prefecture and Kyoto City co-host this forum as part of the DO YOU KYOTO? campaign, a public information campaign designed to stimulate Kyoto residents' environmental consciousness and responsible behavior in everyday life.

RIHN International Symposia

An annual event at which a range of experts discuss environmental subjects related to the research results of RIHN projects.

- 4th *The Dilemma of Boundaries: Toward a New Concept of Catchment* (October 2009)

International Symposia

Held by RIHN or in collaboration with other organizations.

- *Water, Cultural Diversity and Global Environmental Change: Emerging Trends, Sustainable Futures?,* RIHN, UNESCO International Hydrological Programme and United Nations University-Institute for Advanced Studies International Symposium (October 2009)
- *Towards the Future of Civilization: 3 Science Fiction Novelists Dialogue at RIHN,* RIHN Ecohistory Program International Symposium (August 2009)
- *The Cultures of Water Management: Civilizations and Environments in the Midde East,* RIHN and NIHU International Symposium (March 2010)

RIHN Forum

Open to the general public and since 2004 the proceedings were published as monographs.

- 8th *Linking Human Well-being and the Environment* (July 2009)

RIHN Public Seminars

Held almost monthly on-site at RIHN or in the city center.

- 37th *Global Warming and Water,* Manabe Syukuro, Princeton University (February 2010)

RIHN Area Seminars

Take place in, and address specific environmental issues pertaining to, a particular part of Japan.

- 7th *"Sato": Lessons from Japan's Rural Experience for the World,* Kanazawa City, Ishikawa (February 2010)

The 7th RIHN Area Seminar

RIHN Seminars

Invite a range of speakers from abroad to share their expertise with the RIHN community.

- 42nd *NGOs, Public Participation and Dam Construction in China,* Wang Yongcheng, Green Earth Volunteers (February 2010)

PUBLICATIONS

RIHN Book Series

Introduces the significance of research findings for a general audience.

- *Mizu to Hito no Mirai Kanousei* (The Futurability of Water and Humankind: Looming Water Crisis), RIHN (ed.), Showado, 2009.
- *Mono no Ekkyo to Chikyu Kankyo Mondai* (Transboundary Movements and Global Environmental Problems), KUBOTA Jumpei (ed.), Showado, 2009.

RIHN Library

RIHN's researchers introduce the results of their research activities to a wider audience.

- *Eurasia Noukoushi* (Agricultural History in Eurasia), Book series (1-5), SATO Yo-ichiro (supervisor), KURATA Takashi (ed.) Vol. 1,3,5, KIMURA Emi (ed.) Vol. 2,4, Rinsen Book, 2009-2010.
- *Linguistics, Archaeology and Human Past in South Asia*, OSADA Toshiki (ed.), Manohar Publishers & Distributors, India, 2009.

Humanity and Nature Newsletter

The RIHN Initiative for Chinese Environmental Issues (RIHN-China)

Ten-Chi-Jin Newsletter

In 2007 the National Institutes of the Humanities (NIHU) established the RIHN Initiative for Chinese Environmental Issues (RIHN-China). RIHN-China is one of NIHU's six China research centers; the others are located at Waseda University, Keio University, the University of Tokyo, Toyo Bunko (the Oriental Library), and Kyoto University and individually emphasize China's economy, history, politics or society. All research centers are dedicated to the promotion of contemporary China studies in Japan and the encouragement of young scholars in this area.

RIHN-China functions as an umbrella for RIHN research projects conducting interdisciplinary investigation of China's environment. It publishes a newsletter entitled "Ten-Chi-Jin" ("Heaven-Earth-Human") featuring research summaries and excerpts, interviews, and other relevant material. RIHN-China is also building an environmental research network to facilitate exchange between the numerous institutions, individual scholars, and other social actors involved in environmental research in China.

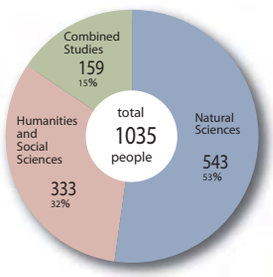
Each year RIHN-China identifies a key unifying topic, such as "water", "food and agriculture" or "urbanization" under which workshops and symposia are organized with Chinese colleagues. Topics for the fifth and sixth years will be, respectively, "health" and "culture". The results of the first international symposium was published in February 2009 as "Chinese Environmental Issues: Water Shortages and Development" in both Japanese (Bensey Publishing Inc.) and Chinese (Hohai University Press).

