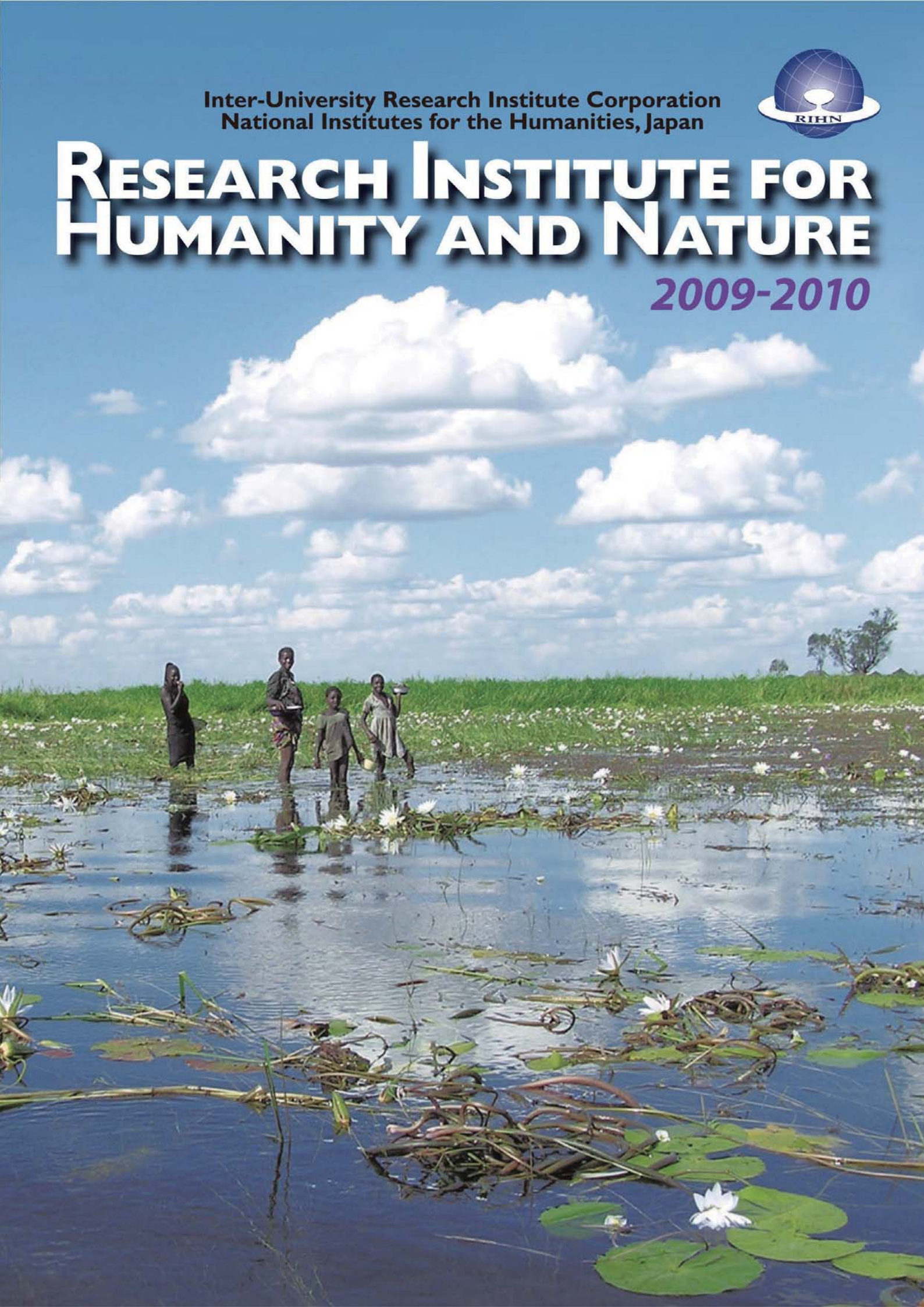
Inter-University Research Institute Corporation
National Institutes for the Humanities, Japan

Research Institute for Humanity and Nature

2009-2010



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Message from the Director-General

TACHIMOTO Narifumi

The Research Institute for Humanity and Nature (RIHN), located in Kyoto, Japan, was created by the Government of Japan in order "to promote integrated cooperative research toward the solution of global environmental problems". From its origins, RIHN was envisioned as an advanced research institute that would transcend the common divisions between the humanities and the social and natural sciences, and combine rigorous empirical study with profound conceptual engagement into the interactions between humanity and nature.

While humankind has experienced environmental change throughout history, contemporary societies have humanized the biosphere to an unprecedented degree. In observing contemporary environments we quickly confront the question of what to do: how should human societies act to improve human wellbeing and ecological integrity? At RIHN we believe that humanity must bring the full range of its intelligence to this task.

As a national research institute—since 2004 RIHN has been one of five institutes that together form the National Institutes for the Humanities—RIHN solicits, hosts and funds integrative, cooperative research projects that advance one of five principal RIHN research domains. Research projects typically last six years, involve scholars from a wide range of academic disciplines, and are supported by cooperative agreements with universities and institutes at home and abroad. Project proposals are solicited publically and are subjected to rigorous review by an external committee of national and international experts. This fixed-term project structure and internationalist orientation gives RIHN the capacity to bring an uncommon range of specialists, methodologies and resources to bear on a particular research question, while also advancing the field of global environmental studies.

This prospectus introduces the conceptual approach, guiding principles, and structure of RIHN research. Each of the 14 Full Research and one Pre-Research projects and five Feasibility Studies currently underway, as well as the ten projects already concluded, is introduced according to the research domain to which it belongs. I hope the reader is impressed at the breadth and quality of RIHN research, and stimulated by RIHN's approach to study of humanity and nature.

It is my pleasure to serve as Director-General of this innovative institute, to work alongside so many talented researchers, and to contribute to our understanding of the interactions between nature and humanity in this critical period of social and ecological change. I invite your warm understanding and support, as well as your critical assessments, of this prospectus and all RIHN activities.

Founding Mission, Goals and Philosophy

RIHN solicits, hosts and funds six-year research projects on key of areas of interaction between humanity and nature. RIHN was established in April 2001 as an inter-university research institute by Japan's Ministry of Education, Culture, Sports, Science, and Technology (MEXT). It was incorporated as one of five member institutes of the National Institutes for the Humanities in 2004. It moved to its present location on the northern outskirts of Kyoto City in 2006. It is now the primary national research institute in Japan devoted to combined empirical and conceptual study of human-environmental interactions.

Contemporary environmental problems transcend academic disciplines just as they do individual places. Until recently, however, much environmental research has been undertaken by researchers operating largely within separate fields of natural science. RIHN's mission is to conduct integrative and cooperative research that examines and clarifies the interactions between human and biophysical systems, to identify the key aspects and processes of environmental change and to suggest how harmonious human-environmental relations can be established or enhanced.

At RIHN we believe that environmental problems concern humanity and all living organisms that inhabit the earth at present, or will do so in the future. We strive for *comprehensive* research: research that integrates academic disciplines so as to develop understanding of a phenomenon in its entirety.

To this end, RIHN research projects fall within one of five research domains—circulation, diversity, resources, ecohistory and ecosophy—each of which is described below. While specific research projects vary greatly, all projects use multiple theoretical approaches and methodologies in their investigations, and are framed by three principal interconnected dimensions of human-environmental interaction.

Villagers remove the thatch top of a dried brick granary before storing the new harvest of white sorghum. The Sahel, Burkina Faso. (Photo: ISHIYAMA Shun)

The first dimension of interaction between humanity and nature refers to the ways in which people understand and act in everyday environments; it involves humankind's immersion within, and experience of, the material and cultural flows that sustain daily life. Included in this dimension is the physical and perceptual experience of the human body in, as well as impacts of human lifestyles on, these flows.

A second dimension of human-environmental interaction has to do with environmental change that is of concern to whole societies, such as global warming, agricultural failure, loss of biodiversity, resource depletion or pollution. In such matters it is important to clarify the relevant social (political and economic) structures associated with specific human-environmental conditions or processes.

A third dimension of human-environmental interaction involves human understanding of the biogeochemical processes that constitute the biosphere. Modern societies depend on the formalized knowledge of the natural sciences, and the manner in which this knowledge is understood and communicated within a society also is of great significance to the first and second dimensions of human-environmental experience.

Taken together, the three dimensions constitute a field of studies that can be called global environmental studies. This is not a systematized discipline but a field of knowledge that should be defined and developed in relation to contemporary environmental and social change. The aim of this field of knowledge should be to enable humankind to better imagine and realize future social-ecological potential. Global environmental studies should thus provide the foundation for specific environmental sciences, as it is broadly addressed to the study of humanity in the midst of nature.

Yak graze on gentle slopes beneath the sacred peak Amne Machin (6282 m). Amdo, Qinghai, China. (Photo: KOSAKA Yasuyuki)

Features of RIHN

Integration

Integration entails the assimilation of multiple knowledge traditions into a single framework. Integration thus allows more accurate understanding of the true dynamism of earth phenomena; it implies that phenomena under examination are themselves multidimensional, and are best understood and described as such. RIHN research investigates global environmental problems such as climate warming, rising sea levels and loss of biodiversity at a regional scale—a scale at which it is possible to resolve both macro-scale and micro-scale processes. In order to synthesize broad trends, yet provide nuanced description that enables positive action, field surveys and data collection are undertaken within integrated research frameworks. Research into questions of human lifestyle and culture is naturally based in the methods and theories of the humanities and social sciences. The natural sciences improve human understanding of the biophysical world; humankind also improves its self-awareness through study of the natural world.

International Networking

Large-scale, multidimensional research projects depend on collaboration with local communities, experts and academics. Such collaboration promotes international scientific fellowship and contributes to improvements in overseas research facilities, enhanced public health campaigns, or increased public discussion of important human-ecological issues. The effect of international networking can also be gauged through the many multi-authored, international publications based on RIHN research collaborations. Foreign research fellows also enrich the RIHN research community by presenting their research in formal and informal settings while visiting our facilities, or by participating in international symposia.

Leadership

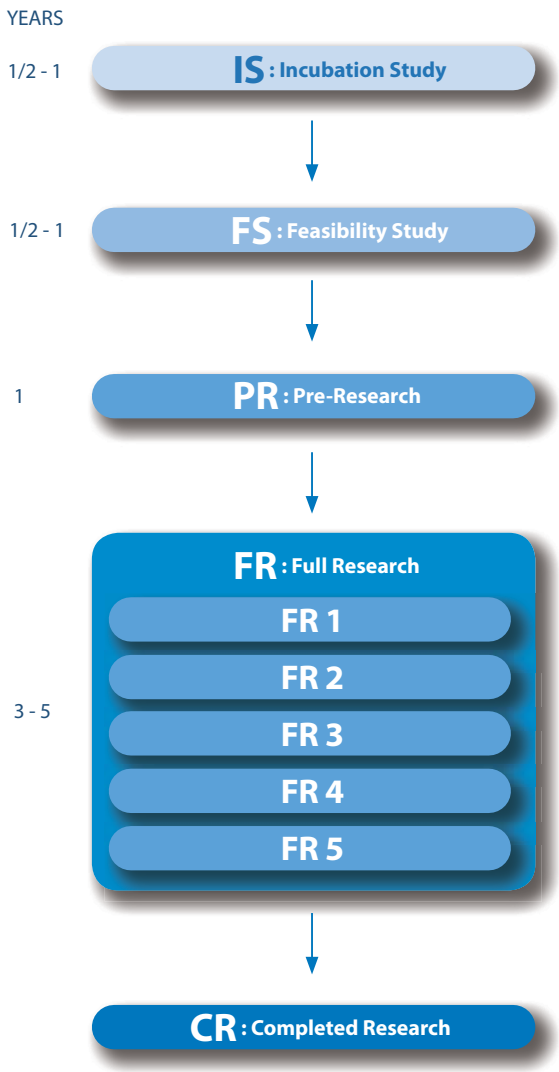
The overall RIHN research trajectory is outlined by the Director-General and Deputy Director-Generals in discussion with the Program Directors of the five research domains. In addition, the research projects are at the center of RIHN activity, and project leaders are deeply involved in determining the character of the institute: their critical assessment of proposed projects and institute structure are essential to RIHN's mission. The experience and suggestions of post-doctoral project researchers provides another perspective on the workings of the institute, as these researchers assume professorships they carry their RIHN experience with them and become part of the RIHN legacy.

Fluidity

In order to offer the opportunity for extended research of such broad scope, RIHN must operate at a slight remove from the normal academic setting and structure in Japan. All professors, associate professors and assistant professors therefore work through fixed-term appointments, as do project researchers (mostly post-doctoral scholars) and others involved in project support. In contrast to the typical pattern of academic advancement in Japan, in which an individual may spend an entire career at one institution, the RIHN structure encourages increased personal and intellectual exchange within Japanese academia.

Research Project System

RIHN operates a system of fixed-term research projects. Projects proposals are solicited publically. Initial evaluation of all proposed studies is undertaken by the Project Review Task Committee (PRT). Proposals at this point are largely exploratory; if a proposal is approved it is granted seed money and advances as an **Incubation Study (IS)**, a stage lasting from six months to one year, in which an applicant is invited to develop a full research proposal. If the IS proposal is approved by the PRT and interviews with institute staff, the project moves to the stage of **Feasibility Study (FS)**. At this stage the project leader undertakes preparatory research, and defines research sites and design in order to submit a fully developed research proposal. The full research proposal is then evaluated by the external Project Evaluation Committee (PEC) and, if approved by the PEC, confirmed by the RIHN Board of Advisors. With the Board's approval, the project is allowed a transitional **Pre-Research (PR)** period of about one year, in which a project leader formally assembles the research team, establishes MoUs necessary for collaboration with other institutions, and makes other practical arrangements to enable **Full Research (FR)**.



Full Research, which typically involves a research team on site at RIHN and concurrent activity with collaborators overseas, several periods of field study, workshops and presentations, and outreach or communication to relevant communities, lasts from three to five years. FR projects are externally evaluated at several stages, including: on the completion of their second year; on the completion of their penultimate year; and on their conclusion.

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. Publications based on RIHN research may follow for several years after project completion; at RIHN, however, each project forms part of the institute's heritage.

Research Domains

Research at RIHN is organized through five research domains. Each of the first three domains is defined by a "root metaphor," a metaphor already widely shared across disciplines, and therefore understood as a key area for conceptualization of human-environmental interactions. The latter two domains take up the same phenomena in an explicitly temporal or spatial context.

Circulation

Projects in this domain trace human impact on the global cycles of nutrients and water that create and define the biosphere. As these cycles are characterized by great complexity and dynamism, research projects in this domain typically entail several data surveys designed to indicate cause-and-effect linkages across spatial scales.

Diversity

Projects in this domain address global environmental problems arising from or associated with the loss of diversity, whether biological (including genetic diversity and availability of niches or habitats), or cultural (including diversity of languages, social structures, religions and world-views).

Resources

Projects in this domain investigate the features of the planet that humankind finds to be of immediate utility: those plants, animals, and materials that humankind uses to satisfy its material and cultural needs, and whose use in turn forms the cultural landscapes of a time and place.

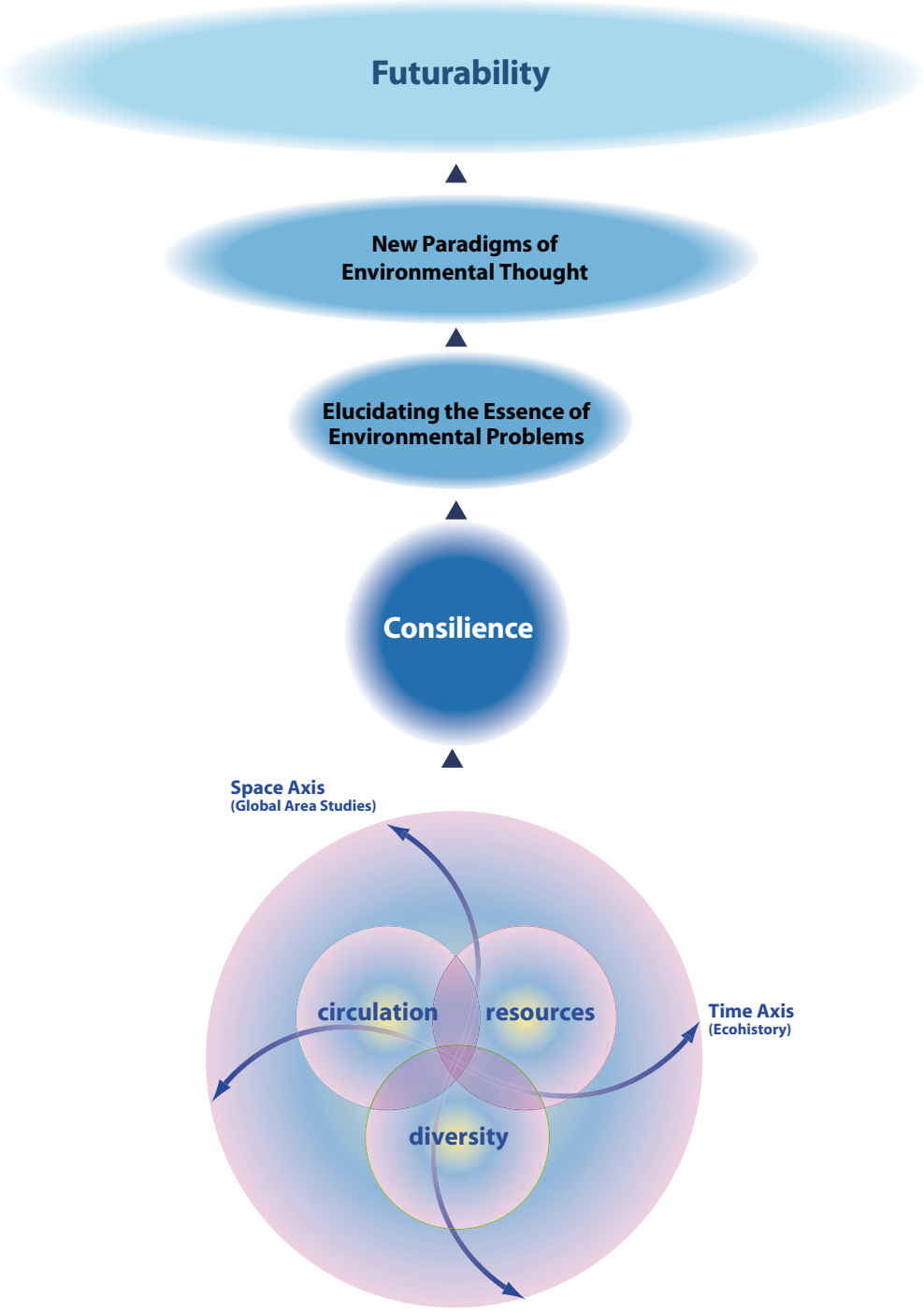
Ecohistory

Projects in this domain take a historical approach to circulation, diversity, or resource questions. There is particular emphasis on using new technologies to examine ecological dynamics involved in past civilizational rise and decline, and so to advance empirical and theoretical understanding of human-environmental dynamics throughout human history.

Ecosophy (Global Area Studies)

Projects in this domain examine the manner in which contemporary environmental problems both contribute to and result from global phenomena and processes. Description is focused on the specific social and environmental contexts in which environmental problems are found, their linkages to social and material phenomena in other places, and the conceptual models used to describe such interconnection.

Consilience and Futurability



If our problem is that of humanity in the midst of nature, empirical understandings of environmental change must be brought directly into dialogue with human experience as inhabitants of, and agents in, perpetually changing environments. *Consilience*, E.O. Wilson's term for a "jumping together of knowledge…across disciplines to create a common groundwork for explanation" can give greater insight into the sources of environmental problems and guide human attempts to address them.

At RIHN we seek transformations in the interactions between humanity and nature. Rather than sustainability, consilience can support *futurability*, a translation of a Japanese term that combines the ideographs for "future" and "potential," and so expresses a wider range of possibility in future development.

The Center for Coordination, Promotion and Communication

The Center for Coordination, Promotion and Communication (CCPC) was established on 1 April, 2008 in order to support RIHN's research projects, manage the institute's facilities and ensure the coherence of the institute's research trajectory. It has three divisions.

Division of Coordination

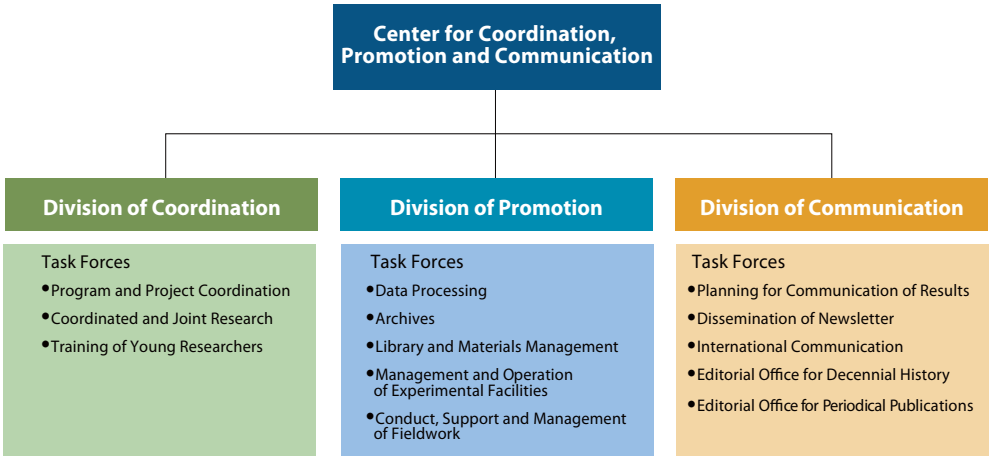
- Conducts analysis of relevant research fields in order to guide the long-term research trajectory of the institute;
- Facilitates collaborative research agreements nationally and internationally;
- Coordinates the RIHN project review process;
- Promotes professional advancement of RIHN researchers;
- Contributes to post-secondary Environmental Studies curriculum development.

Division of Promotion

- Manages and maintains the 18 laboratories;
- Manages and maintains the RIHN library and other archival facilities;
- Maintains protocols for fieldwork and equipment safety.

Division of Communication

- Works in multiple media to improve communication of institute events and project research to both specialist and general audiences;
- Organizes RIHN's annual international symposium;
- Develops collaboration between RIHN and national and international research institutes and communities;
- Manages periodical publications;
- Composes, edits, publishes RIHN documents and explanatory materials as needed.



Definition

The CCPC describes and establishes the field of global environmental studies. Through the CCPC, RIHN hosts lectures and seminars designed to elaborate the philosophical core of this new field. At the same time, the CCPC monitors progress of the traditional fields of environmental study and that of other integrative or multidisciplinary institutions in order to define RIHN's major research emphases. This dialogue between unique core research values and widely recognized research needs is intended to provide a stimulating institutional home for unusual synthetic research and enable incisive and flexible solutions to pressing social-environmental problems.

Networking

The CCPC promotes liaison and collaboration with research institutes and organizations at home and abroad. Much collaboration is project-based, and has established close relationships between scholars in Japan and those in numerous institutes and universities around the world (please see page 59). Additionally, as an inter-university institute, the CCPC is forming an electronic network intended to facilitate environmental research in Japan.

Communication

The CCPC publishes occasional research papers, reports, promotional materials and books. Currently in preparation is "The Encyclopedia of Earth Environments" (and its companion handbook), a comprehensive volume of contemporary global environmental conditions and change, the first such volume to be published in Japanese.

RIHN hosts a large number of fora and public seminars each year (please see pages 57-58) which are open to the interested public. In early 2010, RIHN will collaborate with the Kyoto City and Prefectural governments and the Kyoto Chamber of Commerce and Industry to observe the fifth anniversary of the Kyoto Protocol, the first international agreement to limit emissions of greenhouse gasses associated with contemporary climate change. The Earth Forum Kyoto will take place on 13-14 Feburary, 2010.

Education

A further objective of the CCPC is to develop the field of environmental studies in Japanese secondary and post-secondary education. Aside from formal curriculum development and teacher training programs, primary and secondary school students are invited to tour our site and facilities.

RIHN Facility Tour by Kyoto City Ichiharano Elementary School (December, 2008)

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 changes in the biogeochemical circulations that sustain the biosphere are happening suddenly; they may be irreversible, though this is difficult to predict, as it depends on human action, thought 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-03	**FUKUSHIMA Yoshihiro**	Recent Rapid Change of Water Circulation in the Yellow River and its Effects on Environment
Full Research	**Leader**	**Title**
C-04	**SHIRAIWA Takayuki**	Human Activities in Northeastern Asia and their Impact on Biological Productivity in the North Pacific Ocean
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

Recent Rapid Change of Water Circulation in the Yellow River and its Effects on Environment

A complex set of interacting factors, including natural climate variation, human-caused global warming and changes in land-use, contributed to the 1997 drought crisis in the Yellow River basin. This project evaluated how land use changes affect the water cycle throughout the Yellow River drainage basin and the effect of decreasing groundwater storage on marine environments. This study may prove to be at the forefront of ecological studies of densely-populated coastal zones. In studying the Bohai and Yellow Seas we may also be able to evaluate the effects of Yellow River change on marine products in the Sea of Japan.

Project Leader: **FUKUSHIMA Yoshihiro** Tottori University of Environmental Studies (RIHN until March 2008)

Outcomes

By implementing our Yellow River Study Project (hereafter referred to as YRiS), we were able to invite young and excellent researchers from Chinese universities and institutes. We were also able to obtain good results from the exchange of information between Japanese and Chinese scientists, and from our analysis based on observations, investigations and inspections in the period of 2003-2007.

We found that reforestation works undertaken by the Institute for Soil and Water Conservation on the Loess Plateau, which occupies almost 40% of the Yellow River Basin, have increased evapo-transpiration and consequently decreased the volume of river water by 15 billion m^3. The Chinese Yellow River Conservancy Commission was previously unaware of the link between decreasing river flow and upstream reforestation. Furthermore, regulation governing use of the Yellow River water by surrounding provinces gave each province independent authority. After the severe exsiccation in the Yellow River basin, an improved "water law" was established in 2002. It granted the central government complete authority over river water use and the ability to penalize over-use. Fortunately, there has been a rather large amount of precipitation on the North China Plain since 2000, so there were no instances of the unfair use of river water.

Reforestation has decreased erosion from the Loess Plateau, but the downstream riverbed is still continuing to increase or to maintain the same level despite the completion of the Xiaolandi Dam in 1997 and its important function of flushing out sediment on the riverbed by instigating small flood events. This means that there is increased danger of a flood disaster in an area in which nearly 100 million people live.

The environment of the Bohai Sea has been changed by the shortage of inflow water from the Yellow River. Firstly, the critical condition for primary bio-production has changed from Nitrogen to Phosphorus. Secondly, the exchange of fresh and sea water has decreased remarkably. Thirdly, chlorophyll-a has decreased with the decrease of river water. These findings suggest that primary bio-productivity in the Bohai Sea is decreasing.

How changes in land use affect the atmosphere above the Loess Plateau is still being analyzed. Topographic conditions and the strength of the Asia Monsoon seem to have a larger effect on the atmosphere than do land surface conditions.

It is estimated that almost 10 billion m^3 of water is used in upstream irrigation districts such as Qintongxia and Hetao, an amount that has likely remained constant between 1960 and 2000.

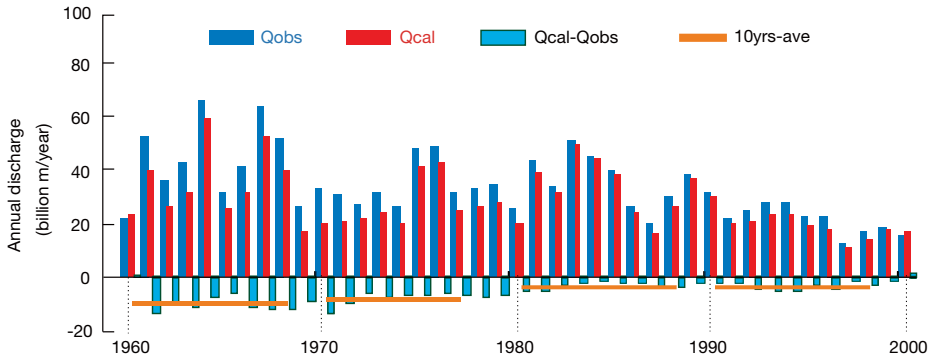
Plans for water supply using three routes from the Chang Jiang River to Beijing, Tianjin and the North China Plain may be completed soon. Whether or not water pollution, which is now a serious concern, will be resolved by this project will become a principal issue in the future because of the large cost of addressing such pollution.

Accounts of our study can be found in the YRiS Newsletters 1-8, published from September 1, 2003 to January 31, 2008 (http://www.chikyu.ac.jp/yris/newsletters.html).

Future Issues

Increased demand for food associated with present growth in the human population may lead to expansion of irrigated agricultural fields into areas where climate conditions are rather dry. Efforts to increase the efficiency of water use would appear to be too late to improve agricultural water-use given the rather small amounts of precipitation, and continued decreases in river water volume is likely to lead to salt accumulation in the Yellow River Basin. The supply of water from the Chang Jiang River to Beijing, Tianjin and the North China Plain is to be realized soon. Still many problems can be anticipated because the pollution of the Yellow River water remains unresolved; pollution in the Bohai Sea is likely to worsen.

Result of model simulation for the Loess Plateau area



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

This project investigates qualitative and quantitative dimensions of iron circulation in heterogeneous human and natural ecological zones. It examines how dissolved iron from forests and wetlands is transported by the Amur River to the Sea of Okhotsk, and its role in supporting marine primary productivity. We also examine the effect of human activities in the Amur basin on these material linkages, and stimulate policymakers to take such large-scale and transboundary environmental circulations into account.

Project Leader
SHIRAIWA Takayuki
RIHN

Takayuki SHIRAIWA is Associate Professor at RIHN. He received his MA in Geomorphology (1989) and his Ph.D. in Glaciology (1993) at Hokkaido University. He was Research Associate (1992-2004) and Associate Professor (2004-2005) at the Institute of Low Temperature Science, Hokkaido University. He was in Antarctica (1993-1995) for field work, and was a visiting scientist at the Swiss Federal Institute of Technology (ETH; 2000-2001).

Core Members

HANAMATSU Yasunori	RIHN
HARUYAMA Shigeko	Graduate School / Faculty of Bioresources, Mie University
KAKIZAWA Hiroaki	Graduate School of Agriculture, Hokkaido University
KISHI Michio	Graduate School of Fisheries Sciences, Hokkaido University
KUMA Kenshi	Graduate School of Fisheries Sciences, Hokkaido University
KONDOH Akihiko	Center for Environmental Remote Sensing, Chiba University
MATOBA Sumito	Institute of Low Temperature Science, Hokkaido University
MATSUDA Hiroyuki	Graduate School of Environment and Information Sciences, Yokohama National University
NAGAO Seiya	Institute of Nature and Environmental Technology, Kanazawa University
NAKATSUKA Takeshi	Graduate School of Environmental Studies, Nagoya University
OHSHIMA Keiichiro	Institute of Low Temperature Science, Hokkaido University
ONISHI Takeo	RIHN
SHIBATA Hideaki	Field Science Center for Northern Biosphere, Hokkaido University
UEMATSU Mitsuo	Ocean Research Institute, University of Tokyo
YOH Muneoki	Institute of Symbiotic Science and Technology, Tokyo University of Agriculture and Technology

Background

Japanese fisherfolk have long held the view that marine productivity is linked to forest conditions; their word for this linkage is *uotsukirin,* literally translated as "fish breeding forest." This project observes a similar linkage, but on a much larger scale. We use the term *kyodai uotsukirin,* or "giant fish-breeding forest" (GFBF) to indicate continental-scale ecological linkage of the Amur River basin and the Sea of Okhotsk and Oyashio area.

The Amur River basin contains extensive wetland and forest; both are important sources of dissolved iron which, when transported to the ocean, is an essential element in marine primary productivity. Dissolved iron is transported by thermohaline circulation—circulation driven by differences in water density caused by freezing seawater—in the Sea of Okhotsk. Aided by the East Sakhaline Current, dissolved iron is distributed into the Oyashio region, where it supports the fertile fisheries of the North Pacific Ocean. Our observations thus confirm that ocean ecological conditions are affected by the land surfaces in the Amur River basin.

The Amur River basin includes territories in Russia, China and Mongolia. More than 100 million people live in the basin and their livelihoods depend on agriculture, forestry and industry. Such activities impact wetlands and forests, and so the flux of dissolved iron, which in turn affects primary production in the ocean. In quantifying our description of dissolved iron transport and measuring the human impact on this process, we hope to improve coordination of the overlapping political, economic, and ecological systems that together affect the giant fish-breeding forest.

Figure 1 **Transport of iron from the Amur River to the Oyashio region**

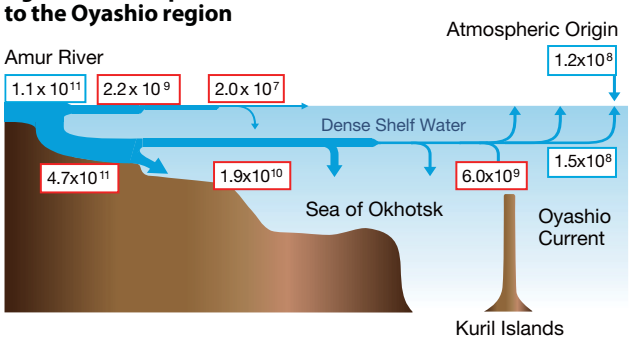
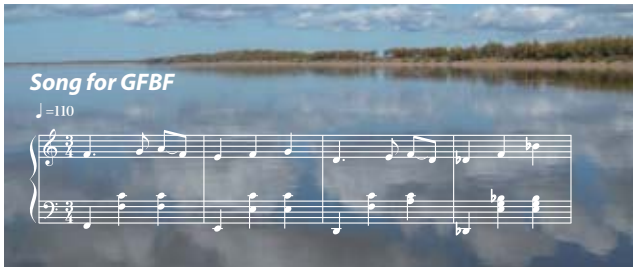


Photo 1 **A photo of the middle part of the Amur River, with musical score of the tune "The giant fish-breeding forest"**



Major results

The average annual flux of total and dissolved iron was estimated in various parts of the GFBF; these measurements confirmed the continuity of iron transport from land surfaces of the Amur River basin to surface water of the Oyashio region (Figure 1). $1.1 \pm 0.7 \times 10^{11}$ g of dissolved iron is transported to the estuarial area from the Amur River annually. Approximately 95% of the dissolved iron coagulates in the Amur–Liman estuarial area and the Sakhalin Bay. There are two pathways of iron transport from the estuarial area to the Oyashio region: 1) surface transport of total iron; and 2) transport with the dense shelf water (DSW). Both flows support primary productivity; the former in the Sea of Okhotsk and the latter in the Oyashio region. We estimate that approximately $1.2–1.5 \times 10^{8}$ g/yr of total iron was provided from the atmosphere and DSW in the Oyashio region. Among the iron used for the spring

Figure 2 **Estimated timber exports from the Russian Far East in 2005**

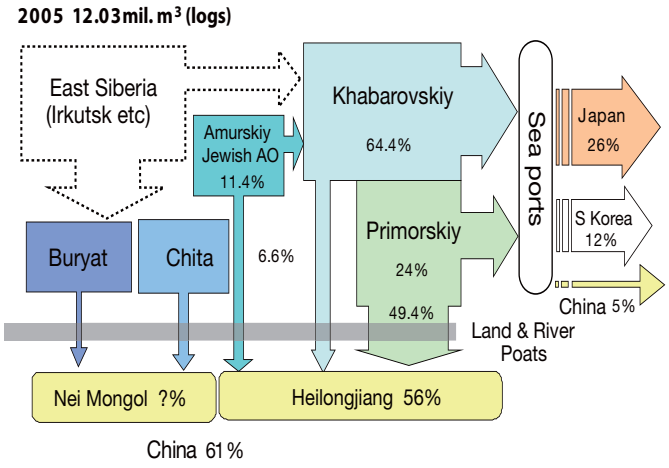


Figure 3a **Time series of dissolved iron concentration in the Naoli River.**

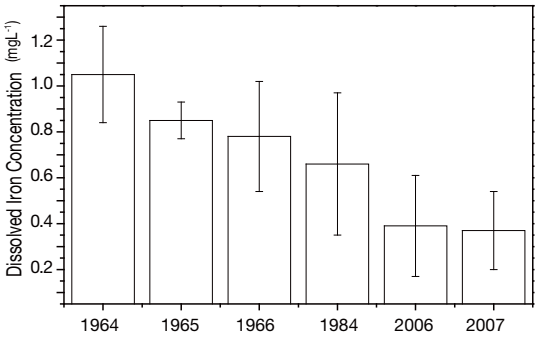


Figure 3b **Time-series of dissolved iron concentrations at Khabarovsk and Blagoveshchensk**

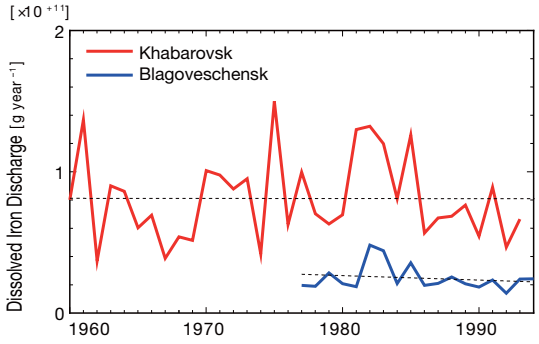


Figure 4 **Structure of the project**

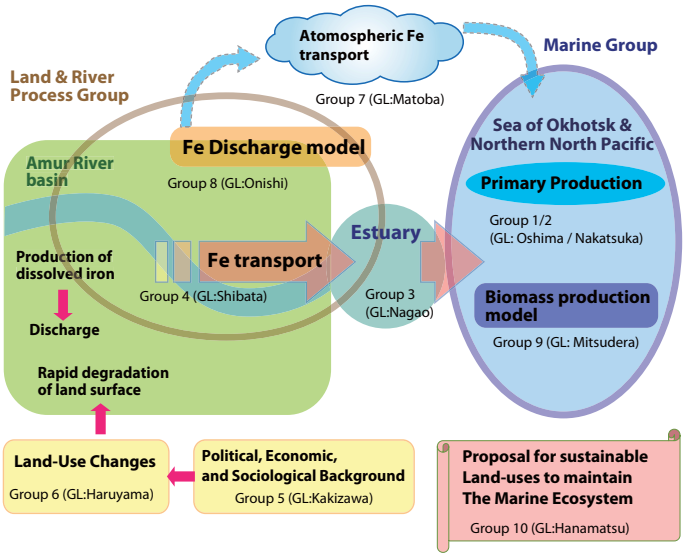
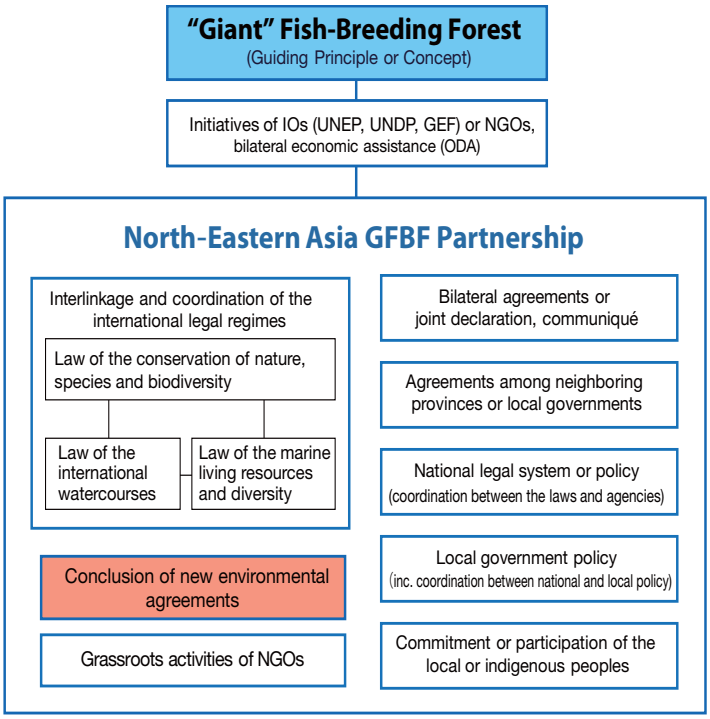


Figure 5 **Structure of Northeastern Asia GFBF Partnership**



bloom in the Oyashio region, 40% was provided by the DSW and 60% was recycled through microbial processes.

The impact of land-use changes on the concentration of dissolved iron were clear in the Sanjiang plain, where time series measurements of iron concentration in a tributary river show a decrease in iron concentration since 1964, as the area of agricultural fields expanded (Figure 3a). It was, however, difficult to find evidence of a decrease in the iron concentration in the main channel of the Amur River (Figure 3b). Time series data of iron concentration at Khabarovsk indicate that iron concentration has varied widely in the past, with no discernable long-term trend. The discrepancy will be studied intensively in 2009.

Deforestation, forest fires and poor management systems are degrading forests in the Russian Far East (Figure 2). After rapid expansion in the latter half of the 20th century, agricultural conversions on the Chinese side of the Amur River basin has stabilized, but irrigation has rapidly reducing the groundwater table of the Sanjiang plain.

Final goals of the project in 2009

On the basis of our description of the Amur River basin, we have: (1) devoted our efforts to developing the agenda for the conservation of the GFBF system; (2) realized that such an agenda should combine an ideal or general framework that suggests an international regulatory system along with a more pragmatic framework that reflects the political and economic situations in each country (Figure 5); and (3) formed a scientific board, the Amur-Okhotsk Consortium, to further discuss the futurability of the Amur-Okhotsk-Oyashio GFBF system.

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 primary goals of this project are to evaluate the relationships between urban development and subsurface environmental problems such as extreme subsidence, groundwater contamination, and thermal anomalies associated with the urban "heat island" effect, and to provide ecommendations of how these impacts can be addressed or voided in the seven Asian coastal cities under study.

Project Leader
TANIGUCHI Makoto
RIHN

Prof. Taniguchi earned a 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
FUKUDA Yoichi	Graduate School of Science, Kyoto University
SHIMADA Jun	Faculty of Science, Kumamoto University
NAKANO Takanori	RIHN
ENDO Takahiro	RIHN
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 objectives

Most global environmental studies have focused on above ground environments. Subsurface environments, though they are involved in biogeochemical circulations and are critical to overall environmental quality, have been largely ignored, perhaps because of their invisibility and difficulty of evaluation. Subsurface environmental problems such as subsidence and groundwater contamination are repeatedly manifest in major Asian cities, though there is often a time lag between the "stage" of urban development and recognition of subsurface impacts. It may be possible to assess and improve future urban environments through understanding of urban areas' historical impact on surface environments.

This project investigates subsurface environmental conditions in Tokyo, Osaka, Bangkok, Jakarta, Seoul, Taipei and Manila. The relationships between these cities' historical development and their impact on subsurface environments will be assessed by socio-economical analyses and historical records. Hydrogeochemical and in-situ/satellite-GRACE gravity data will describe groundwater flow systems and changes in groundwater

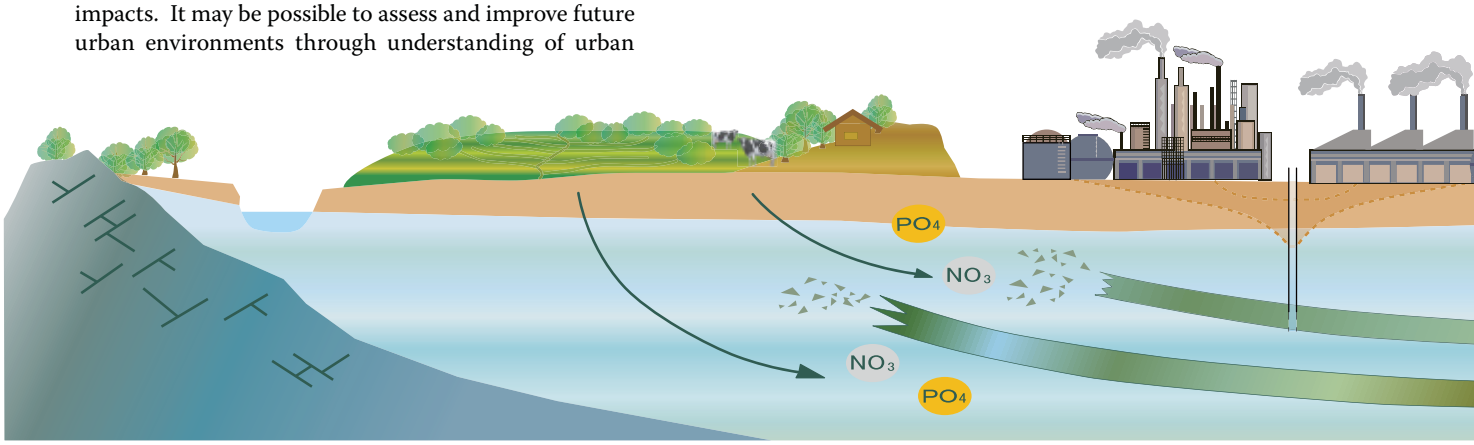


Figure 1 **Research Structure**

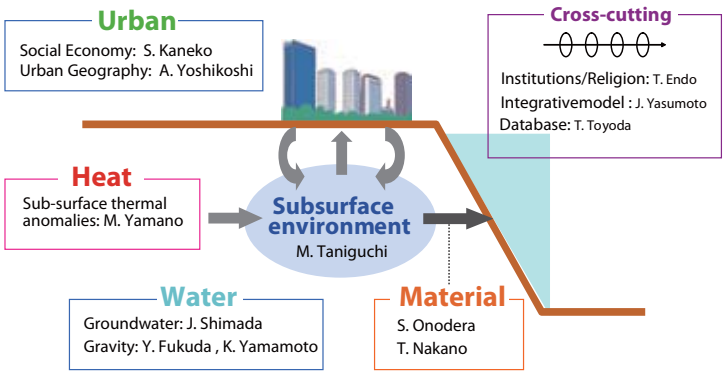
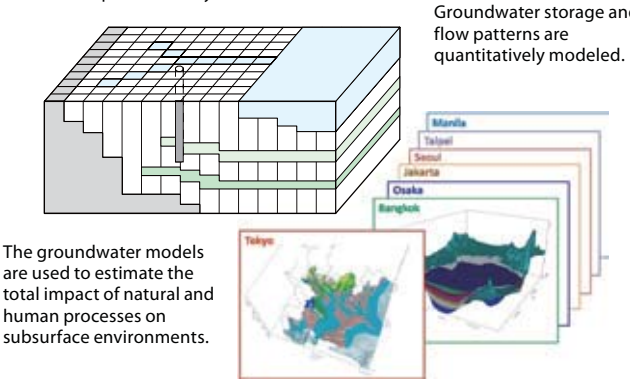


Figure 2 **Cross-cutting analysis: Integrated models**

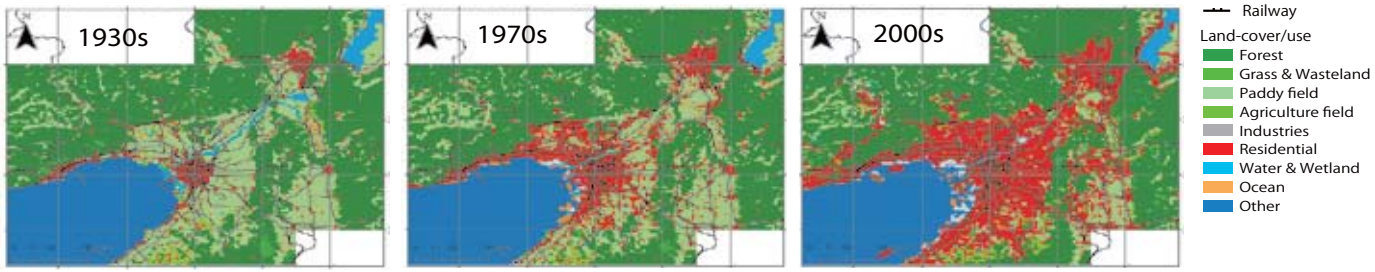
The model working group (MWG) integrates observed data and constructs a framework that allows comparative analysis of the seven cities.