RIHN Director-General Tachimoto and Professor Man Zhi min of Fudan University exchange a Memorandum of Understanding.

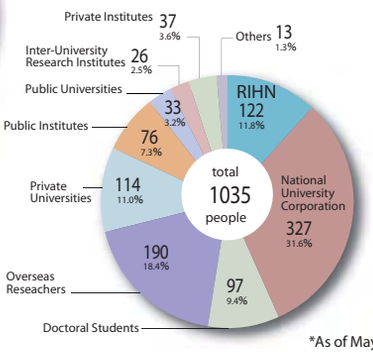
Urbanization was an early focus of the RIHN-China Initiative.

Research Affiliations

Research Areas

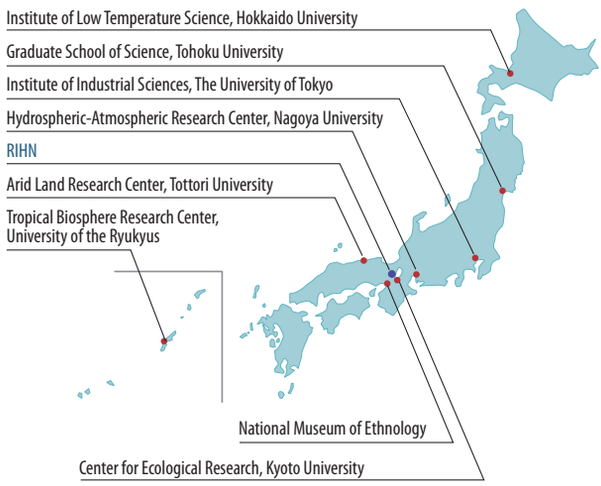


Affiliate Organizations



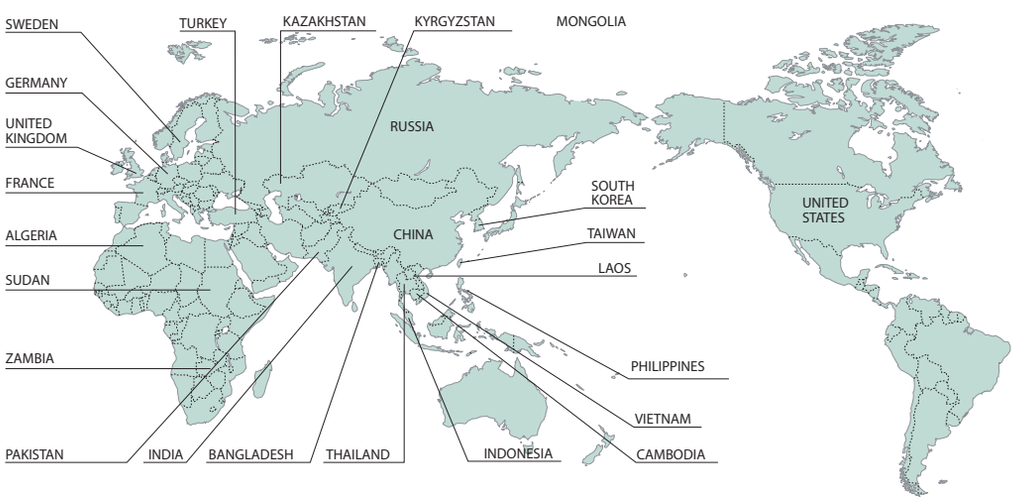
*As of May 1st, 2009

Collaboration in Japan



International Collaboration

Memoranda of Understanding and Research Cooperation Agreements (As of April 1st, 2010)



ALGERIA
Centre National de Développement des Ressources Biologiques* (R-05)

BANGLADESH
International Centre for Diarrhoeal Disease Research (R-04)

CAMBODIA
Cambodian Agricultural Research and Development Institute (H-02)