Groundwater storage and flow patterns are quantitatively modeled.



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

Figure 3 **Cross-cutting analysis : GIS working group**



Changes in land use/cover in Osaka. Residential areas have expanded along the railway corridors.

storage, 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 their 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 2008

Subsurface environment in targeted cities have been surveyed, and monitoring of subsurface environments in Bangkok, Jakarta, Manila, Seoul, Taipei, Tokyo and Osaka is ongoing.

Natural and social data have been assessed in each city, and compiled into a GIS database. Based on this data, 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 co-organized the international symposium, *HydroChange2008*, based on which the book "*From Headwater to the Ocean*" was published by CRC press (2008).

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

Interim results of the project were published as a special issue of the journal Science of the Total Environment (STOTEN vol. 407[9], 2009), which included an overview of the project and 15 original papers.

Future works and challenges

Analysis of water use and quality in relation to public/private water rights and the distinct regulatory histories of surface and groundwater in the various cities.

The Model Working Group has been formed in order to integrate the impacts of economics, water resources, environmental loads, and policy on subsurface environments.

Land use/cover data taken at three dates (1930s, 1970s and 2000s) in the study cities will be used to evaluate the rate of groundwater recharge, thermal storage in aquifer, and subsurface contamination.

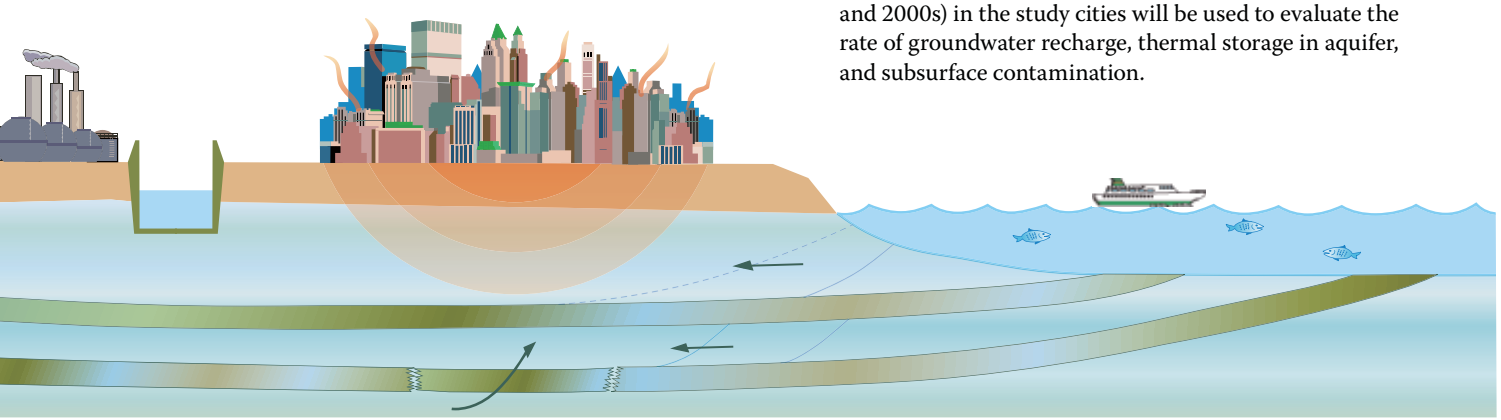
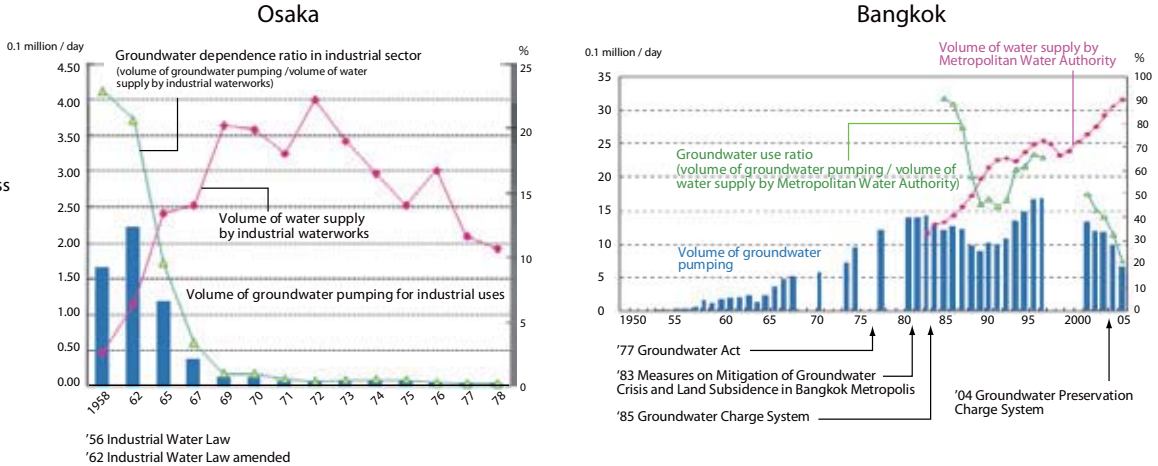


Figure 4
Cross-cutting themes: Legal institutions

This figure demonstrates that appropriate regulation and balanced use of surface- and ground-water can reduce inefficient use. In both Osaka and Bangkok, facilitating access to abundant surface water reduced use of groundwater.



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 increasingly 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 as a model of pathogen-human interactions. Based on experiments and observations, we will suggest ways to prevent or minimize the emergence and spread of infectious diseases.

Project Leader
KAWABATA Zen' ichiro
RIHN

Zen'ichiro Kawabata is Professor at RIHN. He was previously Professor at Kyoto University and Ehime University, and Assistant Professor at Tohoku University. His research field is microbial ecology and aquatic ecosystem ecology.

Core Members

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ITAYAMA Tomoaki	Research Institute of Environmental Eco-Technology
KAKEHASHI Masayuki	Graduate School of Health Sciences, Hiroshima University
KONG Hainan	School of Environmental Science and Engineering, Shanghai Jiao Tong University, China
MATSUI Kazuaki	Department of Civil and Environmental Engineering, Kinki University
MATSUOKA Masatomi	Asahi Fishery Cooperative, Shiga
MINAMOTO Toshifumi	RIHN
NASU Masao	Environmental Science and Microbiology, Graduate School of Pharmaceutical Sciences, Osaka University
OKUDA Noboru	Center for Ecological Research, Kyoto University
OMORI Koji	Center for Marine Environmental Studies, Ehime University
WU Deyi	School of Environmental Science and Engineering, Shanghai Jiao Tong University, China

Background

The spread of emerging infectious diseases is becoming a serious global environmental problem. This study investigates the emergence and spread of Koi Herpes Virus (KHV), a pathogen responsible for episodic mass mortality in common carp (*Cyprinus carpio carpio*) since the late 1990s (Figure 1). The common carp is the original domesticated aquaculture species and is an important source of protein today.

The study has four main objectives: (1) to assess whether there is a positive relationships between human-caused environmental changes and the emergence of KHV disease; (2) to describe recent anthropogenic changes to freshwater ecosystems associated with carp behavior; (3) to investigate the ecological conditions that can be associated with emergence and spread of KHV disease; (4) to evaluate the impacts of KHV disease on the local ecosystem services on which people depend, the social and cultural attempts to address KHV disease, and their environmental significance (Figure 2).

The pattern of environmental change in an ecosystem and emergence of a new pathogen affecting both non-human and human species can be seen as a model of pathogen-human interactions. Because both the disease and the selected study sites allow us to conduct experiments to verify patterns of interaction, a further objective of the research is to suggest a general model of disease emergence and spread (Figure 3).

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 environmental factors involved in KHV and carp biology, so describing the environmental factors involved in KHV infection and communication.

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 describes the KHV disease-associated losses, including in ecosystem services or other economic and cultural aspects, as well as social attempts to redress those losses.

Figure 1 **Carp killed by KHV disease**

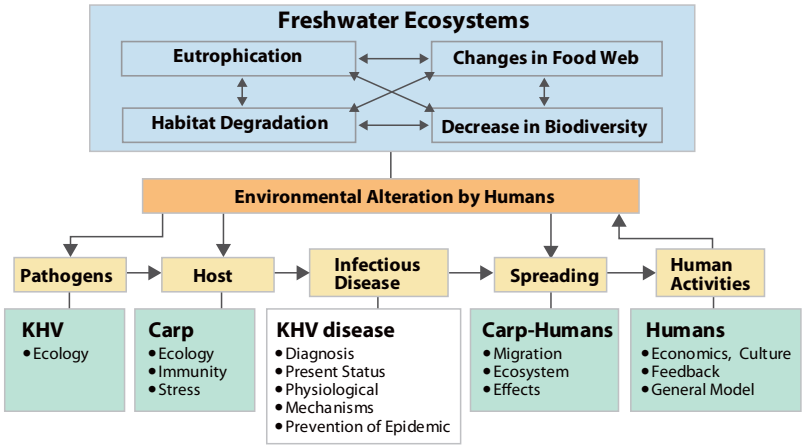


Figure 2 **Case studies: Interactions between KHV disease and humans**

(: research fields with many unrevealed subjects)

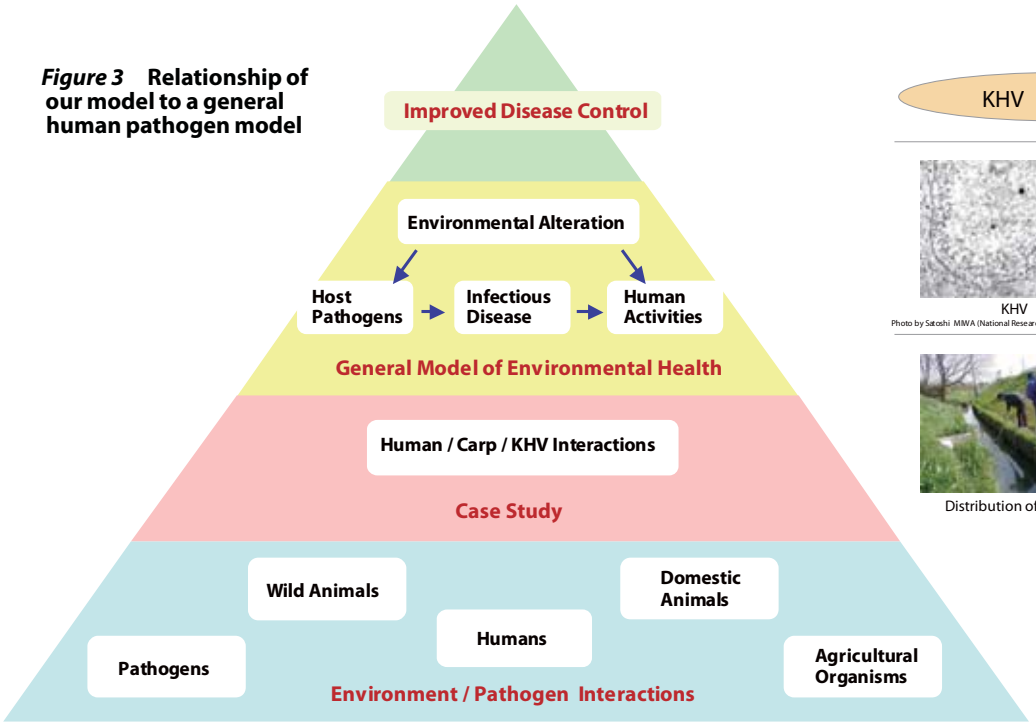


Figure 3 **Relationship of our model to a general human pathogen model**

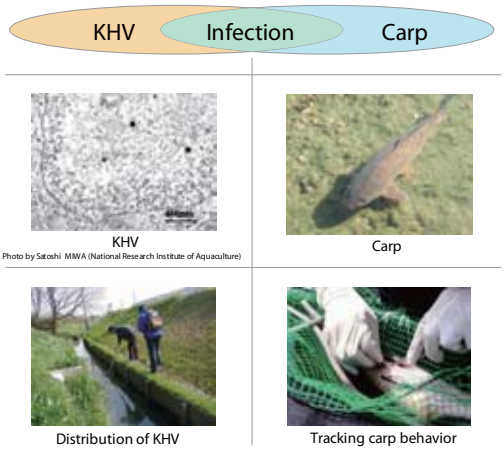


Figure 4
Survey of distribution of KHV and behavioral range of carp to predict the outbreak of infectious diseases.

Carp dishes
Carp is an important food and element of human food culture

The Feedback Group examines the effects of KHV disease-caused losses on subsequent human-driven environmental change.

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

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

Results to date

1) We surveyed the topology, bottom quality, and water quality of six satellite lakes of Lake Biwa that seemed to be important habitat for common carp. We found heterogeneous environments in these lakes. It was revealed that spatial and temporal changes in water temperature in the human-degraded littoral zone are more homogenous than those in natural zones. This has the potential to affect carp behavior, immunity to KHV and stress of carp. A mathematical model, based on the hypothesis that common carp migrate between the satellite lakes seeking better habitats, predicted that lower connectivity among satellite lakes increases the carp stress level and accelerate the spread of KHV disease.
2) With Chinese collaborators we conducted a pre-survey on spatial and temporal changes in water temperature in Lake Erhai, China.
3) We invented a method to detect KHV in natural waters and so were the first in the world to reveal that KHV remains in lakes and rivers long after outbreak.
4) We collected 528 carp from seven sites in Lake Biwa to obtain materials for stable isotope analysis and to identify their behavioral range.
5) We installed breeding tanks with controlled water temperatures and established a method for quantifying stressor-induced substances in the water to discover the relationship between water temperature and stress in carp.
6) We discovered that only carp larger than 30 cm in length are immune to KHV. This indicates that carp behavior due to age is a key factor in determining the site of outbreak and spread of KHV diseases.
7) We began our study of the effect of common carp extinction on ecosystem functions and human economy and culture.
8) We studied the *legionella* infection process to discover common parameters of *legionella* and KHV diseases.
9) We organized the international symposium "Environmental Change, Pathogens, and Human Linkages" at RIHN in June 2008. We concluded that many infectious diseases may be caused by environmental degradation by humans.

Scheduled Research Activities in 2009

1) Survey the spatial and temporal distribution of water temperature in Lake Erhai, China.
2) Reveal the distribution of infective 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.
5) Use radio telemetry to document *C. carpio* range and behavior.
6) Clarify the behavior of *C. carpio* infected with KHV to reveal the locations where the infection likely occurs.
7) Conduct controlled experiments to reveal the relationship between environmental factors and stress in carp.
8) Describe the environmental characteristics of the places where KHV and carp interact.
9) Begin assessment of the economic impact of carp die-offs.
10) Create a preliminary model of the interactions between environmental change, KHV and humans.
11) Describe common parameters of KHV and other infectious diseases.
12) Develop set of recommendations to prevent or minimize the emergence and spread of infectious diseases.
13) Promote collaboration with the international program of biodiversity science DIVERSITAS.

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 in outline. This project uses multiple satellite and surface systems to track changes in the carbon and hydrologic cycles and the cryospher (ice, snow and permafrost), 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	Nagoya University
TAKAKURA Hiroki	Tohoku University
OKUMURA Makoto	Tohoku University

Background and Project Objectives

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

Rising temperatures can trigger drastic change in ice, snow and permafrost environments, and increase the incidence and intensity of extreme weather events, flood and forest fires, as well as alter the structure of interactions between principal biophysical elements. The immediate effect of these changes is likely to increase the presence of carbon dioxide, methane and water vapor in the atmosphere, all of which contribute to further warming (Figure 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 moisture 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 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 natural gas pipelines. Spectral surface data also allows measurement of flood extent and frequency, area of forest degradation or loss, and change in reindeer

Photo 1 **Flooding of the Lena River, *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

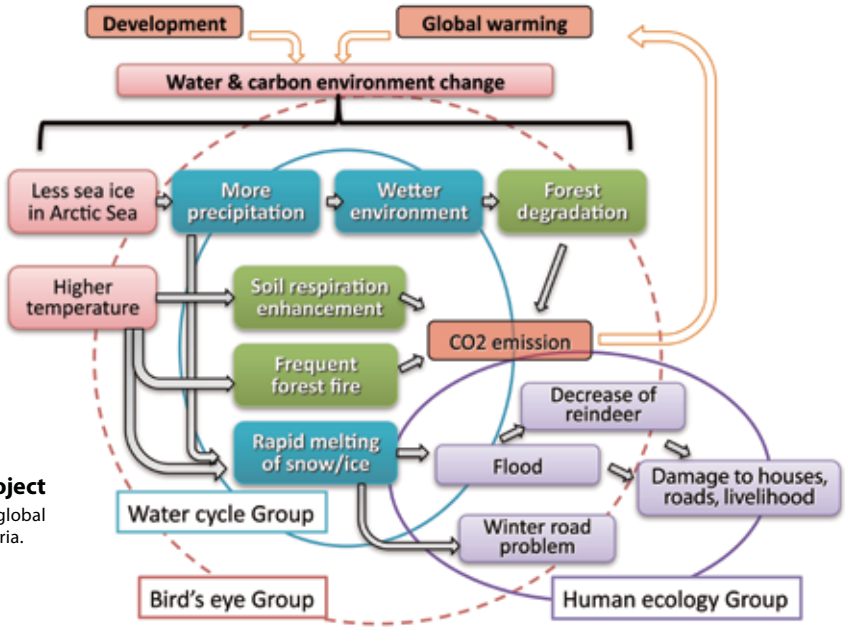


Figure 2 **Flow chart of Project**
Flow chart depicting processes of global warming and development in Siberia.

habitat, phenomena which are also of relevance to the human ecology group.

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 increased soil moisture. Isotope analysis of tree rings provides insight into the past conditions of forest-tundra growth. We have constructed a new monitoring tower at Ustimaya, 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 change affects 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 of hunting are now changing. The number of wild and domestic reindeer has dramatically declined in recent years. Climate warming has negatively affects their 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 action 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.

Diversity Program

Program Director **YUMOTO Takakazu**

The diversity program addresses the loss or degradation of biological diversity, from single species to entire ecosystems, and that of 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; 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: 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 current 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 wellbeing and ecological integrity.

Completed Research	Leader	Title
D-01	**ICHIKAWA Masahiro**	Sustainability and Biodiversity Assessment on Forest Utilization Options
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

Sustainability and Biodiversity Assessment on Forest Utilization Options

Terrestrial biodiversity has decreased mainly because of the loss and/or deterioration of forest ecosystems. A system to utilize forest resources while conserving biodiversity should be developed. This project aims to elucidate the socio-economic factors causing forest decrease, the effect of decreasing forest on biodiversity, and the ecological services that might be lost as a consequence of biodiversity loss. We also evaluate the forest-use options both from ecological and socio-economical perspectives to develop a sustainable utilization system.

Project Leader: **ICHIKAWA Masahiro** Faculty of Agriculture, Kochi University (RIHN until March 2009)

Project Findings

The following subjects were studied at four sites: Sarawak and Sabah in Malaysia, and Yaku Island and Abukuma Mountains in Japan.

1. Changes of forests and their driving forces

- The results were shown as land-use maps and matrices.
- Driving forces of change

2. Effects forest changes on biodiversity

- Biodiversity losses in each utilization option. The results were shown as biodiversity maps.
- Mechanisms of maintenance and loss of biodiversity in natural and disturbed systems

3. Ecosystem functions and services provided by biodiversity and their changes

- The results were shown as ecosystem function and service maps.

4. Social institutions on sustainable use of forest biodiversity

- Environmental economy of each utilization option. Ecological and socio-economic value of each utilization option.

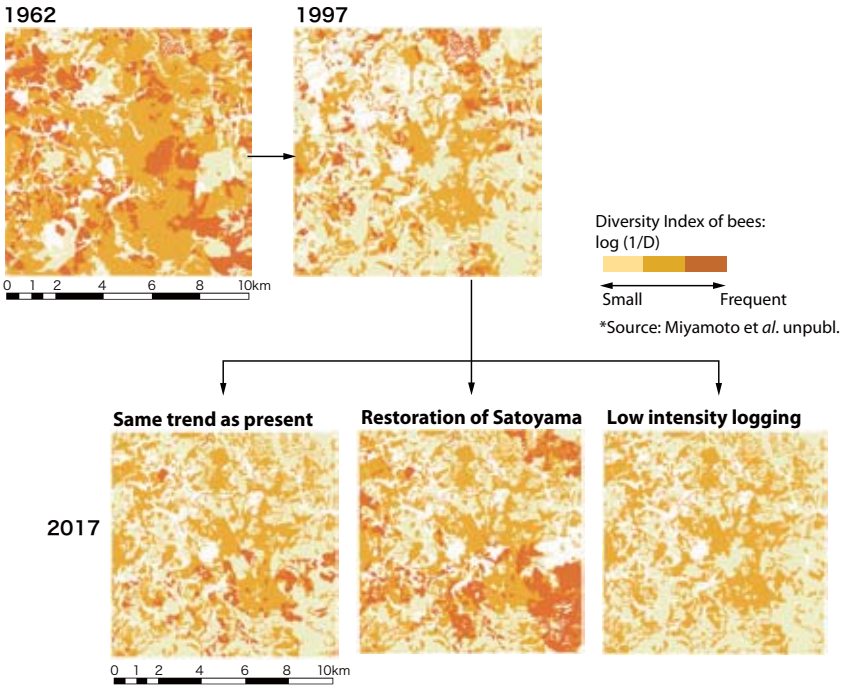
Based on the results of 1 to 4 above, we built an integrated assessment method for sustainable use of forest and biodiversity.

Project Contribution

This project demonstrated how forest changes affect biodiversity. Based on this description we proposed an integrated method to assess sustainable uses of forest and biodiversity. The assessment will be useful as ways are sought to resolve problems on uses of forests and biodiversity in each area. The assessment method could be standardized for use by the public and private sectors.

Published Results

Academic papers with peer review: 203 (English 165, Japanese 38). Papers in books: 67 (English 21, Japanese 46). *For the Future of Biodiversity* (11 chapters), a curriculum for undergraduate students (RIHN and Showa-do in Japanese). *Forest Degradation in the Tropics of Southeast Asia* (Jinbun Shoin, in Japanese), Special issue in *Ecological Research* (2007), *Sustainability and Diversity of Forest Ecosystems* (2007), and others.



An example ecosystem function map

This figure shows change of diversity of bees and projections under three scenarios in Abukuma. Restoration of Satoyama is the best scenario for species richness of bees.

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

Takakazu YUMOTO is Professor at RIHN and Program Director of the 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 before starting RIHN project. Now 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	RHIN
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 will 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 and knowledge of, and skills regarding, nature in general, and to describe human effect on key plant and animal species. Combining biophysical history with human cultural history will lead to a richer appreciation of the human-environmental experience in the archipelago.

Study Area and Methods

Six regions and (in parentheses) seven sites 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 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, such as of pollen, DNA and stable isotopes, will enable comparative analysis of the driving causes and effects of changing human-nature relations in different places and epochs.