CHINA
Cold and Arid Regions Environmental and Engineering Research Institute, Chinese Academy of Sciences (H-01)
Fudan University* (RIHN-CHINA)
Institute of Archaeology, Chinese Academy of Social Sciences (H-02)
Institute of Mountain Hazards and Environment, Chinese Academy of Sciences (R-03)
Qinghai University Hospital (D-03)
Research Center for Environmental Technology of River and Lake, Shanghai Jiao Tong University (C-06)
Xinjiang Archaeological Research Institute (H-02)

FRANCE
La Fondation Maison des Sciences de l'Homme (H-02)

GERMANY
Alfred Wegener Institute for Polar and Marine Sciences (R-03)
Geoforschungszentrum Potsdam (R-03)

INDIA
Deccan College, Post-Graduate and Research Institute (H-03)
Institute of Rajasthan Studies, JRN Rajasthan Vidyapeeth* (H-03)
Maharaja Sayajirao University of Baroda* (H-03)
Maharshi Dayanand University* (H-03)
Rajiv Gandhi University* (D-03)

INDONESIA
Faculty of Agriculture, Hasanuddin University (H-02)
Research Center for Geotechnology, Indonesian Institute of Sciences (C-05)

KAZAKHSTAN
Institute of Archaeology (R-03)
Institute of Geography (R-03)
Kazakhstan Scientific Research Institute on Problems of the Cultural Heritage on Nomads (R-03)
Tethys Scientific Society (R-03)

KYRGYZSTAN
Central-Asian Institute for Applied Geosciences (R-03)

LAOS
National Agriculture and Forestry Research Institute (H-02)
National Institute of Public Health, Ministry of Health (R-04)

MONGOLIA
Hustai National Park Trust (D-04)
Institute of Biology, Mongolian Academy of Sciences (D-04)
Institute of Botany, Mongolian Academy of Sciences (D-04)
Institute of Geoecology, Mongolian Academy of Sciences (D-04)
Institute of Meteorology and Hydrology, Ministry of Nature and Environment (D-04)

PAKISTAN
Shah Abdul Latif University* (H-03)
University of the Punjab (H-03)

PHILIPPINES
University of the Philippines, Los Baños (H-02)

RUSSIA
Far Eastern National University (H-04)
Institute for Biological Problems of Cryolithozone* (C-07)
Institute of Humanitarian Research and the Problems of the Northern Minority Peoples* (C-07)

SOUTH KOREA
Institute of Islands Culture (D-02)
Korea Research Institute for Human Settlements (C-05)

SUDAN
Sudan University of Science and Technology (R-05)

SWEDEN
The Sven Hedin Foundation* (H-02)

TAIWAN
Institute of Earth Sciences, Academia Sinica (C-05)

THAILAND
Deapartment of Groundwater Resources, Ministry of Natural Resources and Environment (C-05)
Rice Department, Ministry of Agriculture and Cooperatives (H-02)

TURKEY
Çukurova University (H-02)

UNITED KINGDOM
Sainsbury Institute for the Study of Japanese Arts and Cultures (H-04)

USA
University of Idaho (R-03)

VIETAM
Cuu Long Delta Rice Research Institute (H-02)

ZAMBIA
Zambia Agricultural Research Institute, Ministry of Agriculture and Cooperatives (E-04)

*MOU signed in 2009

Research rooms on the RIHN campus are designed to provide a sense of openness. The design concept is to allow implemented projects to be loosely interconnected as they occur in one large curved space 150 meters in length. The facilities help external researchers as well as RIHN research staff to meet one another, since they are designed with the maximization of shared use in mind. At the center of the main building, a library and computer room are located for the convenience of many users, and three common rooms are provided for casual discussions. On the basement floor, a cluster of fully functional laboratories has been designed with emphasis on convenience for shared use, as with the research rooms.

The separate RIHN House is a guesthouse. The assembly hall and a dining lounge located to the left of the house entrance serve as meeting spaces for the RIHN staff as well as for guests.

Appropriately for an institution researching the global environment, RIHN is housed in a tile-roofed building suited to the Kyoto landscape, where as many as possible of the trees already on the site have been retained. Lighting and air-conditioning also employ the latest designs to minimize the building's impact on the environment. The design has won acclaim, receiving awards from the Illumination Engineering Institute of Japan, the Japan Institute of Architects, the Green Building Award from MIPIM Asia, and the Architectural Institute of Japan.

Laboratories

RIHN research projects are multi-disciplinary and multi-method; in common they share the need for high quality physical observation and chemical and biological analysis of the surface environments of the earth. As a national institute, RIHN houses eighteen basement laboratories designed to address this need. There are state-of-the-art laboratories dedicated to microscopic, DNA and stable isotope analysis. Additional facilities include two fieldwork preparation rooms for storage and maintenance of observational and sampling equipment, three low-temperature rooms for organism and ice core storage, three incubator rooms for storage of organisms requiring specific temperatures, and a clean room in which samples can be processed in a contamination-free environment.

Instruments

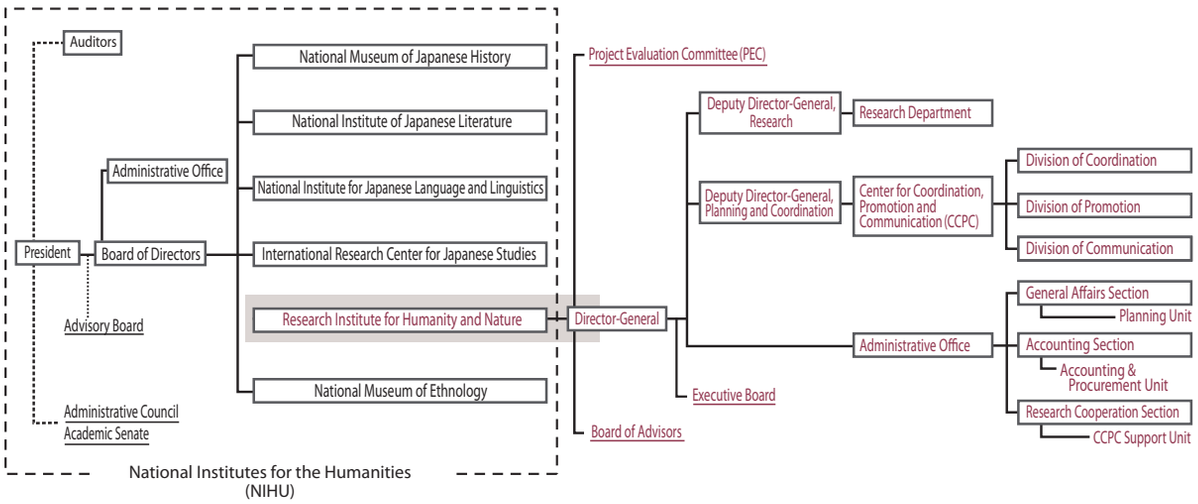
While individual projects make extensive use of specialized instruments, RIHN provides common access to the advanced instruments essential to contemporary environmental studies. In order to assure the proper use and care for this equipment, and to support its accessibility to the joint research of an inter-university research institute, the Division of Promotion maintains a manual of standard equipment and laboratory procedures. Stable isotope analysis has stimulated environmental science in recent years, and RIHN houses one of the most advanced laboratories for stable isotope analysis in Japan, as well as a range of support instrumentation. In order to facilitate access to the instruments, common consumable supplies are purchased collectively.

Management

Within the Center for Coordination, Promotion and Communication, the Division of Promotion manages and maintains the research facilities in cooperation with the research projects making use of them. About 200 people from 35 institutes used the RIHN laboratory facilities in fiscal 2009. As new research projects are established at RIHN each year, the Division of Promotion runs workshops several times a year in order to develop general understanding of the facilities and their procedures and enhance communication among lab workers. Laboratory procedures, instrument manuals and information relating to samples in storage are also available on the RIHN laboratory website. Beginning in 2010, the Division of Promotion will also conduct research into new technical methods in environmental studies.

Stable isotope analysis describes how things are linked to one another, where they come from and how they change in contact with other elements and through time. It is a powerful tool in the study of contemporary biogeochemical processes as well as of deep historical change. In analyzing the stable isotopes of the varying elements present in ground-, river-, lake- and other waters of a particular landscape, for example, researchers can describe its original sources as well as the route and time it took to get to its present location. Such description can illuminate how mountain forests and soils contribute to the quality of rice grown on the plains below.