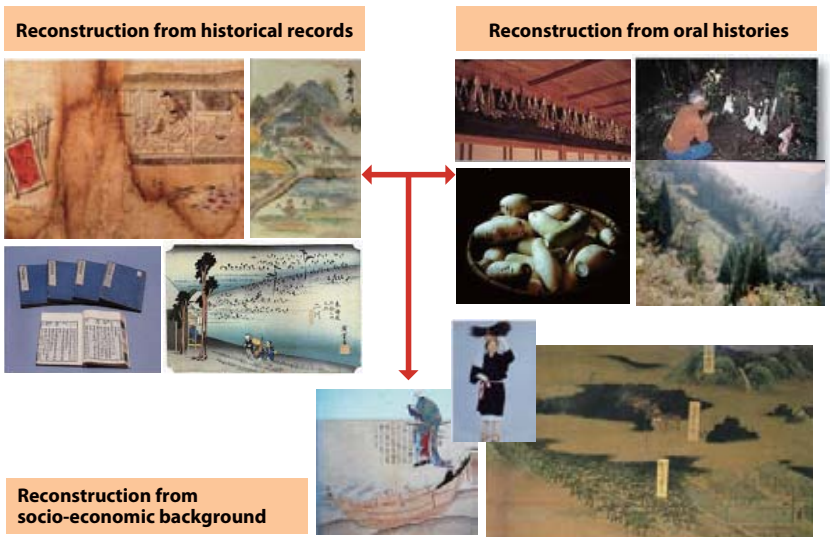


Figure 1
We combine analysis of historical records, folklore and socio-economic background to understand "wise use" of ecosystem services.

Results

For each study region we are compiling a series of environmental history charts that indicate major environmental issues and changes in resource management policy. 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 so as to utilize (or otherwise take benefit from) renewable natural resources and ecosystem services without exhausting them. We are distinguishing and categorizing examples of "wise use" and "unwise use" from each district 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 attempt to describe 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 constitute quality social and ecological life.

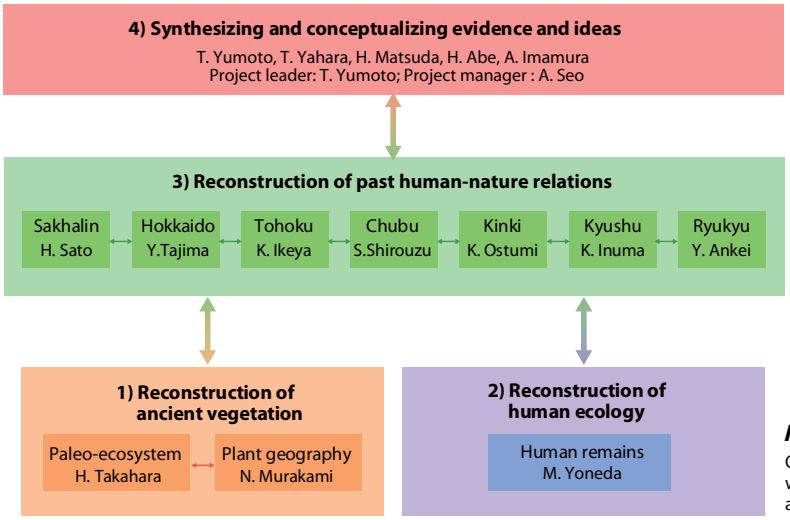


Figure 2

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

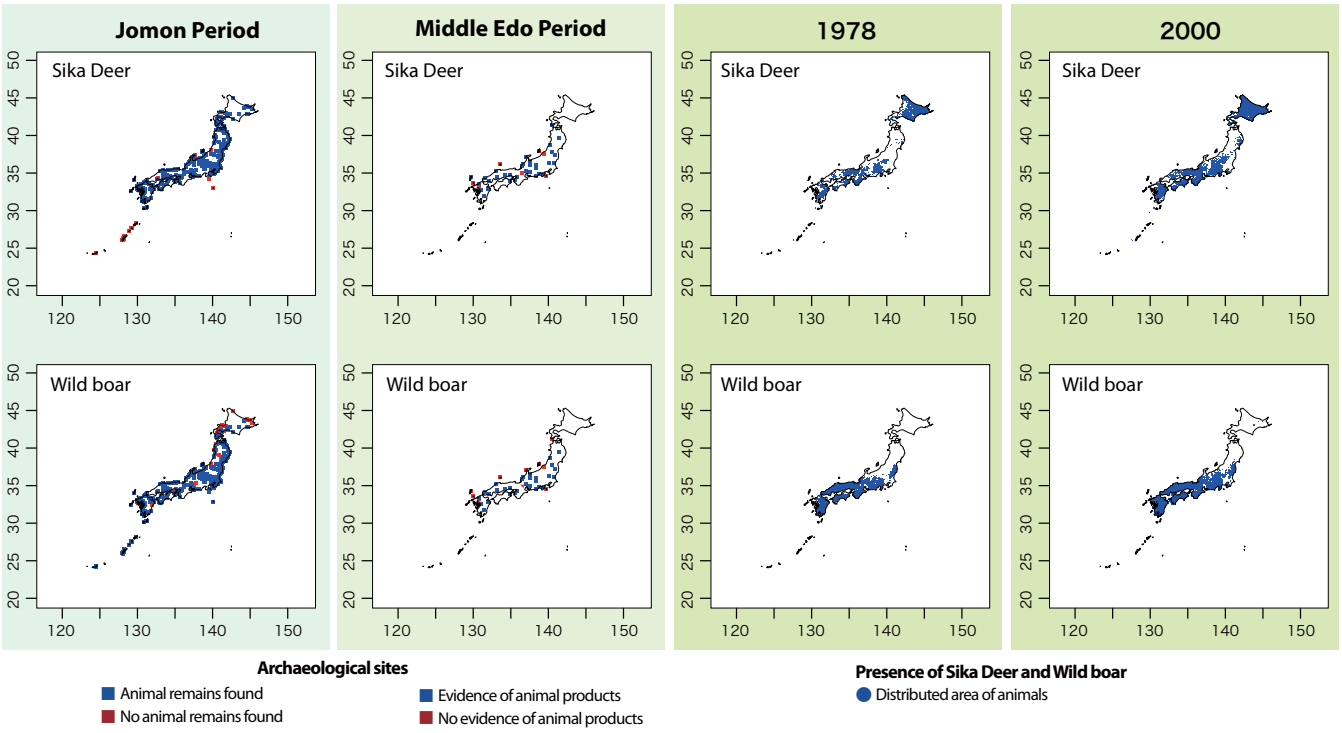


Figure 3 **Distribution maps**

Distribution maps of sika deer and wild boar in Jomon Period, Edo Period, 1978 AD and 2000 AD in Japanese Archipelago. Distribution map of Jomon period was drawn from the data of Kaizuka (Shell mound) database (http://aci.soken.ac.jp/database/kaizuka/index.html). Distribution map of Edo period and 1978 AD and 2000 AD were cited from Japan Integrated Biodiversity Information System (http://biodic.go.jp/kiso/fnd_f.html), Ministry of the Environment Biodiversity Center of Japan.

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

This project takes new perspectives on the long- and short-term effects of high-altitude environments on human physiology and health. We focus on several common health problems associated with aging and contemporary lifestyle because we regard these as manifestations of global environmental issues in the human body. Focusing on Himalaya-Tibet in comparison with the other "highland civilizations" in the Andes and Ethiopia, we examine ecological, cultural and physiological adaptations to high-altitude environments and how recent changes in lifestyle have affected quality of life amongst the elderly in these places.

Project Leader
OKUMIYA Kiyohito
RIHN

Dr. Okumiya earned a doctorate in medicine 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

Are High-altitude environments harsh? They have little oxygen, cold temperatures and fragile ecosystems; these conditions have caused physiological changes in their inhabitants. Examinations reveal that physiological adaptations to high altitude differ between the populations of Tibet, Andes and the Ethiopian highlands. Andean people, who of the three civilizations have the shortest history of high-altitude inhabitance, show increased number of red blood cells. This adaptation is the same as that found in lowlanders who have migrated to high-altitudes. Tibetan people show a greater blood flow capacity than is commonly found in lowland residents or those of shorter-term highland cultures. Ethiopians, who have the longest history of high-altitude habitation, may have the best physiological adaptation to the challenges of high-altitude environments: their blood shows very high oxygen saturation. Thus this project has described physiological adaptation to high-altitude environments at different time scales.

Our research objectives are as follows: first, to further clarify how humans have adapted to high-altitude environments, physio-medically and culturally; and second, to consider the relation between the human body as the internal environment shaped by long-term adaptation and recent livelihood changes and health problems associated with contemporary globalization. Specifically, we examine incidence of diabetes, obesity, hypertension and other lifestyle-related diseases, and their likely significance for highland populations.

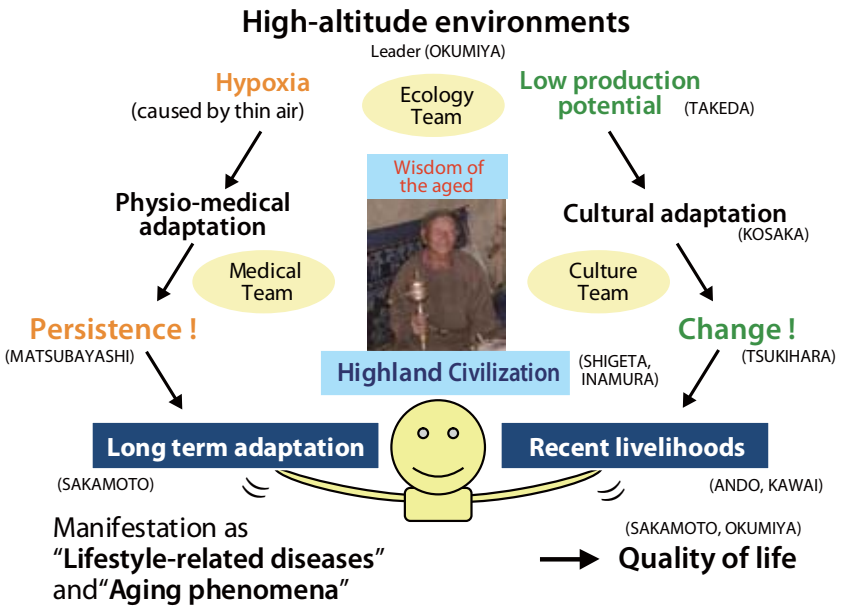


Figure 1 **Framework of the project**
How do recent livelihood changes affect long-term cultural and physio-medical adaptations to highland environments?

Progress to date

We have composed a series of examinations and interviews regarding health, longevity, and quality of life among recent and long-term residents of Tibet, and among a population of Japanese lowlanders for comparison. In Tibet, we found that Han peoples show increased red blood cell counts. Since obesity and hypertension are also associated with increased red blood cells, this process of hypoxic adaptation may expose Han people to greater risk.

We found that the prevalence of diabetes in Han and Tibetan elderly was lower than in Japanese lowlanders. This is compatible with previous reports showing that the lifestyle in highlands may help prevent diabetes. However, diabetes appears to be increasing in highland resident office workers and monks, and follow-up and prevention schemes are needed. The prevention of diabetes is important,

Photo 1 **Tea trade**
Commerce networks between different ecosystems have a history of over a thousand years.

Photo 2 **A contemporary funeral in Tibet**
Modernization reaches into all aspects of life and death.

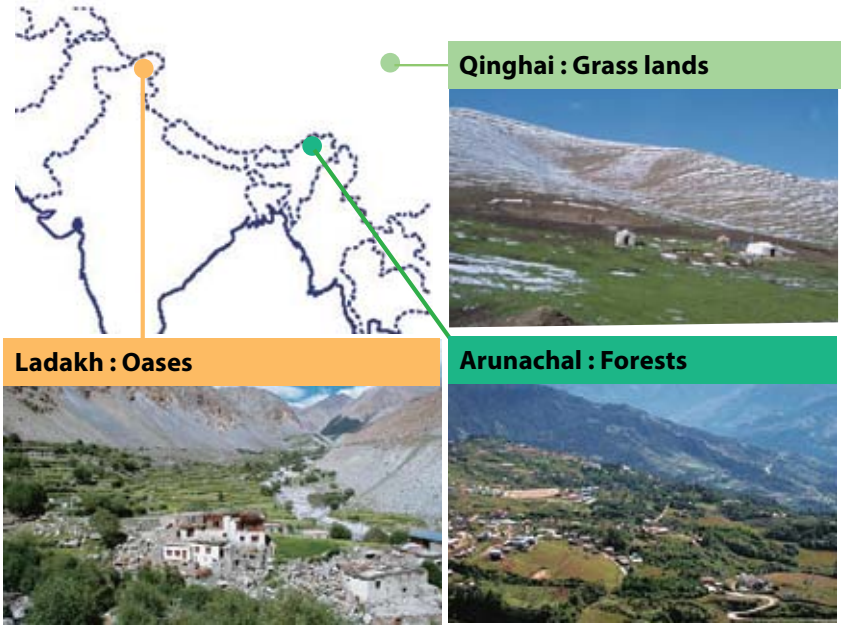


Photo 3 **The main research areas in the Himalaya-Tibet region**
Ladakh, Qinghai and Arunachal are located in distinct oasis, grassland and forest ecological zones.

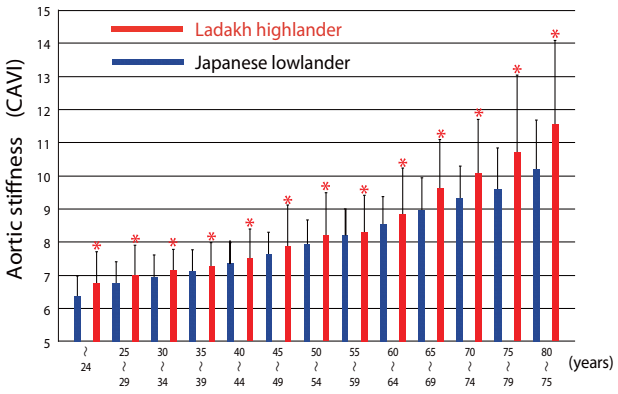


Figure 2 **Accelerated aging of blood vessels in highlanders**
Ladakhi women highlanders had greater aortic stiffness (CAVI: cardio ankle vascular index) than Japanese lowlanders. Aortic stiffness is a marker for arteriosclerosis (Kuniaki Otsuka; Himalayan Study Monograph 10 2009).

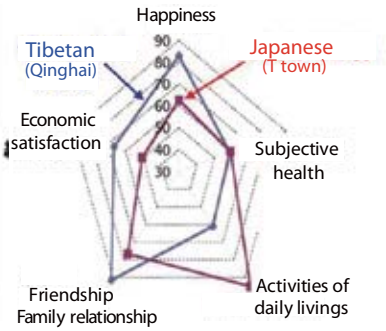


Figure 3 **Subjective quality of life and living abilities**
In spite of low functional abilities and health indicators, Tibetans self-report a higher quality of life than do elderly Japanese. (Matsubayashi K, *Geriat Geront Int*. 2009 in press.)

because diabetes accelerates arteriosclerosis which inhibits the transport of oxygen in the human body.

Rural-urban migration is increasing in Ladakh, with great effect on agro-pastoral traditions and livelihoods of the area. Out-migration has caused a labor shortage; agro-pastoral households are decreasing in number as rural households turn to commercialized agriculture. Such changes in the rural economy will affect community form and dietary habit. We are studying their effect and mapping changes in land use.

Schedule in 2009/2010

Our research will emphasize linkages of medical problems and cultural and ecological factors in each study site, including:

(1) Association between hypoxic adaptation and lifestyle related diseases;
(2) Acceleration of aging at high altitudes;
(3) Low prevalence of diabetes in highlanders, but increasing in office workers;
(4) Rapid increase of off-farm workers at high altitude;
(5) Transformation of the agro-pastoral linkage due to rural-urban migration.

We will concentrate on the Himalayas/Tibet and propose a model of human-nature interactions in Asian highland civilization . We intend to make further comparative study of Himalaya-Tibet with the Andes and Ethiopia in the future.

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 the subject has focused only on the direct cause and effect of ecosystem degradation in a particular place. This project applies new network sciences to the problem of ecosystem deterioration and collapse, and to the prospects of their restoration. The project examines interactions between human societies and nature in two distinct ecosystems where humans are dramatically altering the course of ecosystem change, 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	RHIN
ISHII Reiichiro	Frontier Research Center for Global Change
FUJITA Noboru	Center for Ecological Research, Kyoto University
ICHIKAWA Masahiro	RIHN
MAEKAWA Ai	RIHN
NAKASHIZUKA Tohru	Faculty of Bioscience, Tohoku University
OHGUSHI Takayuki	Center for Ecological Research, Kyoto 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 a network-based analytical framework amenable to description of 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 are one of the consequences 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 Asian ecosystems. Recent advances in computer science and in theoretical studies on complex networks (i.e. complex system sciences, complex adaptive systems) have dramatically increased our ability to describe complex interactions such as those between ecosystems and human societies. Complex system sciences 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 of the potential for restoration.

Research Sites

Field research takes place in tropical rainforests in Sarawak, Indonesia and the grasslands in Mongolia.

Mongolia, healthy grassland (A) and degraded pasture (B). Sarawak, rainforest (C) and plantation (D).

In Mongolia, livestock have grazed the grasslands intensively for a long time. In recent years, overgrazing by livestock, especially by the increased number of goats used in the production of cashmere for export, has caused a serious problem in the region. In Sarawak, the ecosystem has changed dramatically over the last 100 years; land use has shifted from extensive agriculture in forests by aboriginal people to logging in natural forests as a source of timber for export, and more recently to oil-palm plantations.

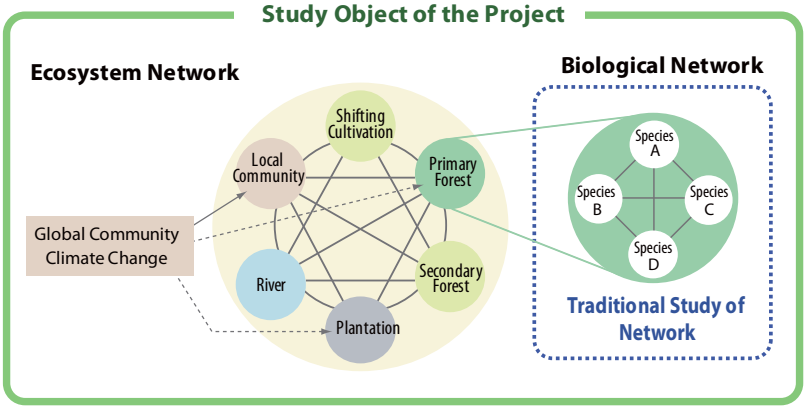


Figure 1 **Example of an ecosystem network in Sarawak**

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.

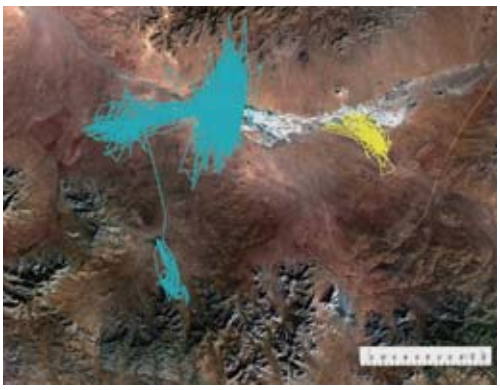


Figure 2 **GPS data for movement of livestock in two families in Bayanunjuul (10 km x 7 km)**

The range of one family's grazing livestock from August to November (shown in blue) and that of another in August (yellow). The former family shifted the location of its house twice in the period of four months. The graph shows that the livestock of both families have a fairly regular daily range of several kilometers from their pens.

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 response 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 changes their practices and prospects.

Research Methods

The most important concept of this project is the "ecosystem network," which has a nested structure of interactions among and within network subsystems, including human systems, as shown in Figure 1. Our project will describe the existing ecosystem network structure in both regions. Because biological interactions within ecological subsystems have already been studied extensively, our ecological surveys will focus on material flow and the movements of organisms—especially pollinators, predators and parasitoids—between subsystems, and their role in ecosystem function.

As for the human action relevant to the ecosystem network, we are investigating the ecological effect of specific human actors (e.g. pastoralists), the reasons for their behavior, how it may be subject to that of other actors, and how present social and ecological relationships differ from those of the past. Based on our results, we will construct models that can describe the ecosystem networks in the two regions, and predict their patterns of change. Further, we will generalize the results to determine the critical network characteristics likely to result in environmental problems.

Progress to date

In 2008, our initial year of research, we established our observational infrastructure at several sites in Sarawak and Mongolia and collected satellite data and statistical data with a GIS. We conducted ecological and social surveys on which initial projection models have been based.

In Sarawak, we: (a) established survey plots at primary and secondary forests in Lambir National Park, and surveyed biological species and ecosystem services; (b) conducted intensive social surveys on a few selected villages and extensive questionnaire surveys on many villages over all Sarawak; (c) examined the status and causes of expansion of oil palm plantations, and socio-ecological systems of certified forest biological resources.

In Mongolia, we: (a) set up automating weather systems at three points, Ulaanbaatar in the forest steppe, Mandalgobi in the steppe, and Hanhongor in the desert steppe; (b) examined migration patterns of nomadic people by setting GPS on livestock (Figure 2), and surveyed grass production and livestock grazing pressure; and (c) conducted questionnaire surveys on factors determining the migration patterns of nomadic peoples, with special emphasis at Ulaanbaatar.

For our modeling component, we: (a) started construction of models predicting the biomass in Mongolian grasslands using satellite and climate data; (b) started construction of agent-based models examining relationship between vegetation changes and migration patterns; and (c) constructed a GIS database of population and livestock with SUM (an administrative division) units. We documented a recent rapid increase in the number of goats associated with the production of cashmere, especially near Ulaanbaatar.

Issues to be addressed

Because the land cover in Mongolia is relatively simple, the modeling is easier, and project modeling and surveys are better integrated in Mongolia than in Sarawak. Based on our progress in describing the ecological structure and in identifying appropriate modeling subjects, model construction is now set to proceed in Sarawak. In both areas, where spatial data are available, we will model dynamics of plant biomass and land use. Biodiversity serves as an index of land cover and land use. Modeling the effects of human activities on ecosystems is still a challenging task. In Mongolia, we will abstract the rule of movements of nomadic households and livestock from GPS data and questionnaire surveys. In Sarawak, we have to determine both the unit and rule of decision-making in regard to utilization of ecological resources. As for the final goal of our project, the future projection and evaluation of ecosystem networks under several scenarios, we must also focus our efforts and determine scenario parameters.

Resources Program

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 ecological sensible and best promote human wellbeing, and what alternatives may exist. The Resources Program takes an integrated, transdisciplinary approach to such questions.

Completed Research	Leader	Title
R-02	**AKIMICHI Tomoya**	A Trans-Disciplinary Study on Regional Eco-History in Tropical Monsoon Asia: 1945-2005
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 Changes and Infectious Disease in Tropical Asia
R-05	**NAWATA Hiroshi**	A Study of Human Subsistence Ecosystems in Arab Societies

A Trans-Disciplinary Study on Regional Eco-History in Tropical Monsoon Asia: 1945-2005

This research project completed a holistic analysis of eco-historical phenomena in tropical monsoon Asia in the decades since WW II. The area has experienced dramatic changes in political regime, devastating wars, modernization, economic globalization, and population growth, all of which have affected both local environments and human populations. The project developed almost 100 flow charts in order to illustrate these processes and their effects. This eco-historical model can be expected to be extensively applied in the analysis of local and global environmental problems.

Project Leader: **AKIMICHI Tomoya** RIHN

Major Research Findings

In scrutinizing the eco-history of tropical monsoon Asia in the past several decades, our project aimed to synthesize an eco-linkage model based on about one hundred descriptors of historical interactions between the local environment, human population, and external forces. We were able to identify a number of relevant interactions and events that could be accurately illustrated in themselves and in interaction with a range of other factors so as to depict a complex whole. A range of eco-sensitive phenomena, such as natural and domestic resources, human nutrition and health, and land access rights and eco-policies were identified through exploratory fieldwork.

Our analysis showed that not only state policies but also local community response and decision-making provided the key for understanding the recent process of historical change in the tropical monsoon region.

Rapid modernization and globalization has impacted local environment, modes of life and human health; there is increasing cultivation of cash crops and cash-driven land use, frequent migration, and increased consumption of sugar and fat. Yet, despite these changes, essential elements of the traditional food culture, including consumption of glutinous rice, raw animal meat, and particularly of freshwater fish, remain. In some cases, the incidence of some diseases, such as paragonimiasis and liver fluke, that are associated with traditional diets, remains high.

Our project compiled a database of material culture and photographs collected by Japanese scholars during the past several decades in this region. An eco-chronicle database in Yunnan, China has also been completed for public use.

Outcomes and Database

In addition to numerous articles and papers, we have published sixteen books on various themes and topics (10 Japanese, 4 English and 2 Chinese). The meta database on our findings and collected materials is now available for public use through RIHN's archives (http://db1.chikyu.ac.jp/archives/).

Rural landscape in southern Laos

Paddy fields, fish traps and water buffalos in a rice producing forest.

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 18th century, however, a national border defined the region between Russia and Qing China. In the next decades, the inhabitants of the area experienced a great change of lifestyle, as national borders and 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 windblown deposits in order to describe the rise and fall of nomadic peoples and states, and their effect on the natural resources and climatic conditions in the Ili River watershed. Project researchers also investigate the present effect of human activities on both sides of the Russia/China border in order to describe the potential effect of boundaries on contemporary environmental conditions.

Research area and groups

Research centers on the Ili River watershed area, which flows from China to Kazakhstan, the surrounding areas, including Kyrgyzstan and Uzbekistan. Throughout human history, Central Eurasia has been a key site of interaction between individual ethnic groups of the area, as well as 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 change.

Progress to date

Initial analysis of data from Lake Balkash indicates that the 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

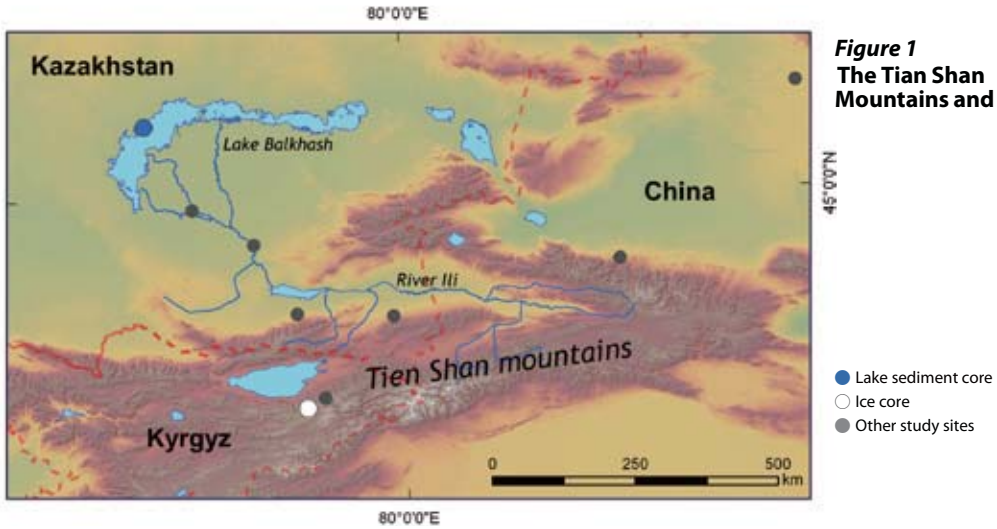


Figure 1
The Tian Shan Mountains and Ili River

Figure 2 **Outline of the project**

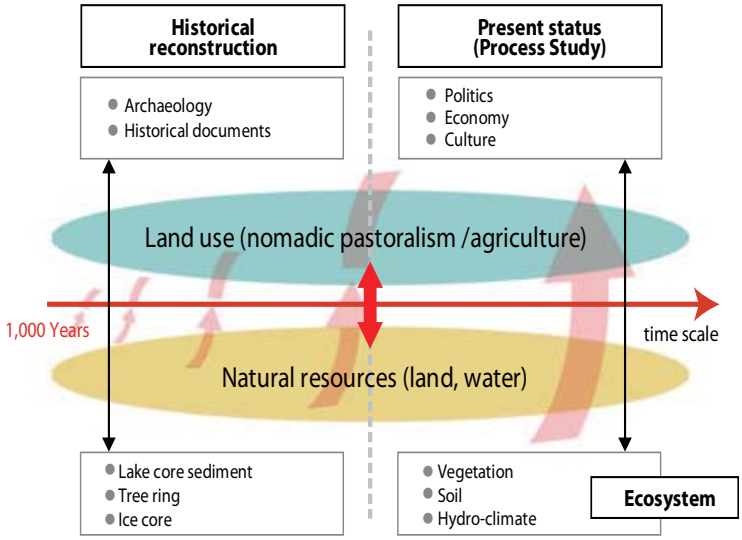
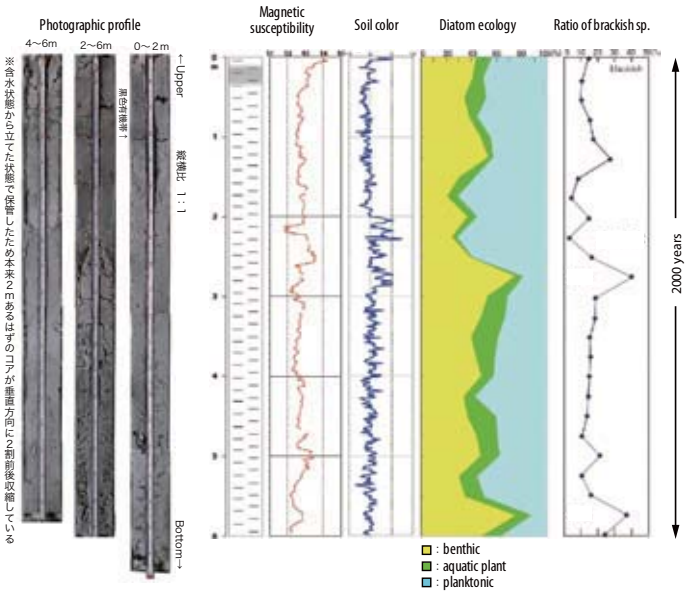


Figure-3 **Profile of the Lake Balkhash core drilled in 2007**



until the modern regression beginning in the 1960s. We therefore concur that the so-called Medieval Warm Period was warm and dry, and the Little Ice Age was cold and wet.

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, began to demonstrate human potential to cause dramatic environmental change.

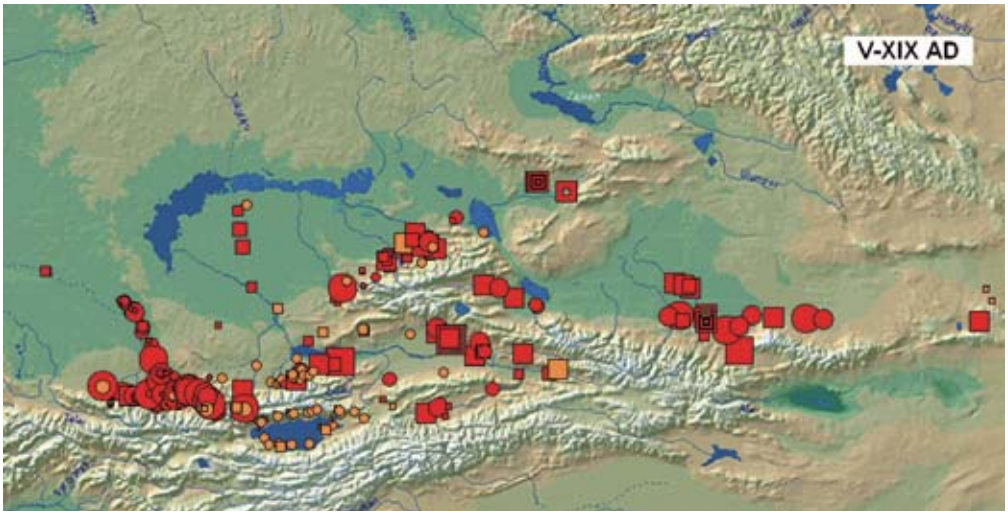
The most dramatic change in long-term patterns of human and environmental interaction in semi-arid Eurasia was the shift from nomadic to sedentary societies accompanying the establishment of modern agriculture. Russia's expansion into Kazakhstan in the late 19th century, agricultural collectivization 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 which are written in Manchuraian have not been previously investigated because few researchers can understand the Manchuraian 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 transformation of Central Eurasia.

Figure 4 **Distribution of historical monuments in Central Eurasia**



Environmental Change and Infectious Disease in Tropical Asia

This project examines the relationships between recent changes in climate and environment and those in the health profile of the people of tropical monsoon Asia. The project examines the effects of human societal and environmental changes on the ecology, endemiology/epidemiology of several vector-borne diseases, such as malaria, dengue fever, and filariasis, and food- and water-borne diseases, such as liver fluke infection, cholera and other diarrheal diseases.

Project Leader
MOJI Kazuhiko
RIHN

Kazuhiko MOJI is Professor 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

MASCI-TAYLOR Nicholas CG	Cambridge University, UK
KOBAYASHI Shigeo	Kyoto University
IIJIMA Wataru	Aoyama Gakuin University
KOBAYASHI Jun	Inter National Medical Center of Japan
TOMITA Shunsuke	The University of Tokyo
ASAKURA Takashi	Tokyo Gakugei University
SUNAHARA Toshihiko	Nagasaki University
HASHIZUME Masahiro	Nagasaki University
YAMAMOTO Taro	Nagasaki University
KAMMURDIN, Ahmed	Oita University
BOUPHA, Boungnong	National Institute of Public Health, Lao PDR
KOUNNAVONG, Sengchanh	National Institute of Public Health, Lao PDR
PONGVONGSA, Tiengkham	Savannakhet Malaria Centre, Lao PDR
PHONGMANY Panom	Savannakhet Health Department, Lao PDR
ISLAM, Sirajul	ICDDR, B, Bangladesh
HUNTER, Paul	University of East Anglia, UK
RAHMAN, Mamudur	IEDCR, Bangladesh
LE Khanh Thuan	NIMPE, Vietnam
CAI Guoxi	RIHN
ICHIKAWA Tomo	RIHN

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.

Tropical monsoonal Asia is characterized by distinct wet and dry seasons. The region is susceptible to flood and drought. Rice is the traditional staple food of this area and is cultivated by either slash-and-burn methods or in wet paddies. People chop down the tropical forest and cut terraces in which to cultivate rice, but they also remain dependent on a variety of forest products. Recently, population increase and migration, economic development, urbanization, deforestation and lifestyle changes have dramatically affected the ecological conditions of region, and so the relations between human beings, pathogens and vectors.

Research Methods and Organization

The project consists of three study groups, each containing several sub-groups, as follows:

1) The Field Study Group consists of research teams in Lao PDR, Bangladesh, China, and a Southeast Asia comparative study team.
2) The Methodology Study Group consists of historical, agro-forestry, human ecology and health education study teams.
3) The Integration Team manages the project by supporting activities of the field study group and the methodology group and by integrating the results of the project.

The project concluded MOUs in 2008-2009 with the

Photo 1

The Banghiyang River, Lahanam area, Songkhone district, Savannakhet Province of Lao PDR, one of tributaries of the Mekong river. This area is frequently damaged by flood. At the same time, however, it has reaped the benefit of the river for wet rice cultivation and fisheries. Fishing activities in the river and flood plain are very active, as is the river fluke parasite *Opisthorchis viverrini*.

Photo 2

Meeting of local staff of the Lahanam Demographic Surveillance System (DSS). All the houses of the area are regularly visited by the staff, which collects information on pregnancy and birth, death, marriage and migration. These data form one base of the study of the health transitions underway in this area.

Photo 3

Satellite image of Lahanam area. Houses, rice fields and forest are identified. Analyses of the ALOS satellite image of all area of Lao and Bangladesh will be executed in the project.

Figure 1 **The Great Mekong Region**

The economic and social influences of China in this area are remarkable. The project has studied the epidemiology of HIV/AIDS in the region, especially among highly mobile populations in the South China border zone.

National Institute of Public Health, Ministry of Health (NIOPH), Lao PDR, and the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). The project established the "Lao-Japan Consortium on Health Research" to facilitate systematic and comprehensive health research in Lao. It co-organized the Second National Health Research Forum in September 2008, and invited the Health Minister of Lao PDR to the RIHN Special Meeting on "Ecohealth Promotion" in November, 2008.

Results to date

1) The Lao study team conducted demographic and health research in Lahanam area, Savannakhet Province, focusing on maternal and child health. The team also initiated surveys on the health system, school health, and incidence of malaria among indigenous groups residing in remote areas of the Sepone district.
2) In Bangladesh, studies of relation between climate and infectious disease in Matlab were initiated in collaboration with ICDDR,B, Nagasaki University, Kyoto University, Tsukuba University, and the London School of Hygiene and Tropical Medicine. An automated weather observation system (AWS) was installed in Matlab to collect climate data. We have also been working in collaboration with the Institute of Epidemiology, Disease Control and Research, Bangladesh, and Cambridge University to establish a national disease database.
3) The China study team carried out survey on HIV/AIDS in cooperation with Kunming Medical College and the Yunnan Health and Development Research Association (a NPO), focusing on social change and population mobility. The team is to develop a research network of HIV/AIDS in the Greater Mekong Region.
4) The historical study team collected and analyzed historical data on infectious diseases in East and Southeast Asia, held an international workshop in Taiwan, and has analyzed medical information in the British Parliamentary Papers (BPP).
5) The agro-forestry study team focused on changes in land-use and land-cover in Southeast Asia, using satellite images to establish GIS-based data on environmental change.
6) The human ecology study team made community-level assessments of the current state and change in local environment, life style, and health.
7) The health education study team developed an ecohealth questionnaire to be administered in communities and schools to collect information on environmental changes and lifestyle changes.

Scheduled Research Activities in 2009 and beyond

Lao PDR

1) Analysis of land-cover changes;
2) Study of child health and nutrition in Lahanam;
3) Demographic study in Lahanam;
4) Water quality study, mainly in Sepone, SVK;
5) Thai liver fluke study in Lahanam (including fish survey);
6) Malaria study using mobile phone in Sepone, SVK;
7) Health system strengthening using mobile phone network;
8) Promotion and education of ecohealth concept through folk-media;
9) Community-oriented development of ecohealth (CODE) in community and school;
10) Historical study of health transition (through database construction);
11) Comparative village study on human ecological transition;
12) Results of National Health Survey 2000 and environment.

Bangladesh and Sri Lanka

1) Study of relation between climate and diseases;
2) Constructing reporting system of the national disease surveillance system;
3) Lota-virus infection in Sri Lanka;
4) Analysis of land-cover changes in Bangladesh.

China

1) Study on HIV transmission and the behavior of female commercial sex workers and their clients;
2) Collection of historical data on schistosomiasis control in southern China.

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. Using the research results, we will propose a scientific framework to strengthen subsistence productivity and combat livelihood degradation in local Arab communities in preparation for 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

KOBORI Iwao	United Nations University
KAWATOKO Mutsuo	Research Institute for Islamic Archaeology and Culture
SUGIMOTO Yukihiro	Graduate School of Agricultural Science, Kobe University
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)
ONUMA Hiroyasu	Appropriate Agriculture International Co.
ABDEL GABAR E. T. Babiker	Sudan University of Science and Technology
ABDALLA M. A. Abu Sin	Gezira University
ABDEL BAGI M. A.	Agricultural Research Cooperation, Sudan
ABDEL HADI A. W. M.	Agricultural Research Cooperation, Sudan
LAUREANO, Pietro	Traditional Knowledge, World Bank
BENKHALIFA, Abdrahmane	Centre National de Développement des Ressources Biologiques, Algeria

Background and Objectives

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 economic prosperity for their own benefit, these countries have exploited irreplaceable resources, such as fossil fuel and fossil water. Schemes to plant alien species have placed additional stress on local ecosystems. In the Middle East, these practices have widened social differences at a time when it faces a turning point in the modern oil-based civilization. Fossil fuel-based interdependencies must be replaced by new forms of exchange that support viable future societies.

Our project focuses on human subsistence ecosystems; the traditional life support mechanisms and self-sufficient modes of production of the region, such as hunting, gathering, fishing, herding, farming, and forestry, that involve low energy resource consumption. Our analysis of traditional livelihoods will allow us to re-examine the costs and benefits of advanced technology and economic development, and to suggest comprehensive measures to combat immediate environmental problems, such as desertification. Based on our research results, we will propose a scientific framework for strengthening subsistence productivity and enhancing daily life in Arab societies in the post-oil era.

Research Areas, Approaches, and Methods

We will develop and implement our study of human subsistence ecosystems around three main areas: 1) comprehensive measures to control the alien invasive species mesquite; 2) assessment of the environmental effects of development programs in coastal zones of the arid tropics; and 3) sharing of research results to support local decision making.

Our research method combines two main approaches: (1) analysis of subsistence ecosystems, focusing on keystone species such as camels, date palm, dugong, mangrove, and coral reefs; and (2) examination of the sustainability and fragility of Arab societies, focusing on the ecotones wadi beds, riverbanks, mountainsides, and seashores.

Figure 1 **Area of field surveys**

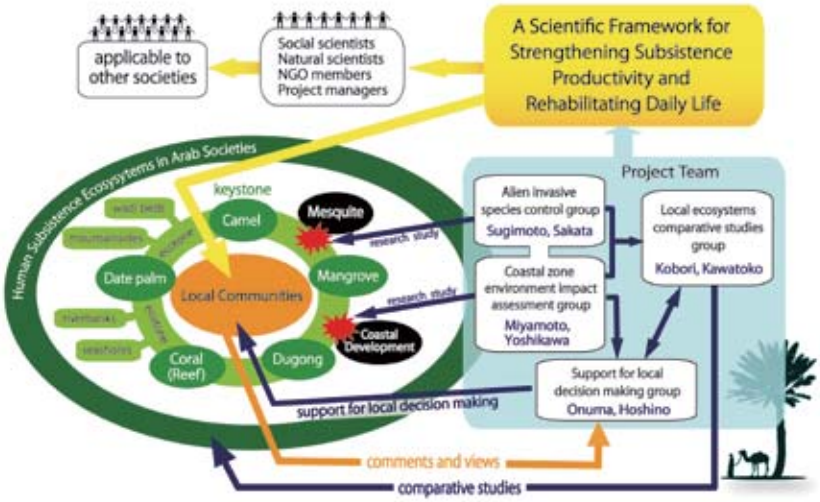


Figure 2 **Research Methods, Approaches, and Organization**

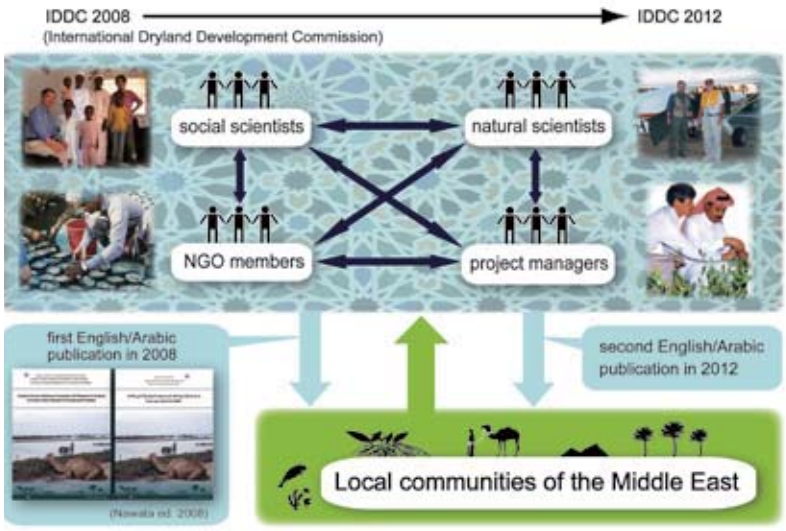


Figure 3 **Research communication and exchange**

Field surveys will be conducted in semi-arid lands between the Nile River and the Red Sea in Sudan, with the Red Sea coast, Butana area, and Nile River areas as the main survey areas (Figre 1). Additional surveys will be conducted at the Sinai Peninsula in Egypt, Red Sea coast in Saudi Arabia, and a Saharan oasis in Algeria. We will compare keystone species, ecotones, and traditional knowledge and examine differences in the sustainability of subsistence economies under site-specific conditions.

Project Organization

The members of this project include social and natural scientists, members of local NGOs and project managers, who are divided into four study groups (2).

1) Alien invasive species control group
2) Coastal zone environmental impact assessment group
3) Support for local decision making group
4) Local ecosystems comparative studies group

Achievements

Field Survey in Sudan

Sudan is the top-priority country for the field survey. Project members from RIHN and the Sudan University of Science and Technology (SUST) met on 27 November, 2008, and agreed to a joint Memorandum of Understanding and Implementation Agreement. The main objective of this collaboration is to develop comprehensive measures for controlling the alien invasive species mesquite (Prosopis spp.).

Publications in Arabic and English

We published a leaflet and an edited volume in Arabic and English. The leaflet describes the overall research project. The volume, entitled "A Study of Human Subsistence Ecosystems with Mangrove in Drylands: To Prevent a New Outbreak of Environmental Problems"(Figure 3), relates to mangrove afforestation in drylands, and features several notable studies undertaken by Japanese research groups. The volume emphasizes connections between scientific evidence and practical observations, and so demonstrates the compatibility of scientific and local knowledge, and facilitates the exchange of information with other researchers and local people in the study region.

Distribution the Publications among International Conference and Quantitative/Qualitative Responses to the Project

We distributed the leaflet and volume to 188 participants of the ninth conference of the International Dryland Development Commission (IDDC), in Alexandria, Egypt, 7–10 November, 2008. When handing out our publications, we had opportunity to discuss our project with IDDC participants face-to-face. They asked a number of questions, including which types of livestock can eat mangrove foliage and whether mangrove can be used as a bio-fuel. Egyptian students were particularly interested in our research because the brochure and booklet were printed in Arabic. We consider such engaged responses to our publications to be an indication of the impact of the project in its first year. We plan to incorporate local peoples' opinions in our project targets and activities, and encourage continued communication between project researchers and local communities by publishing a revised version of the edited volume on the project's completion.

Further Issues

In the first year of Full Research we intend:

- To initiate full-scale field surveys in each research area in order to collect positive observed/measured data.
- To install the physiological and ecological measuring equipment for alien invasive species in Sudan and physiological measuring equipment for mangrove trees in Saudi Arabia.
- To hold an international symposium on control of alien invasive species at Sudan University of Science and Technology.
- To present the results of our comparative studies of local ecosystems at the 16th World Congress of International Union of Anthropological and Ethnological Science s (IUAES) in Kunming, China.
- To adopt MOU and IAs with appropriate research institutions in Saudi Arabia, Egypt, and Algeria.

Encounters in the field

1

2

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4

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7

	Photographer	Location	
1	NAKAMURA Ryo	Tanzania	The traditional method of setting fish-fencing in Kilwa Island
2	ONISHI Takeo	Suburb of Khabarovsk, Russia	A woman sells vegetables on the roadside
3	TERAMURA Hirofumi	Gujarat, India	Cows and a common-use cowshed
4	OKAMOTO Masahiro	Western Province, Zambia	A mother watches with affectionate eyes as her son sips water through a water lily stalk
5	ENDO Takahiro	California, USA	A Mexican migrant worker operating a grape harvester
6	SHINDO Kenji	Lijiang City, Yunnan Province, China	Nakhi people of China
7	OKUMIYA Kiyohito	Tibet, China	A woman using a wooden barrel to carry water from a water hole

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 historical perspective to the development of *futurability*. Like all RIHN research programs, it should elucidate global environmental issues, propose solutions and deepen understanding of human-environmental potential.

In 2009 the program is comprised of four projects, one already completed (CR) and three in progress (FR). These are: "Historical Evolution of the Adaptability of an Oasis Region to Water Resource Changes (CR; Project leader, NAKAWO Masayoshi); "Agriculture and Environment Interactions in Eurasia: Past, Present and Future—A ten-thousand-year history" (FR; Project leader, SATO Yo-Ichiro); "Environmental Change and the Indus Civilization" (FR; Project leader, OSADA Toshiki); and "Neolithisation and Modernization: Landscape History of East Asian Inland Seas" (FR; Project leader, UCHIYAMA Junzo).