Organization



Financial Information

■ Segmental Financial Information (Fiscal Year 2008)

Operating Expenses

Category	Amount (Yen in thousands)
Operating Expenses	2,207,991
Educational/Research Aids	2,540
Inter-University/Joint Research	1,156,981
Outsourced Studies	64,315
Outsourced Operations	58,689
Personnel	925,466
General Management	164,650
Financial Expenses	70,447
Total Expenses	2,443,089

Operating Income

Category	Amount (Yen in thousands)
Subsidy for Operation	2,170,963
Contract Research, etc.	2,540
Contract Operations, etc.	58,689
Donations	6,782
Others	213,598
Total Earnings	2,452,574

Operational Balance 9,484

■ External Sources of Funding

(Fiscal Year 2008)

Category	Amount (Yen in thousands)
Fund for Promotion of Academic and Industrial Collaboration	58,690
Grants-in-Aids for Scientific Research	86,525
Donations for Research	7,520

* Fund for Promotion of Academic and Industrial Collaboration is the sum of contract research and joint research expenses.

Board and Committees

Board of Advisors

Oversees personnel, planning, administration and operation of the institute

FUJII Yoshiyuki
Director-General, National Institute of Polar Research
FURUSAWA Iwao
President, Tottori University of Environmental Studies
IWASAKA Yasunobu
Professor, Kanazawa University Frontier Science Organization
SHIRAHATA Yozaburo
Professor, Research Department, International Research Center for Japanese Studies, NIHU
WASHIDA Kiyokazu
President, Osaka University
YASUNARI Tetsuzo
Professor, Hydrospheric Atmospheric Research Center, Nagoya University
YOKOYAMA Toshio
Professor, Graduate School of Global Environmental Studies, Kyoto University
YONEMOTO Shohei
Professor, Research Center for Advanced Science and Technology, The University of Tokyo
ABE Ken-ichi
Program Director, RIHN
AKIMICHI Tomoya
Deputy Director-General, RIHN
Director, CCPC, RIHN
SATO Yo-Ichiro
Deputy Director-General, RIHN
Program Director, RIHN
TANIGUCHI Makoto
Program Director, RIHN
WATANABE Tsugihiro
Program Director, RIHN
YUMOTO Takakazu
Program Director, RIHN

Project Evaluation Committee (PEC)

External review of research project proposals

(Domestic)
IWASAKA Yasunobu
Professor , Kanazawa University Frontier Science Organization
MUSHIAKE Katsumi
Research Counciler, Foundation of River & Watershed Environment Management; Visiting Professor, Graduate School of Engineering, Hosei University
NAKAMURA Masami
Professor, Edogawa University; Former Senior Staff Writer, Editorial Bureau, Nihonkeizai Shimbun Inc.
OHTSUKA Ryutaro
President, Japan Wildlife Research Center
TANAKA Koji
Director, Center for Integrated Area Studies, Kyoto University
UETA Kazuhiro
Professor, Graduate School of Global Environmental Studies, Kyoto University
YAMAGATA Toshio
Professor, School of Science, The University of Tokyo
YOKOYAMA Toshio
Professor, Graduate School of Global Environmental Studies, Kyoto University

(Overseas)
BELLWOOD, Peter
Professor, School of Archaeology and Anthropology, The Australian National University, Australia
CHUN, Kyung-soo
Professor, Department of Anthropology, Seoul National University, Korea
FU, Congbin
Director, START Regional Center for Temperate East Asia, China; Research Professor, Institute of Atmospheric Physics (IAP) / Chinese Academy of Sciences (CAS), China
IKAWA-Smith, Fumiko
Former Associate Vice Principal, McGill University, Canada
LOVEJOY, Thomas E.
President, The H. John Heinz III Center for Science, Ecomonics and the Environment, USA
OHMURA Atsumu
Professor, Swiss Federal Institute of Technology, Switzerland

Executive Board

Oversees administrative operation of the institute.