Focusing on different regions and a range of historical moments, these projects 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 Zone', 'Mugi Zone' and 'Vegeculture Zone'. It takes an interdisciplinary approach to the idea of 'genetic diversity' in agriculture in the hope that enriched appreciation of genetic diversity will contribute to improved future agriculture.

Project Leader
SATO Yo-Ichiro
RIHN

SATO Yo-Ichiro is Deputy Director-General and Professor at RIHN. He received his doctorate in agronomy from Kyoto University (1986). He served as Research Associate at Kochi University (1981-1983), Researcher at the National Institute of Genetics (1983-1994) and Associate Professor at Shizuoka University (1994-2003). His major research fields are plant genetics, especially evolution and genetics of rice plant and other crop species, and history of agriculture and human ecosystems. He is particularly interested in the domestication of crop species and using the tools of DNA archaeology to examine the origins of rice.

Core Members

ISHIKAWA Ryuji	Faculty of Agriculture and Life Science, Hirosaki University
WILLCOX George	Maison de l'Orient et de la Mediterranee, France
KATO Kenji	Faculty of Agriculture, Okayama University
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
TAN'NO Ken'ichi	Faculty of Agriculture, Yamaguchi University
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
YANG Haiying	Faculty of Humanities and Social Sciences, Shizuoka University

Project Description

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 greenery and water are still plentiful, 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 the character of agricultural and environmental change in three distinct climate zones in the last ten thousand years. We aim at comprehensive understanding of the history of agriculture-environment interactions, focusing on impact of "genetic diversity" on environmental transformation, destruction, collapse and recovery.

Research groups address the Monsoon zone, the *Mugi* (winter annual crop) zone, and the Vegeculture zone (Figure 1). The Swidden Agriculture Group conducts research on sustainable farming techniques based on the findings of the above groups.

Main Research Results

Using mixed methodologies (Figure 2), each research group has been drawing a picture of the history of human agricultural activities in its respective region. In each case, production developed unevenly and collapses were frequent.

● Monsoon Zone Group

Prehistoric sites offer evidence of early agriculture in Japan. Excavations have revealed the introduction of more vigorous cultivar species and evidence of river channels, probably constructed as buffers to flood, drought or other natural disaster. Nevertheless, it appears that cultivation was inconstant, interrupted by periods of fallow or natural disaster, in the middle Yayoi and ancient periods (Figure 3). Such results show that the history of Japanese agriculture has been one of collapse, adjustment and recovery, as described in Figure 4.

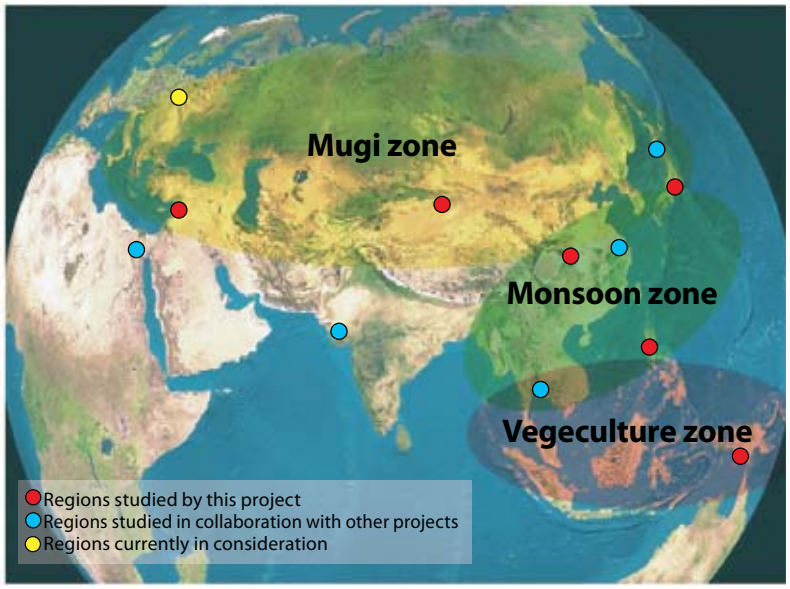

Figure 1 **Research zones and sites**

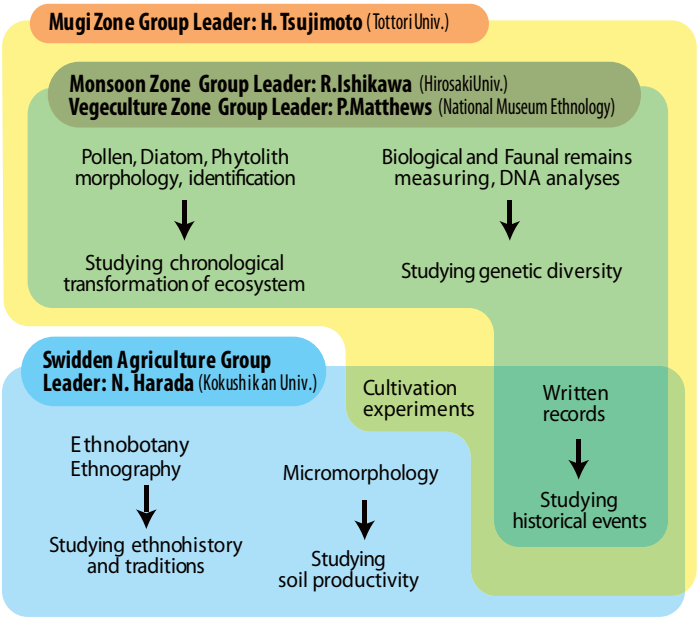

Figure 2

The four project groups and their study methods.

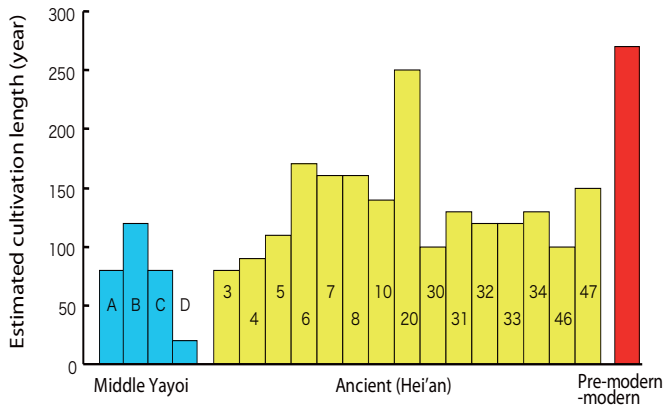

Figure 3

Each column represents the cumulative years of production in a single field unit. This figure indicates that there were frequent fallows or other interruption in earlier paddy rice production.

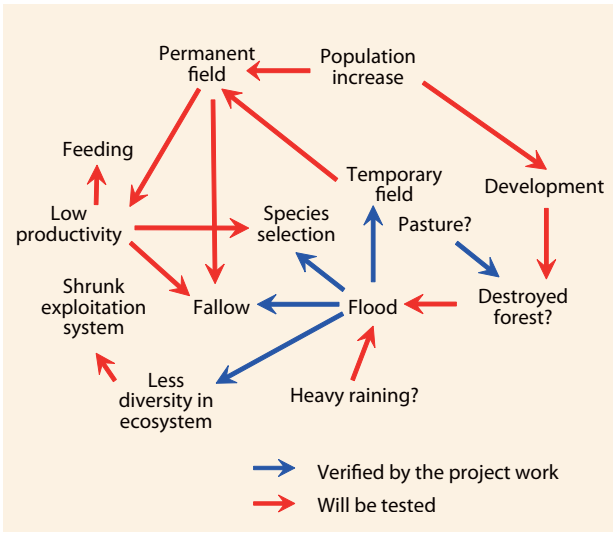

Figure 4

This conceptual outline of possible past human-environmental interactions is based on archaeological excavations undertaken in Osaka.

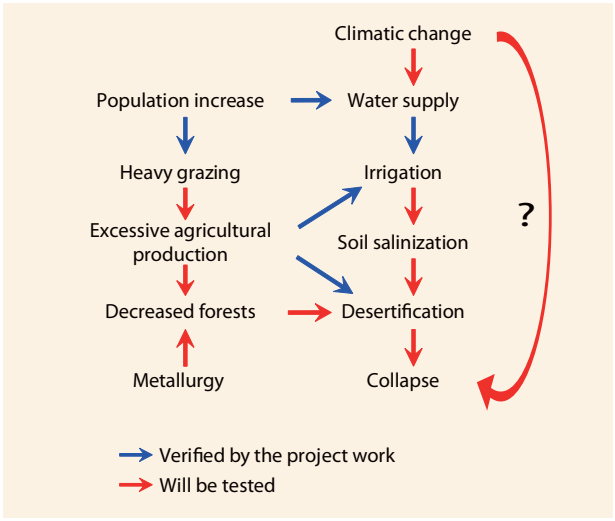

Figure 5

This conceptual outline of past human-environmental interactions is based on excavations at Shaohe in the Takaramakan desert.

- ***Mugi* Zone Group**

Excavation has been carried out in northwestern China. Morphological and DNA analyses of excavated faunal and botanical remains, suggest that the area was formerly of the *makiba*, or pasture climate zone, characterized by extensive wheat fields, meadow and forests; significantly different from its present desert-like, salinized state. One possible explanation for the change is the repeated cycle of 'cultivation > soil salinization > abandonment' shown in Figure 5.

- **Vegeculture Zone Group**

Core samples of pollen collected in the Kokoda Valley, Papua New Guinea, indicate that the origin of vegeculture there was much earlier than previously thought.

- **Swidden Agriculture Group**

Field tests of swidden agriculture in northeastern Japan verified that the use of fire was effective in eliminating harmful insects and weeds and in increasing inner-soil nitrogen, and thus that this agricultural technique has certain advantage to the modern agricultural technique.

Future research

Each research group will continue its efforts to develop the picture of Eurasian agricultural history in its respective climate zone. The *Mugi* and Monsoon Zone Groups will test each factor in their conceptual models of interactions between agriculture and the environment (Figure 4, 5), emphasizing the role of genetic diversity in relation to collapse and recovery of agricultural systems. The Vegeculture Zone Group will continue excavation in Papua New Guinea in order to describe the linkages between environmental change and early vegeculture there. The Swidden Agriculture Group will continue to build its database and analysis of present swidden fields and conduct studies to probe the conceptual models of the other research groups (Figure 4, 5). In particular, it will examine the relationship of fallows and genetic diversity in swidden agriculture, and the potential role of this relation to historical changes in genetic diversity and past cases of agricultural development and failure.

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 sewage systems—and also for its brief tenure. Indus cities and culture spread over 680,000 km² along the Indus and Ghaggar rivers and into Gujarat in Western India, yet its urban phase lasted for only 700 years, a much shorter period than any of its contemporaries. Drawing on archaeology, Indology, and paleo-environmental study, project members compose social and environmental histories of several Indus civilization cities in order to determine whether environmental factors were the cause of their short life and rapid decline.

Project Leader
OSADA Toshiki
RIHN

I am a linguist who has worked among the Munda people of Jharkhand, India, since the 1980s. I spent more than six years in India — from 1984 to 1990. The Munda appear to be one of the oldest peoples of India; (their linguistic roots may be traced back to the Indus civilization, the oldest of the Indian subcontinent). Formerly based at Kyoto University of Arts and Design, I joined RIHN in 2003 and proposed this project shortly thereafter in order to combine linguistic and archaeological inquiry into 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

Our project is divided into four research groups: (1) the palaeo-environment 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) (Figure 1). The four groups combine sarchaeology and Indology with paleo-environmental study in order to evaluate the impact of environmental change on the subsistence economy and trade network that sustained the Indus civilization's urban system. Important subjects of investigation in 2008 included the avulsion of the Ghaggar River, the palaeo-coastline in Gujarat, ancient climate change, and palaeo-seismic activities (Figure 2). PERG uses field research and satellite imagery to identify the former course of the Ghaggar River (the old Sarasvati River) and to determine the causes and the dates of its avulsion. Indologists of ICRG compare these findings to description of the Sarasvati River found in the ancient Rig-Veda text. MCRG has excavated the Farmana site along the Ghaggar River in order to better describe the Indus society and economy and assess its possible susceptiblity to environmental flux.

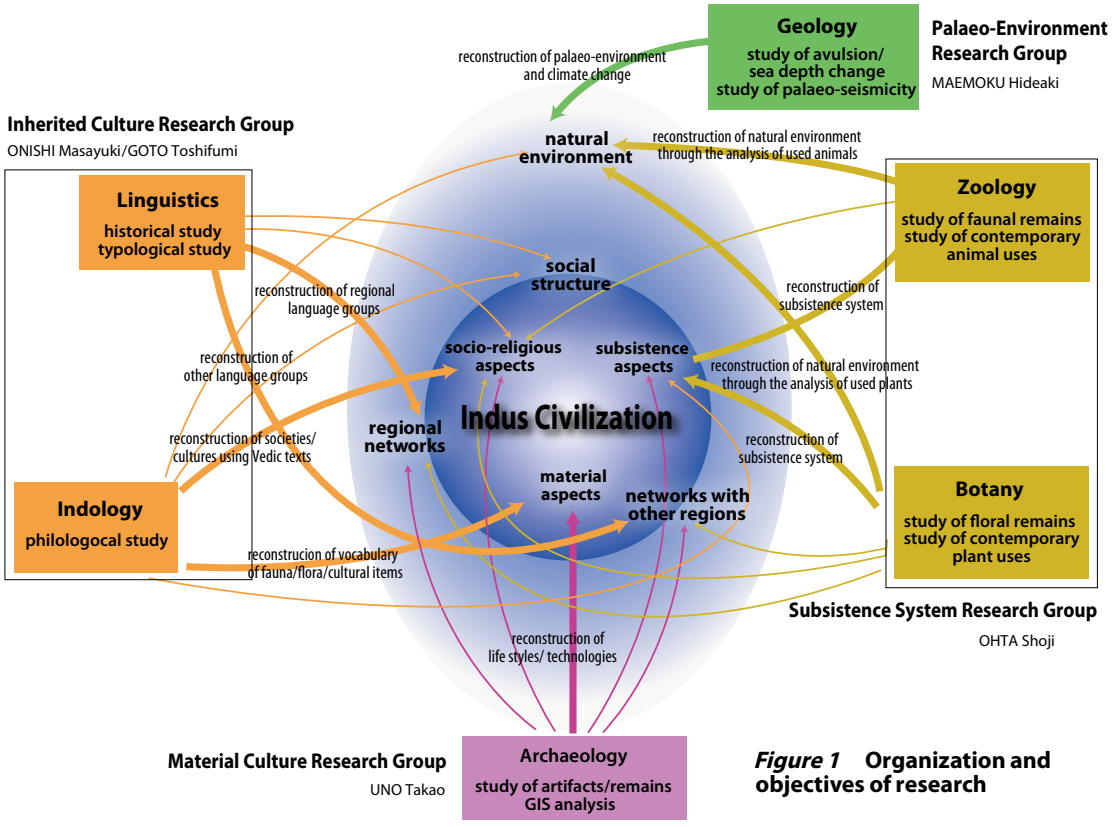

Figure 1 **Organization and objectives of research**

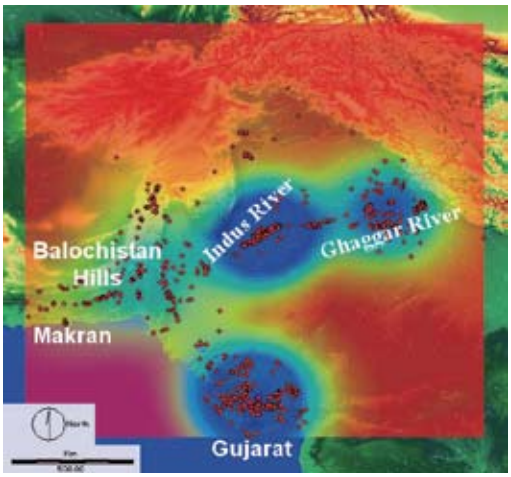

Figure 2 **Distribution and concentration of the Indus sites**

GIS allows integration of data obtained from each research group into a single database.

Photo 1 ***Graves at the Farmana site***

We have discovered many well-preserved human bones. We plan to begin DNA analysis of these bones in 2009.

Photo 2 **View of the Kanmer site**

Excavation revealed that the Kanmer site had been surrounded by large walls of stone.

Photo 3 **Pendants excavated from the Kanmer site**

The identical Indus seal is stamped on one side of each pendant and different lettered script is found on the reverse.

Geological and archaeological data obtained in excavation at Kanmer are combined to describe ancient sea level change along the coast of Gujarat. Palaeo- and ethno-botanical research are combined with philological and linguistic research to provide evidence of the past natural environment, subsistence system and trade network in this region.

We are particularly interested in the effect of the Indian Ocean Diapole (IOD) phenomenon on the decline of the Indus civilization. Coral samples taken in the Maldives allow description of Indus period sea temperatures and monsoon rains associated with the IOD. Integration of climate change evidence with pollen and pitholith analysis should allow us to describe the subsistence system of the Indus civilization and to examine whether environmental factors were involved in its decline.

Major Achievements

Excavations at Kanmer and Farmana have been immensely successful. In addition to uncovering a number of structures, including a citadel with rock walls (photo 2) and diverse artefacts, excavation teams found three pendants with Indus script (photo 3) and other Indus seals with and without Indus script. These artifacts provide important data for continued efforts to decipher the Indus writing system. In Farmana, where buildings made of sun-dried bricks were found in previous excavations, a large-scale burial ground was discovered (photo 1) as were grains of rice, which have rarely been found in Indus sites. Each of these findings makes a significant contribution to our understanding of the society, culture and subsistence system of the eastern Indus.

Paleo-environmental findings have also been substantial. It appears that the Ghaggar River, which was described as a large river in the Rig-Veda text, is likely to have been rather small and highly affected by the monsoon. If so, the Indus civilization would be unique among the four great ancient civilizations, all of which were established on large rivers. Simulation based on bathymetric data suggests that Indus period sea level was about two meters higher than in present day Gujarat. If correct, the cities which are currently found inland would have earlier been located along the coast.

Future Activities

Major excavations at the sites in Kanmer and Farmana were completed in 2008. The activities of MCRG members now shift to the analysis of obtained data. As of 2009, principal field activities will involve core sampling at Rara Lake and in the Maldives that may confirm our hypotheses of the Ghaggar and Gujarat sites. SSRG will carry out pollen and pitholith analysis on data already obtained from the excavations. Several human bones were discovered in the Farmana excavation, and a new research group specializing in DNA analysis will be formed for their analysis. In sum, our efforts are now directed towards synthesis of the findings of individual research groups in order to develop a robust description of the climate and subsistence systems of the Indus period.

Neolithisation and Modernisation: Landscape History on East Asian Inland Seas

This project aims at reconstructing and understanding historical landscape change to offer new insights into the concept of "cultural landscape". Focusing on the Japan Sea and East China Sea, our research concentrates on two periods of revolutionary landscape change, Neolithisation and Modernisation. The present project aspires to explicate the formative history of the present-day landscape through a holistic analysis from the human sciences' perspective.

Project Leader
UCHIYAMA Junzo
RIHN

Junzo Uchiyama is an Associate Professor whose academic background is environmental archaeology. He received his MA from Durham University, UK in 1996 and his PhD from the Graduate University for Advanced Studies in 2002. He is particularly keen on landscape changes in the Jomon period and assessing land use patterns based on the analysis of hunting animals, such as wild boar and deer.

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ZEBALLOS VELARDE, Carlos Renzo	RIHN

Research background and objectives

What is "landscape"? How should landscapes be maintained, protected or created? 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. 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 perception and identity for the next generation, which will in turn alter its environment according to its abilities and imagination. The term landscape thus refers to both the visible material landscape, the mental landscapes and their dynamic interrelations (Figure 2). As landscapes are the stages on which everyday life plays out, and contextualize the interactions between humanity and nature, landscape study can reveal how and why environmental issues arise and can best be addressed.

In recent years the terms "cultural landscape" and "cultural landscape protection" have gained importance in the international fight against the loss of cultural diversity. In the course of globalisation unique local landscapes that were rooted in peculiar traditional cultures are disappearing throughout the world. On the other hand, certain traditional landscapes are often idealized as examples of sustainability and virtuous interactions between humanity and nature. Large investments are made to maintain or even recreate such landscapes, even though the society and cultural processes that produced them are long lost. Understanding of the historical and cultural processes involved in landscape formation will help contemporary societies to address landscape extinction and design well-grounded landscape protection policies for the future.

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

Figure 1b **NEOMAP Organization**

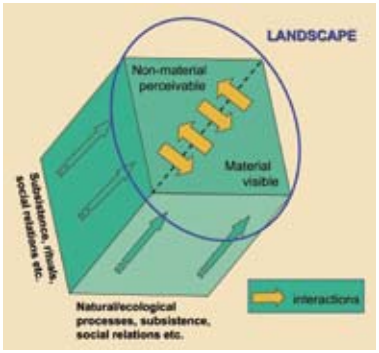

Figure 2 **Concept of Landscape**

Photo 1 **Shirakawa Village, Japan**

The present project focuses on the East Asian Inland Seas, a region of rich cultural and landscape diversity. This project examines landscape change in this area from the end of Ice Age up to the present day, with particular emphasis on Neolithisation and Modernisation, two epochs of profound landscape change. 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.

Photo 2 **The Research of Boisman Sell Mound in Primorye**

Results to date

The project has eight regional work groups that carry out research in eight key areas on the East Asian Inland Seas (Figure 1a). Research focuses on four umbrella topics: (1) The birth and expansion of agriculture; (2) Waterfronts including from the sea/lakes to the waterways/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

How 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 ever/increasing human exploitation of the environment, one that was manifest in domestication and gardening techniques already practiced in the primarily hunter-gatherer societies, "Neolithisation" should be defined as a process of human adaptation to the new natural environment following the end of the last Ice Age. As aggressive resource use and regional interdependency are characteristic of the present day as well, the Modernisation period can be seen as a climax—or continuation of—Neolithisation, and not as an utterly unique historical epoch.

(2) The cultural functions of inland seas

A sea has an immeasurable impact (both good and bad) on its surrounding landscapes. Inland seas enable migrations and new colonisations, transforming indigenous spiritual and sustenance landscapes and imposing new settler landscapes, as described by our Hokkaido workgroup. 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 view. At times, the maritime and continental influences cross-react, 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

A ban on killing living beings (animals, fish) was established in the Nara period (AD 710-794) under the influence of Buddhism. Its influence remained through premodern times in the form of taboo on eating meat, and has had a huge cultural impact over the natural environment of the Japanese archipelago. In the Middle Ages, hunting and fishing were 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. This had a profound impact on the landscape of the area: imagining the landscape from the Buddha statue's vantage point, the hunters and fishers went on altering some areas more than the others. The influence of this early landscape protection policy that was born from a religious and not environmental thought can be seen in the landscape until recent times.

Landscapes

1

2

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8

	Photographer	Location	
1	NAWATA Hiroshi	Sinai Peninsula, Egypt	Swarming egrets in the rich natural mangrove forest
2	NARAMA Chiyuki	Issy-Gol, Kyrgyzstan	Global warming is melting glaciers and leaving glacial lakes in the Tian Shan mountains
3	ENDO Takahiro	Triple frontier region of Thailand, Laos, and Myanmar	Boats coming and going along the Mekong River in the Golden Triangle
4	ENDO Takahiro	California, USA	Pacific Sea Lions with San Francisco in the background
5	ABE Ken-ichi	Indonesia	Taking a rest on a brace root during tough field research in a mangrove forest
6	ABE Ken-ichi	The upper Yangtze River, China	Milk coffee colored water flows, eroding the valley
7	NARAMA Chiyuki	Naryn Province, Kyrgyzstan	Pastoralism has been practiced since the time of the former Soviet Union and many pastoral farmers live in this area during summer
8	YUMOTO Takakazu	Uzuki-yama, Hiroshima	Each early spring, a controlled burn regenerates the grassland

Ecosophy Program

Global Area Studies

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 Resource

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 establish 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 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? People's 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. In addition, a number of original papers have been published for academic audiences.