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AKIMICHI Tomoya
Deputy Director-General Director, CCPC
SATO Yo-Ichiro
Deputy Director-General
Program Director
ABE Ken-ichi
Program Director
TANIGUCHI Makoto
Program Director
WATANABE Tsugihiro
Program Director
YUMOTO Takakazu
Program Director
SATO Yoshiaki
Director, Administrative Office

Emeritus Professor

NAKANISHI Masami
WADA Eitaro
NAKAWO Masayoshi
FUKUSHIMA Yoshihiro

Guest Professor

KINOSHITA Tetsuya

In Memoriam

Professor HIDAKA Toshitaka
First Director-General of RIHN

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DEPUTY DIRECTOR-GENERAL, Planning and Coordination AKIMICHI Tomoya
DEPUTY DIRECTOR-GENERAL, Research SATO Yo-Ichiro

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DIRECTOR SATO Yoshiaki

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Deputy Head **YAGI Kiyotaka**
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Chief **ISHIJI Keisuke**
Personnel Subsection
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Chief **INABA Shigeo**
Clerk **OKAUCHI Naoko**
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Planninng & Assessment Subsection
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Information Subsection
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Head **NISHIKAWA Tomonobu**
Accounting & Procurement Unit
Head **NAKAKUBO Takao**
Accounting & Procurement Subunit
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CCPC Support Unit
Head **ISHIDA Yataro**
CCPC Support Subunit
Head **MIHARA Kazuaki**
Clerk **HONDA Takayuki**

RESEARCH DEPARTMENT

*As of April, 2010

Program Directors

ABE Ken-ichi
SATO Yo-Ichiro
TANIGUCHI Makoto
WATANABE Tsugihiro
YUMOTO Takakazu

Professors

INOUE Gen	Atmospheric Chemistry
KAWABATA Zen'ichiro	Microbial Ecology
MOJI Kazuhiko	Human Ecology, Population Health in the Tropics
MURAMATSU Shin	Architectural History, Urban History
OSADA Toshiki	Linguistics
SATO Yo-Ichiro	Plant Genetics
TANIGUCHI Makoto	Hydorology
YAMAMURA Norio	Mathematical Ecology
YUMOTO Takakazu	Plant Ecology

Associate Professors

HIYAMA Tetsuya	Ecohydrology
KUBOTA Jumpei	Hydrology
NAWATA Hiroshi	Cultural Anthropology
OKUMIYA Kiyohito	Field Medicine
SAKAI Shoko	Plant Ecology
UCHIYAMA Junzo	Prehistoric Anthropology
UMETSU Chieko	Resource & Environmental Economics

Assistant Professors

KATO Yuzo	Legal History
YATAGAI Akiyo	Meterology, Climatology

Visiting Professors

GOTO Tamon	Chinese History, Film Making
HAYASHIDA Sachiko	Global-scale Geographic Information
IEDA Osamu	East European Area Studies, East European Economic History
KADA Ryohei	Agricultural Policy, Environmental Economics
KAWASAKI Masahiro	Atmospheric Chemistry
KOYAMA Shuzo	Archaeology
MITSUTANI Takumi	Dendrochronology
SHIBAYAMA Mamoru	Area Informatics

Visiting Associate Professors

FUJITA Noboru	Grassland Ecology
ISHIKAWA Satoshi	Conservation Ecology, Global Fisheries Science
TANAKA Hiroki	Environmental Hydrology

Visiting Reseach Fellows

EVANS, Tom	Geography
MERTZ, Mechtild	Wood Anatomy, Ethnobotany, East Asian Art History
NACHINSHONHOR, Urianhai	Plant Ecology

Senior Project Researchers

C-06	MINAMOTO Toshifumi	Molecular Ecology
C-07	FUJIWARA Junko	Cultural Anthropology
C-07	SAKAI Toru	Satellite Ecology
D-02	TSUJINO Riyou	Plant Ecology, Mammal Ecology
D-03	YASUTOMI Natsuko	Meterology, Climatology
R-03	CHENGZHI	Central Eurasian History
H-02	KURATA Takashi	Philosophy
H-03	MORI Wakaha	Linguistics, Sumerology
H-03	ONISHI Masayuki	Linguistic Typology
H-04	MAKIBAYASHI Keisuke	Archaeology
H-04	ZEBALLOS VELARDE, Carlos Renzo	Urban Environmental Planning
E-04	KUME Takashi	Isotopic Soil Hydrology
E-04	LEKPRICHAKUL, Thamana	Environmental & Health Economics

Project Researchers

C-05	NAKADA Satoshi	Physical Oceanography
C-05	TOYOTA Tomoyo	Development Economics
C-05	YAMAMOTO Keiko	Geodesy
C-06	ABE Akira	Sociology, Ethics
C-06	HONJO Mie	Microbial Ecology
C-06	ITAYAMA Tomoaki	Aquatic Eco-Engineering, Biophysics
C-06	TAKAHARA Teruhiko	Chemical Ecology
C-07	KIM, Heonsook	Atmospheric Modeling
C-07	KOBAYASHI Nakako	Forest Meteorology
C-08	HAYASHI Kengo	Southeast Aian Architectural History, Urban History
C-08	MATSUDA Hiroko	Southeast Aian Architectural History, Urban History
C-08	MEUTIA, Ami Aminah	Hydorology
D-02	ISHIMARU Eriko	Zooarchaeology, Isotope Archaeology
D-02	MURAKAMI Yumiko	Archaeology
D-02	SASAKI Naoko	Vegetation History
D-02	SEO Akihiro	Plant Taxonomy
D-03	HAMADA Atsushi	Meteorology
D-03	KOSAKA Yasuyuki	Ethnobotany
D-03	SAKAMOTO Ryota	Public Health
D-04	KISHIMOTO Keiko	Entomology
D-04	KOIZUMI Miyako	Cultural Anthropology
R-03	NARAMA Chiyuki	Physical Geography
R-03	WATANABE Mitsuko	Physical Geography
R-04	CAI, Guoxi	International Health & Public Health
R-04	FUKUSHI Yuki	Modern Chinese History
R-04	JIANG, Hongwei	Human Ecology
R-04	NISHIMOTO Futoshi	Social Anthropology
R-04	TOJO Bunpei	Area Studies
R-05	ISHIYAMA Shun	Cultural Anthropology
R-05	NAKAMURA Ryo	Cultural Anthropology
H-02	HOSOYA Leo Aoi	Archaeobotany, Ethnoarchaeology
H-02	KIMURA Emi	Japanese Culture History History of Tea Culture
H-02	TANAKA Katsunori	Plant Cell Genetics, Plant Breeding, Ethnobotany
H-03	TERAMURA Hirofumi	Archaeology
H-03	UESUGI Akinori	Archaeology
H-04	NAKAMURA Oki	Archaeology
E-04	ISHIMOTO Yudai	Ecological Anthropology
E-04	MIYAZAKI Hidetoshi	Soil Science

Project Research Associates

C-05 OKAMOTO Takako
C-06 IBUKI Naomi
C-07 SHIMIZU Hiromi
D-02 HOSOI Mayumi
D-03 KINJO Machiko
D-03 NOSE Mitsuhiro
D-03 TANAKA Aiko
D-04 KITAMURA Naoko
R-03 YODEN Makoto
R-05 ISHII Yume
R-05 JIA, Ruichen
R-05 MIZUMA Sakiko
H-02 MUTO Chiaki
H-02 OKITA Hiroko
H-03 ENDO Hitoshi
H-03 SONODA Takeru
H-04 KAMURA Nozomi
H-04 OTANI Megumi
H-04 UCHIKADO Megumi

Research Fellow, NIHU Center for Area Studies / RIHN Initiative for Chinese Environmental Issues (RIHN-China)

MATSUNAGA Kohei	Geography

Center for Coordination Promotion and Communication (CCPC)

DIRECTOR AKIMICHI Tomoya

Professors

AKIMICHI Tomoya	Ecological Anthropology, Ethno-biology
ABE Ken-ichi	Director, Division of Communication Integrated Area Study
NAKANO Takanori	Director, Division of Promotion Isotope Envinonmental Studies
WATANABE Tsugihiro	Director, Division of Coordination Irrigation Engineering