Publications

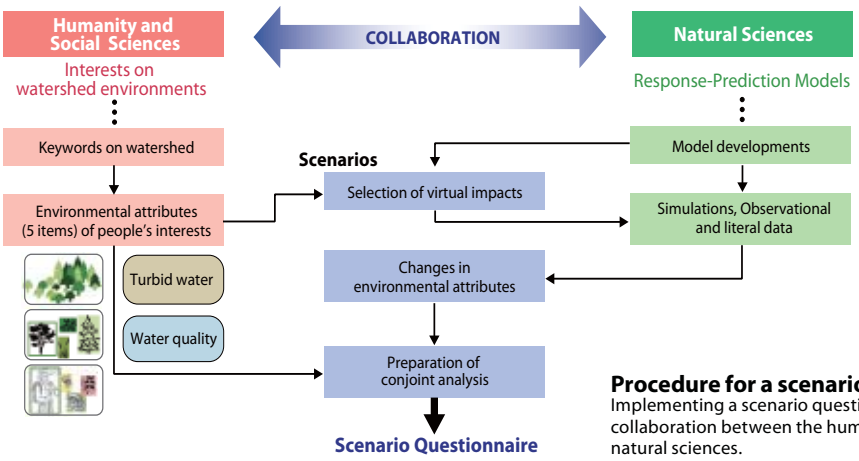
Fujimaki, R., R. Tateno and N. Tokuchi (2007) Root Development across a chronosequence in a Japanese cedar (*Cryptomeria japonica* D. Don) plantation, Journal of Forest Research, 12:96-102.

Fukuzawa, K., H. Shibata, K. Takagi, F. Satoh, T. Koike and K. Sasa (2007) Vertical distribution and seasonal pattern of fine-root dynamics in a cool-temperate forest in northern Japan: implication of the understory vegetation, Sasa dwarf bamboo. Ecological Research 22: 435-495.

Kawano, T., H. Takahara, T. Nomura, H. Shibata, S. Uemura, N. Sasaki and T. Yoshioka (2007) Holocene phytolith record at Picea glehnii stands on the Dorokawa Mire in northern Hokkaido, Japan. The Quaternary Research, 46:413-426.

Fukuzawa, K., H. Shibata, K. Takagi, M. Nomura, N. Kurima, T. Fukuzawa, F. Satoh and K. Sasa (2006) Effects of clear-cutting on nitrogen leaching and fine root dynamics in a cool temperate forested watershed in northern Japan, Forest Ecology and Management, 225:257-261.

Sekino, T. and T. Yoshioka (2005) Diagrammatic representation of environmental monitoring data. Korean Journal of Limnology, 38:76-83.



Procedure for a scenario questionnaire
Implementing a scenario questionnaire requires intensive collaboration between the human and social sciences and natural sciences.

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, it is necessary to thoroughly understand the interaction between unique islands environments and the social systems. This project examined Iriomote Island in Okinawa Prefecture as an example of contemporary island dynamics. We aim to provide 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 (RIHN until March 2009)

The Purpose of the Project

Islands throughout the world 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 others, as well as vulnerable to rapid social and environmental changes. Iriomote Island, a typical subtropical island located in Okinawa Prefecture, provides an ideal study example, as it is rich in natural resources such as water and virgin forests, as well as traditional art and culture.

Research

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 assess the human impact on rivers.

We described the functions and maintenance mechanisms of evergreen and mangrove forests, while studying biodiversity and interaction among organisms. We examined the dynamism of forests in an island environment and assessed the human impact on forests.

We examined the background of human activities causing deterioration of natural environments, including industrial development, demographic structure and government policies. In particular, we explored how the main industry of the island has changed from traditional agriculture to tourism and how this change has affected the island's social system.

Field school on seagrasses

Regarding the community decision-making process, we studied how local people understand the impact of human activities on the natural environment and how common rules have been modified over time according to changes in the use of natural resources.

Progress Status, Achievements, and Future Challenges

To clarify the water balance on Iriomote Island, we have installed a monitoring device on the island. The database is 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.

Our studies have shown that typhoons affect turnover in broadleaved evergreen forests. In forests including those of mangroves, we have been keeping track of production/circulation of substances, while monitoring the impact of human activities. We are providing information on effective maintenance and management of forests in the near future.

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 from the viewpoint of island economics. In this process, we have focused on tourism, agriculture, health and education.

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 communities' decision-making processes.

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 will proceed with this project so that the findings can contribute to promoting local industries and developing new ones. We take part in education at schools and in communities, and would like to help locals promote the island's traditional culture and communication 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 several 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. Many 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 soils 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 is an associate professor of resource and environmental economics at RIHN. 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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Project Objectives

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

This project uses the concept of social-ecological resilience in order to evaluate the attempts of agricultural societies in Sub-Saharan Africa to adapt to environmental change, population increase and rural social collapse. We investigate the mechanisms that facilitate recovery from specific social and environmental perturbations, the factors that determine the adaptive capacity of households and communities, and the role of institutions in strengthening overall social-ecological resilience. Such analysis can improve policies intended to enhance human security in developing countries.

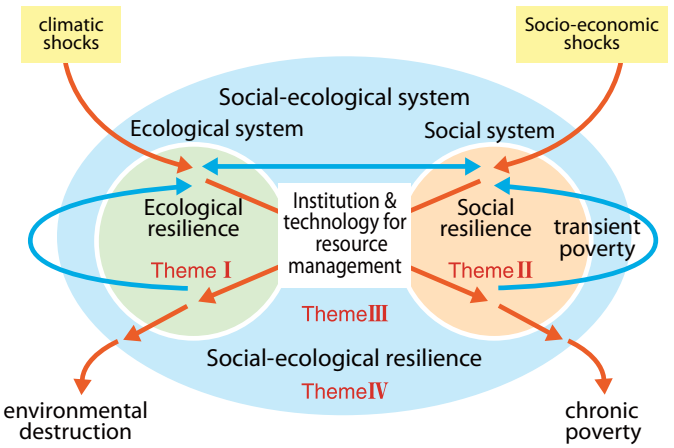

Figure 1 **Close Relationship between Social and Ecological Resilience**

Research Methods and Target Areas

The project is organized by four research themes. Theme I analyzes ecological resilience through examination of soil and forest resources. In theme II, we will conduct intensive interviews of farm households/communities and identify the factors affecting social resilience. Theme III considers historical changes in land tenure systems made by government policies and their effects on natural environment. It also examines the social and political factors that cause vulnerability, collapse and that aid in recovery in different communities. Theme IV uses statistics, remote sensing data and aerial photographs to help trace long-term changes in land cover, rainfall and temperature. Analysis of 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 irregularities; food security, poverty and environmental conservation are thus highly interrelated. The concept of social-ecological resilience can provide an integrative approach to human wellbeing and ecological integrity.

Research Outcomes to Date and Expected Results

1) Field trials at several sites in Southern Province showed that topography and water availability significantly influenced maize yield. Farmers responded to serious floods by shifting from cultivation of maize to sweet potato and beans during the 2007/2008 cropping season.
2) We collected rain gauge data from the fields of 48 households during the 2007/08 rainy season and 2008 dry season. Data show that plot-level rainfall can vary within a single village by as much as 190 mm/season.
3) We continued weekly household interviews in our three sample villages throughout the 2008 dry season and into the 2008/09 rainy season. Interviews address production, consumption, time allocations, social

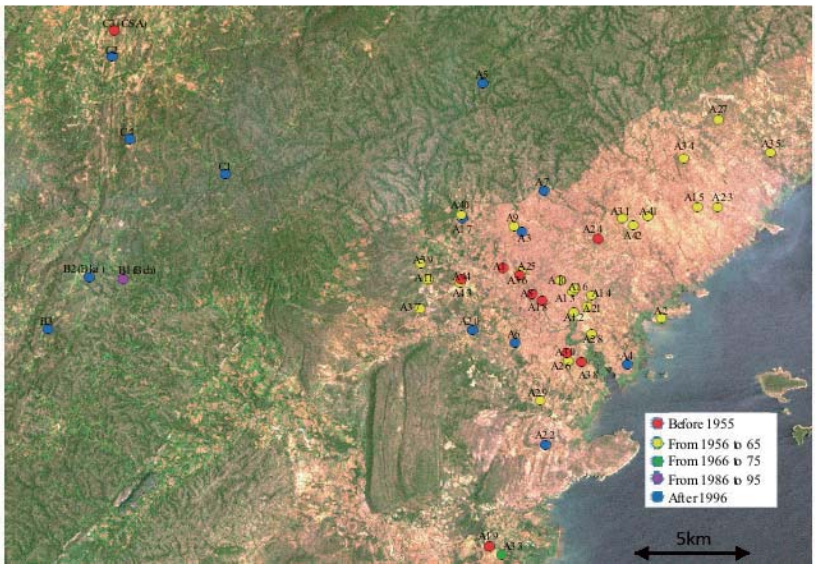

Figure 2 **Distribution of villages along Lake Kariba by year of their establishment**

Photo 1

Weeding is usually done by female household members using simple and labor intensive technology.

Photo 2

A Tonga village at site B, Southern Province.

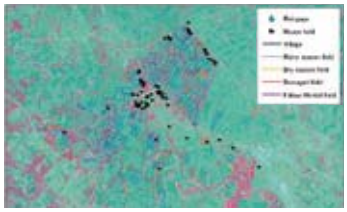

Figure 4

Distribution of fields in rainy and dry season, site A, Southern Province.

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

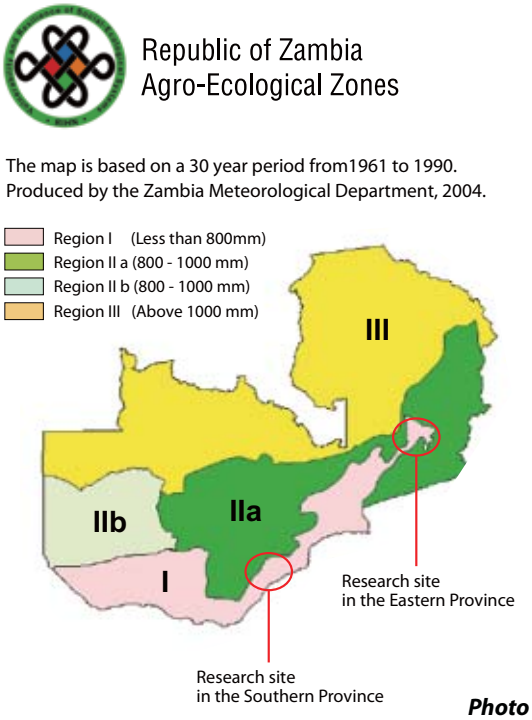

Photo 3

Raising cattle is an important form of saving among the Tonga population.

Photo 4

Villagers meet to grant their consent to the study, Eastern Province.

Photo 5

Field experiment to examine ecological response to human activities and climatic factors, Eastern Province.

activities; body measurements are also made.

4) We investigated agricultural land use in several principal study sites. To supplement satellite imagery, we conducted land use analysis using aerial photographs and GPS observations.
5) Various ethnographic studies were conducted to examine mechanisms and roles of alternative livelihoods in reducing household vulnerability to environmental variability. Additional anthropological studies were initiated to examine social networking, livestock rearing, and the effect of food aid.
6) A field experiment in Eastern Province showed that tree-burnt areas provided significantly higher maize yield than did non-burnt areas. Field trials for maize production, soil and vegetation survey were carefully conducted. Data collection and analysis of the effect of burning on overall ecological resilience are in progress.
7) Integration of four themes has advanced, especially through the linkage of temporal and spatial data.

Future plans

We will continue with data collection from household surveys, body measurements, and anthropological surveys and in qualitative and quantitative analyses of the factors affecting resilience.

Megacities and the Global Environment

The world's urban population has been increasing at an alarming speed in recent years, with the trend toward megacities getting stronger. This project examines the Jakarta metropolitan region, a classic example of a developing-world megacity. We attempt to develop an *urban sphere model* of megacity growth that can illuminate the negative environmental impacts associated with megacities while at the same time highlighting the real and potential benefits of urban life for citizens of the developing world.

Project Leader
MURAMATSU Shin
RIHN

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HAYASHI Kengo	RIHN

Research Background

It is predicted that more than twenty-seven megacities—cities with a population of 10 million or more—will exist in 2020. Most of these megacities will be located in developing countries where urban infrastructure and environmental regulation are already overwhelmed. The problems of urban sprawl, "heat island" effect, flooding, overcrowding and traffic are not just of local concern; they are also clearly linked to a number of global-scale environmental issues.

The problem of megacity growth has attracted the attention of urban administrators, academics, and those working in international aid and NPOs. Often their approaches to megacities, however, rely on those devised in the context of the climate, population size and historical development of 19th and 20th century Western Europe, the United States and Japan. Such approaches are not always applicable to megacities in developing countries, and can even be detrimental.

Research Methods and Target Regions

This study will be conducted in the following three phases:

Phase 1: Mechanism investigation

We will examine depletion of fisheries, degradation of urban amenities, and the negative impact of construction waste on the natural environment. Our analysis encompasses both causes and effects of these phenomena, which, when combined with urban inhabitants' value assessments, will identify and inform effective future urban regulation.

Phase 2: Database construction and utilization

We will create a system, content (a database of geographical space information and policies), and a structure of cooperation (consensus building) in order to allow various stakeholders—urban administrators, NGOs, citizens, and foreign institutions—to utilize the results of our research.

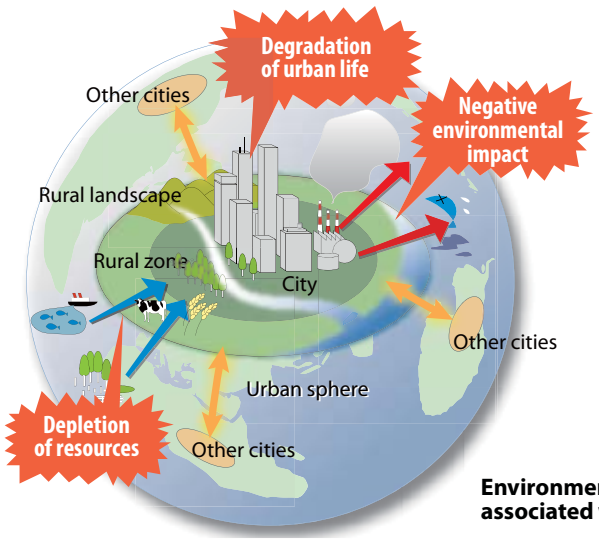
Phase 3: Urban sphere model and policy proposals

Based on the results gained in the first phase, we will present spatial placement plans and scenario-based forecasts that can be applied to existing or emerging megacities in developing countries.

Expected Results:

In 2009 we will:

1) Organize various study meetings regarding cities and the global environment, which will help us to further develop our research policy and methods;
2) Conduct preliminary research on Jakarta and other relevant cities;
3) Organize a conference together with the University of Indonesia in order to promote cooperative research;
4) Publicize the results of the above endeavors through websites and other English and Japanese language media.



Environmental problems associated with cities

An Environmental History of Nomads and Farmers in Central Asia

Central Asia is the crossroads of Eurasia. This project investigates the still unknown origins of Central Asian nomads and describes environmental change in the region over the last ten thousand years, with emphasis on the Syr Darya, Zeravshan, Amu Darya rivers, Aral Sea and the Pamir mountains. In clarifying the activities of and interactions between nomads and farmers, and their relation to the environmental changes of Central Asia we hope to compose a unique environmental history, and so to inform future interaction between humanity and nature in the region.

Principal Investigator
UNO Takao
International Research Center for Japanese Studies

Core Members

SATO Yo-Ichiro	RIHN
NAKANO Takanori	RIHN
KUBOTA Jumpei	RIHN
SAKAI Hideo	Faculty of Science, University of Toyama
YAMAGUCHI Hiroshi	International Research Center for Japanese Studies

Project Objectives

Central Asia is located at the center of the "yellow belt" of Eurasia, and it has long been a crossroads between Eastern and Western Asia and northern nomads and southern farmers. Our project will first investigate the origins of nomad peoples in this topography. Second, we will describe the water circulation systems that have sustained all life in the Pamirs, the three large rivers of the region and Aral Sea. Third, we will describe and compare the activities of nomads and farmers from their origins until modern times, and clarify the impact of these peoples on Central Asian environments. We will also explore possibilities for the future interaction between humankind and nature suggested by the research results.

Methodology

We research the origin of nomads by excavating their burial places and collecting bone fragments of livestock (Photo 1). Morphological and genetic analysis of livestock bones will allow us to determine whether nomads were involved in the domestication of wild animals or if their livestock species were originally domesticated by agricultural peoples. Core-sampling and proxy analysis at the Pamir Mountains and Aral Sea allow us to describe long-term environmental change in these areas. A Geographic Information System will allow us to reconstruct paleo-topography and attempt runoff analysis. Digital Elevation Models (Figure 2) will describe long-term environmental change of drainage basins. Comparing such environmental data with archaeological, anthropological and historical data of nomad and farmer activities will allow us to develop a rich description of Central Asian human and environmental history.

Photo 1 **Tombs of nomads in Kurgan, Sazagan cemetery, Uzbekistan**

Figure 1 **Runoff analysis in Central Asia. SRTM 3 data is used to create a base map**

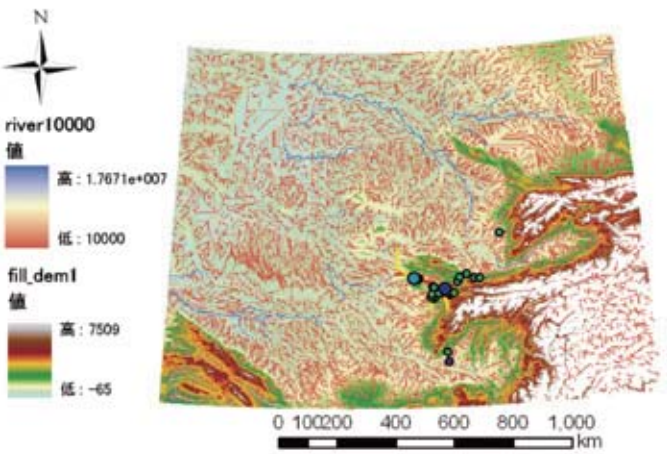
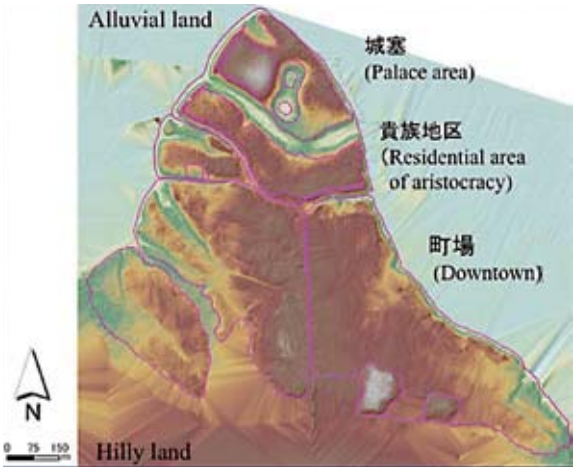


Figure 2 **A Digital Elevation Model of an urban settlement at Dabusya, Uzbekistan**



Agricultural and Hydrological Cycles in the Changjiang Basin

This study examines interactions between agricultural activities and hydrological environments in the rapidly changing Changjiang basin in south China. It will clarify the influence of recent socio-economic and climate change on the hydrologic cycle in the Changjiang basin, as well as the manner in which this change impacts basin residents and adjacent dry regions, and so improve human capability to mitigate and adapt to contemporary environmental change.

Principal Investigator
TANAKA Hiroki
Hydrospheric Atmospheric Research Center, Nagoya University

Core Members

TANAKA Kenji	Disaster Prevention Research Institute, Kyoto University
LIU Yuanbo	Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences
UCHIDA Taro	Public Works Research Institute, Japan
ZHU Anxin	Department of Sociology, Nanjing University
TATENO Ryunosuke	Faculty of Agriculture, Kagoshima University
ENDO Nobuhiko	Research Institute for Global Change, Japan Agency for Marine-Earth Science and Technology
YAMADA Hiroyuki	Research Institute for Global Change, Japan Agency for Marine-Earth Science and Technology
TANAKA Shigeyoshi	Graduate School of Environmental Studies, Nagoya University
ONISHI Akio	Graduate School of Environmental Studies, Nagoya University
HIYAMA Tetsuya	Hydrospheric Atmospheric Research Center, Nagoya University
MORIMOTO Akihiko	Hydrospheric Atmospheric Research Center, Nagoya University

Project overview

Water is essential to all life. It circulates in many forms throughout the biosphere. Even small fluctuations in the hydrologic cycle—small changes in the temporal and spatial distribution of water—may have significant impacts on human activities.

Economic development is rapidly changing land use in China. Urban and peri-urban areas have been transformed, but rural areas have also been affected, for example by improvements in rural livelihoods and change in rural industrial structure. Change in land use and land cover is now associated with local environmental problems in the basin as well as global climate change. This study investigates human-environmental interactions in the Changjiang basin, with emphasis on the environmental problems associated with interactions between agriculture and the hydrologic cycle.

Research methods and expected results

Analysis of statistical data, literature of socio-economic and land use activities, remotely sensed land cover data, and materials gathered in the field will allow us to compile a spatially explicit history and dataset of land use in the basin. We will describe the key social and natural factors contributing to changes in land use. Important social factors to be considered include changes in policy, economy, agriculture, society, industry, and water use, while natural factors include changes in climate and distribution of precipitation.

Field measurements of hydrometeorological properties, including river discharge and precipitation, will be made at several points in the basin. Changes in the water environment and in patterns of water- and land-use in each area will be represented quantitatively. Analysis of this data should describe the root causes of contemporary hydrologic problems, and illuminate interactions of different biophysical systems and their impacts on human societies, and so improve human capability to mitigate and adapt to contemporary environmental change.

Hilly terrain in the middle stream of Changjiang basin, southern Jiangxi Province, China, 1993.

Small-scale paddy fields, distributed over severely eroded hills, recharge the regional water table. What impact will rapid economic development, or the shift to a market economy, have on this landscape?

Ecosystems and Social Sustainability in Coastal Southeast Asia

The coastal areas of Southeast Asia contain great biodiversity, and livelihoods of the people of Southeast Asia directly and indirectly depend on this biodiversity. We use a holistic approach to give a full accounting of how people use coastal resources so that rational and sensible measures to for social and ecological sustainability can be established.

Principal Investigator
ISHIKAWA Satoshi
School of Marine Science and Technology, Tokai University

Core Members

OKAMOTO Junichiro	Graduate School of Fisheries Sciences, Hokkaido University
KUROKURA Hisashi	Graduate School of Agricultural and life Sciences, University of Tokyo
SANO Mitsuhiko	Graduate School of Agricultural and life Sciences, University of Tokyo
NISHIDA Mutsumi	Ocean Research Institute, University of Tokyo
ARIMOTO Takafumi	Faculty of Marine Science, Tokyo University of Marine Science and Technology
BABA Osamu	Faculty of Marine Science, Tokyo University of Marine Science and Technology
YOSHIKAWA Takashi	School of marine science and technology, Tokai University
YAMADA Yoshihiko	School of marine science and technology, Tokai University
TAWA Masataka	Department of Geography, Kwansei Gakuin University
KAWADA Makito	School of Contemporary Sociology, Chukyo University
KONO Yasuyuki	Center for Southeast Asian Studies, Kyoto University
TAKAHASHI Hiroshi	National Fisheries University
MATSUOKA Tatsuro	Department of Fishery, Kagoshima University
MOTOMURA Hiroyuki	The Kagoshima University Museum
HORI Mina	Graduate School of Agricultural and life Sciences, University of Tokyo

Purpose of the project

This project will conduct interdisciplinary field surveys in the coastal areas of Southeast Asia in order to establish a consolidated database of livelihood and resource utilization. This database will stimulate exchange of ideas, opinions and information among local people, researchers, politicians and other interested stakeholders. The resulting dialogue will improve understanding of social and ecological interdependence in the region, so that rational and sensible countermeasures for social and ecological sustainability can be established.