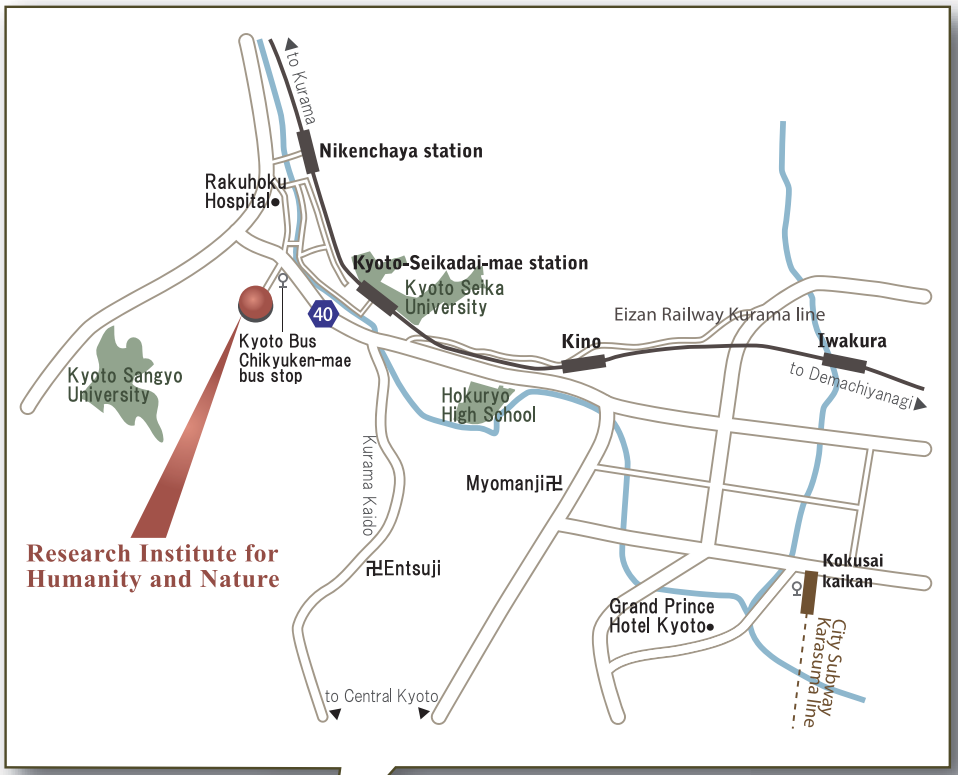
Associate Professor

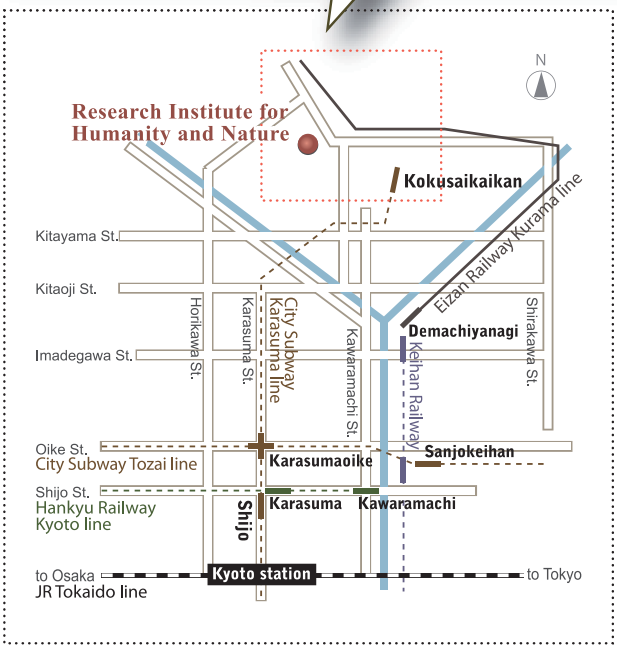
SEKINO Tatsuki	Information Science

Assistant Professors

KOHMATSU Yukihiro	Ecology Geography
NILES, Daniel	Geography
UYAR, Aysun	International Relations, International Political Economy
YONEZAWA Go	Geoinformatics

Access





By City Subway

From Kyoto Station, take the Karasuma Line to Kokusaikaikan Station (the last station), and transfer to Kyoto Bus as below.

By Kyoto Bus

From Kokusaikaikan Station, take bus No. 40 or 50 to Chikyuken-mae.
RIHN is at the base of the hill to your left.

By Eizan Railway

From Demachiyanagi Station in Kyoto City, take the Kurama line.
Exit at Nikenchaya Station. RIHN is a 10 minute walk to the South.

Cover Photo

A researcher on the lip of a glacial lake in the Talas range, western Kyrgyzstan
The lake has been expanding since the 1970s as the glacier has gradually warmed.
(Photo by NARAMA Chiyuki, Aug 2009)

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