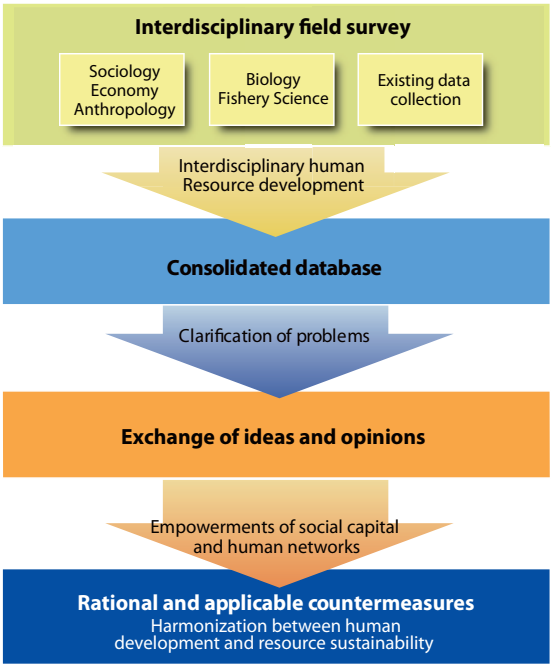
Research Approaches

1. Interdisciplinary field surveys
Data on biodiversity and resource utilization in coastal areas of Southeast Asia will be complied through collaborative field surveys conducted by biologists, economists, anthropologists and others. Some biological samples will be subject to molecular and stable isotope analysis in order to identify the stock and ecosystem structure.

2. Consolidated database
All information collected by the field surveys is compiled into databases that will be available through the World Wide Web. The results of scientific analysis, including DNA and stable isotope analysis, are also included the database.

3. Dialogue and exchange
Researchers examine principal patterns of resource utilization in relation to sustainable resource use. Research findings are provided to resource users and managers and other involved stakeholders. The project offers a series of workshops in order to facilitate the exchange of ideas and opinions about resource problems.

4. Establish countermeasures
The project solicits advice from local people, researchers, politicians and others regarding pressing resource and livelihood problems, and attempts to develop countermeasures to improve social and ecological interactions. Project researcher actions and monitoring systems are determined through popular discussions.



Project framework and approach

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, and exchange ideas of potential solutions. Project researchers will also monitor feedback mechanisms, once countermeasures are adopted. In addition, as continued field surveys will be required to update the database, this project will contribute to the formation of a new human network of social and ecological sustainability.

Development, Migration, Environmental Change and Human Health in Malaysia

Globalization is transforming lifestyles, livelihoods and environments around the world. People in search of economic advantage follow development, moving from one place to another. Development projects, such as infrastructure work, industry, and the associated changes in cultural landscapes, have dramatic, and sometimes dire, effect on biophysical environments. This project will evaluate change in natural and social environments associated with development and population flows in Malaysia, and quantitatively measure their impact on human health.

Principal Investigator
SUDA Kazuhiro
Faculty of Humanities,
Hokkai-Gakuen University

Core Members

KUCHIKURA Yukio	Faculty of Regional Studies, Gifu University
ODANI Shingo	Faculty of Letters, Chiba University
NOBUTA Toshihiro	National Museum of Ethnology
TAWA Masataka	School of Humanities, Kwansei Gakuin University
IIDA Taku	National Museum of Ethnology
WATANABE Chiho	Graduate School of Medicine, University of Tokyo
INAOKA Tsukasa	Faculty of Agriculture, Saga University
OOKUBO Satoru	Graduate School of Agricultural and Life Sciences, University of Tokyo
UMEZAKI Masahiro	Graduate School of Medicine, University of Tokyo
NISHITANI Masaru	National Museum of Japanese History
Mohd Zahedi bin Daud	Malaysia Darul Iman University
Ramle bin Abdullah	Malaysia Darul Iman University

Project Background and Objectives

People adapt in different ways to the environmental effects of development. Some people may remain in their home regions to actively take part in the development, while the other may choose or be obliged to migrate to other regions or nations in an attempt to maintain or better their lifestyles. Such population flows may put additional pressure on local environments and social systems; intensified use of resource associated with development can lead to conflict between the original occupants of an area and newcomers. This project evaluates the effect of development and population flow on biophysical and social environments in Southeast Asia, especially by quantifying their impact on human health.

Research Method and Expected Results

Development in rural Malaysia has taken the form of palm oil production and dam construction, both of which encroach on tropical forests in Malaysia. This project examines the coping mechanisms and responses of the *Orang Asli* people, an aboriginal people in peninsular Malaysia, to such development. We will collect and analyze data in three spheres: 1) the human relation with environments, such as resource use, subsistence strategy and perception of environments, 2) natural and social environments, such as environmental assessment and legislation of land and resource use, 3) the influence of environments on humans, especially as new environments of development affect nutrition and health. With respect to population flow, we also study the national and international origins of migrant in order to examine regional developments in relation to new population flows.

A tropical forest submerged by a dam
This forest was formerly the subsistence area for the *Orang Asli* people.

Genetic Pollution, Farming Ecosystems and New Energy Crops in Tropical Asia

Rapidly expanding cultivation of new energy crops is reducing the area of rain forest in Tropical Asia. Biofuel crops require intensive application of chemical fertilizers and pesticides, which can pollute surrounding ecosystems and damage human health. Energy crops also displace cultivation of food for human consumption, endangering food security. This project examines the effect of energy crops on biodiversity and human health in Tropical Asia.

Principal Investigator
SATO Tadashi
Graduate School of Life Sciences, Tohoku University

Core Members

KASAHARA Yasuhiro	Institute of Low Temperature Science, Hokkaido University
KIMURA Toshiaki	Graduate School of Arts and Letters, Tohoku University
KAWANO kazuaki	Kagoshima Prefectural Museum of Culture Reimeikan
MATO Tooru	Graduate School of Agriculture, Kyoto University
SATO Yo-Ichiro	RIHN
YUMOTO Takakazu	RIHN

Research purpose

This research project investigates the following themes: 1) the factors influencing conversion from traditional agriculture to modern agriculture in Tropical Asia; 2) the biodiversity in traditional and modern farming ecosystems, including microorganisms coexisting in the rhizosphere and plants; 3) genetic diversity of crops in different cultivation systems; 4) the sociocultural infrastructure, such as mythology and customary practices, related to traditional agriculture and foodstuffs. In combination, the above themes will describe the role of farm- and ecosystem-scale biodiversity in sustainable crop production. Further, we will determine to what degree genetic diversity is related to traditional social and agricultural systems. Based on this analysis, the research project should present proposals for sustainable food production in tropical Asia.

Research methods

Field research will take place in regions of tropical Asia where modern agriculture is displacing traditional agriculture. We have conducted several preliminary investigations, including: examination of genetic-diversity of crops and the dynamic state of nutrients such as nitrogen and phosphoric acid in distinct agricultural systems; examination of field biodiversity found in companion planting, soil microbes, and symbiotic microbes; ethnic and religious studies investigating traditional farming systems and food consumption. Molecular biological and stable isotope analysis will complement field observations. Social-scientific investigations entail interviews and field investigations as well as reviews of existing literature.

Future study

In this year of feasibility study, we emphasize: 1) clarification of physical and socio-cultural factors that most influence biodiversity and genetic-diversity in farming ecosystems; and 2) advancing our proposal concerning the key components of sustainable food production and consumption in tropical Asia.

Traditional farming field located in a valley of Northern Laos
Rice yields here reached 3 tons per hectare without chemical pesticides and fertilizers. Slash and burn fields are visible in the surrounding mountains.

In-field diversity in Northern Laos
Various rice cultivars have different colors and panicle sizes.

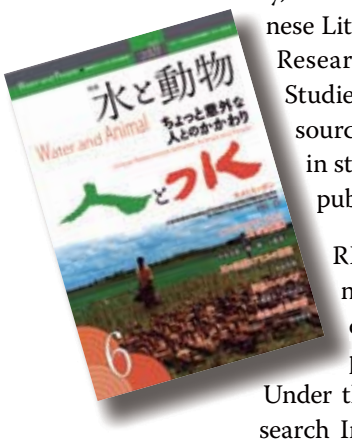
Rice and fish are harvested in paddy fields/ pond systems in Sulawesi, Indonesia
The circles visible within paddy fields are the banks of excavated fish ponds.

Completed Research

Research projects completed in the previous two years (2008/09) are assessed by the Project Evaluation Committee and so have been described in the program domain sections. The following projects were completed in years previous to 2008.

Domain	Year completed	Project leader	Project title	Present affiliation of project leaders
Circulation	2007	**HAYASAKA Tadahiro**	Emissions of Greenhouse Gases and Aerosols, and Human Activities in East Asia	Center for Atmospheric and Oceanic Studies, Graduate School of Science, Tohoku University
Circulation	2007	**KANAE Shinjiro**	Global Water Cycle Variation and the Current World Water Resources Issues and Their Perspectives	Institute of Industrial Science, University of Tokyo
Resources	2007	**WATANABE Tsugihiro**	Impact of Climate Changes on Agricultural Production System in the Arid Areas	RIHN
Ecohistory	2007	**NAKAWO Masayoshi**	Historical Evolution of the Adaptability in an Oasis Region to Water Resource Changes	National Institutes for the Humanities
Ecosophy	2007	**YACHI Shigeo**	Multi-Disciplinary Research for Understanding Interactions between Humans and Nature in the Lake Biwa-Yodo River Watershed	Center for Ecological Research, Kyoto University

RIHN within the National Institutes for the Humanities



The National Institutes for the Humanities was established on 1 April 2004. RIHN joined the National Museum of Japanese History, the National Institute of Japanese Literature, the International Research Center for Japanese Studies and the National Museum of Ethnology as a member institute. RIHN shares resources and contributes to joint research with other NIHU institutes, and collaborates in staging public lectures and symposia and other activities designed to generate broad public interest in intersections between the humanities and the environment.

RIHN coordinates two NIHU endeavors on topics of great regional and global significance: Water in Asia, and environmental transformation in China. RIHN is the core institution in the Integrated Study of Water and People in Humid Asia, and publishes themed issues of the journal Water and People for a specialist audience. Under the NIHU Center for the Promotion of Area Studies, RIHN established the Research Initiative for Chinese Environmental Issues. The RIHN-China Newsletter, published in Japanese and Chinese, and the Symposium Series on Chinese Environmental Issues, held at locations in both Japan and China, have established RIHN as a central node in the network of scholars concerned with environmental transformation in China.

Science Communication

As a national research institute RIHN is expected to conduct exemplary science; it also must communicate its research agenda and results to the public. A number of public symposia and campaigns, seminar series, and publications are designed to reach specialist and general audiences, and to stimulate both formal fields of environmental knowledge and popular engagement with environmentalism. Some of these recent activities include:

Kyoto Forum on Environmental Wisdom and Culture

RIHN and Kyoto Prefecture and 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

International symposia are held in English and allow a range of experts to discuss pressing environmental subjects.

- ***The Dilemma of Boundaries: Toward a New Concept of Catchment*** **(upcoming)**
- ***The Futurability of Islands: Beyond Endemism and Vulnerability***

RIHN Public Seminars

Held almost monthly on-site at RIHN, recent public seminars include:

- ***Nature and Environmental Disruption in Tropical Forest in Malaysia and Grassland in Mongolia***
  - SAKAI Shoko — Associate Professor, RIHN
  - FUJITA Noboru — Assistant Professor, Center for Ecological Research, Kyoto University
  - YAMAMURA Norio — Professor, RIHN
- ***Global Environmental Change and Health: How should we change our lifestyles?***
  - MOJI Kazuhiko — Professor, RIHN
  - OKUMIYA Kiyohito — Associate Professor, RIHN
- ***Whaling Eco-Politics: A new horizon of human interactions with wildlife in the 21st century***
  - HOSHIKAWA Jun — Executive Director, Greenpeace Japan
  - AKIMICHI Tomoya — Deputy Director-General, Professor, RIHN
- ***Dendrochronology: From the past to the future***
  - MITSUTANI Takumi — Visiting Professor, RIHN
  - SATO Yo-Ichiro — Professor, RIHN
- ***Antarctic Research and the Global Environment***
  - NAKAWO Masayoshi — Professor, RIHN
  - SAITO Kiyoaki — Professor, RIHN
  - SHIRAIWA Takayuki — Professor, RIHN

The RIHN Forum

The RIHN Forum is usually held at the Kyoto International Conference Center and is open to the general public. Since 2004 the proceedings were published as books intended for a general audience. Recent subjects include:

- ***Our Responsibilities toward Unseen People and Unborn Generations***
- ***Human Wellbeing and the Environment: Designing Global Ecohealth***

Project-based communication

Individual research projects host a number of conferences, symposia and seminars. One of these, Sato Project's (H-02) Seminar on Environmental Thought offers distinguished intellectuals, artists, journalists, and a range of other speakers an opportunity to make provocative discussion of contemporary environmentalism, to uncover or rediscover the ecological knowledge embedded in culture, to activate our daily sensitivity to nature, and to seek an eco-philosophy equal to the contemporary world.
Recent seminars include:

- **Why do I love flowers?**
  AZUMA Makoto, Flower artist
- ***De profundis:* Nature in Japanese Ceramic Art**
  RAKU Kichiza'emon the 15th, Potter, Director of the Raku Museum, Kyoto
- **Silenced by Aesthetics? A Tentative Poetics of Art History and Ecology**
  Gregory P. A. LEVINE Associate Professor, University of California, Berkeley
- **What is Chanoyu? Japanese Tea Culture in Search of a Contemporary Lifestyle**
  KUMAKURA Isao Professor Emeritus, National Museum of Ethnology, Osaka
- **Millennial Cuisine: Food and Prepared Dishes from the Heian Imperial Court**
  HORIBA Hiroyuki Head Chef, Rokusei restaurant, Kyoto

RIHN Area Seminars

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

- ***For Better Human Life in Yambaru: Conservation of nature, culture and landscape and the role of tourism***

TACHIMOTO Narifumi	Director-General, RIHN
YUMOTO Takakazu	Professor, RIHN
NAKAHARA Hirotetsu	Director, Nakijin Village History & Culture Center
MIZUSHIMA Satoru	Tourism Resources Division, Japan Tourism Agency
INOUE Noriko	Cultural Property Examiner, Agency for Cultural Affairs
HAYAISHI Shuhei	Adjanct Lecturer, University of the Ryukyus
ANKEI Yuji	Professor, Yamaguchi Prefectural University
KUDAKA Masakazu	Advisor, NPO Kunigami Tourism Association
SHIMABUKURO Seibin	Director, Yambaru Monozukuri Juku
HANAI Masamitsu	Professor, University of the Ryukyus

RIHN Seminars

RIHN also invites a range of speakers from abroad to share their expertise with the RIHN community. Recent seminars include:

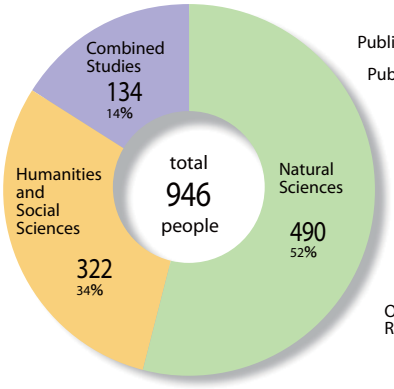
- ***The Evolution of Scientific Research and Science Magazine***
  Barbara R. JASNY Deputy Editor for Commentary, Science/AAAS
- ***Satoyama woodlands in Japan and outlands in Europe: An historical perspective on traditional farming landscapes***
  Bjorn E. BERGLUND Department of Geology/Quaternary Geology, GeoBiosphere Science Centre, Lund University Sweden
- ***The Global Precipitation Centre (GPCC): Rain gauge-based precipitation analysis for the land areas of the Earth in support of climate research and water resources management***
  Tobias FUCHS Director, Global Precipitation Climatology Centre, Germany
- ***Constructing Sustainability Studies***
  TAKEUCHI Kazuhiko Vice-Rector, United Nations University, Professor, Laboratory of Landscape Ecology and Planning, Department of Ecosystem Studies, The University of Tokyo

Books in Translation

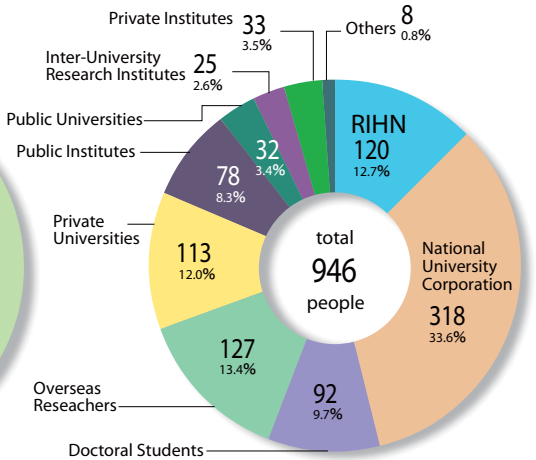
In 2008 RIHN professors OSADA Toshiki and SATO Yo-Ichiro translated into Japanese Peter Bellwood's magisterial volume on the origins of agriculture *First Farmers: The Origin of Agricultural Societies*. ***Nōkō Kigen no Jinruishi*** was published by Kyoto University Press.

Research Collaboration

Research Affiliations



Research Areas



Affiliate Organizations

*As of May 1st, 2008

International Collaboration

RIHN has signed memoranda and research cooperation agreements with overseas research institutes to encourage cooperative projects, share information, and exchange researchers. RIHN also invites many distinguished overseas researchers to serve as visiting research fellows at RIHN for periods of up to one year.

Memoranda of Understanding and Research Cooperation Agreements

(As of June 5th, 2009)

Project C-04
Far Eastern Branch of the Russian Academy of Sciences, Russia

Project C-05
Department of Groundwater Resources, Ministry of Natural Resources and Environment, Thailand
Institute of Earth Sciences, Academia Sinica, Taiwan
Korea Research Institute for Human Settlements, South Korea
Research Center for Geotechnology, Indonesian Institute of Sciences, Indonesia

Project C-06
Research Center for Environmental Technology of River and Lake, Shanghai Jiao Tong University, China

Project D-02
Institute of Islands Culture, South Korea

Project D-03
Qinghai University Hospital, China

Project D-04
Hustai National Park Trust, Mongolia
Institute of Biology, Mongolian Academy of Science, Mongolia
Institute of Botany, Mongolian Academy of Science, Mongolia
Institute of Geoecology, Mongolian Academy of Science, Mongolia
Institute of Meteorology and Hydrology, Ministry of Nature and Environment, Mongolia

Project R-01
Adiyaman University, Turkey
Çukurova University, Turkey

Project R-02
La Fondation Maison des Sciences de l'Homme, France

Project R-03
Institute of Archaeology Kazakhstan
Institute of Geography Kazakhstan
Institute of Mountain Hazards and Environment, CAS, China
Kazakhstan Scientific Research Institute on Problems of the Cultural Heritage on Nomads Kazakhstan
Northwest Sci-Tech University of Agriculture and Forestry, China
Tethys Scientific Society , Kazakhstan

Project R-04
International Centre for Diarrhoeal Disease Research, Bangladesh
National Institute of Public Health, Ministry of Health, Laos

Project R-05
Sudan University of Science and Technology, Sudan

Project H-02
Cambodian Agricultural Research and Development Institute, Cambodia
Çukurova University, Turkey
Cuu Long Delta Rice Research Institute, Vietnam
Faculty of Agriculture, Hasanuddin University, Indonesia
Institute of Archaeology, CAS, China
National Agriculture and Forestry Research Institute, Laos
Rice Department, Ministry of Agriculture and Cooperatives, Thailand
Research Institute of Cultural and Archaeological Relics of Xinjiang, China
University of the Philippines, Los Baños, Philippines

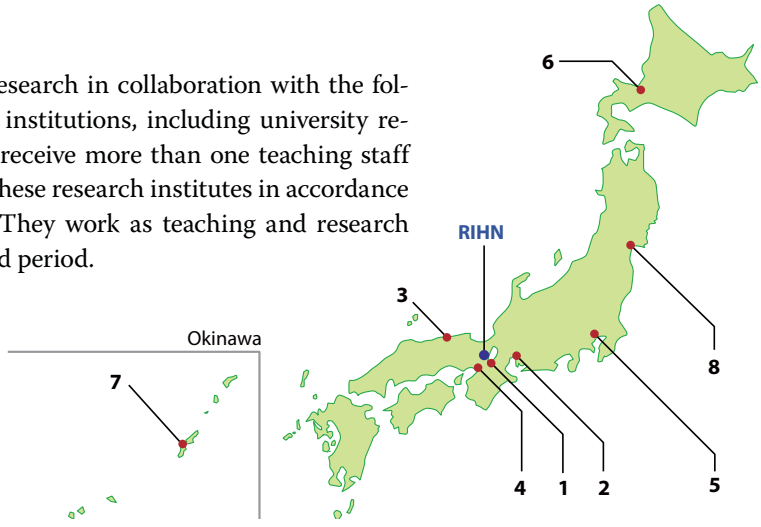
Project H-03
Deccan College, Post-Graduate and Research Institute, India
Shah Abdul Latif University, Pakistan
University of the Punjab, Pakistan

Project H-04
Far Eastern National University, Russia
Sainsbury Institute for the Study of Japanese Arts and Cultures, United Kingdom

Project E-04
Zambia Agricultural Research Institute, Ministry of Agriculture and Cooperatives, Zambia

Collaboration in Japan

RIHN has promoted research in collaboration with the following eight domestic institutions, including university research institutes. We receive more than one teaching staff member from each of these research institutes in accordance with our agreement. They work as teaching and research staff at RIHN for a fixed period.



Partner Organization

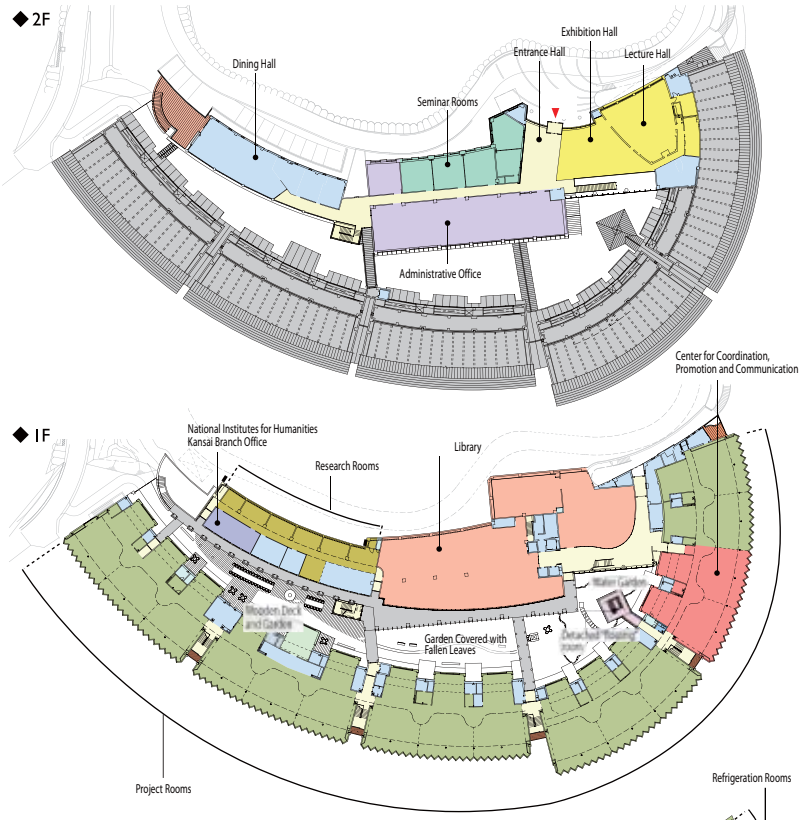
1. Center for Ecological Research, Kyoto University
2. Hydrospheric-Atmospheric Research Center, Nagoya University
3. Arid Land Research Center, Tottori University
4. National Museum of Ethnology
5. Institute of Industrial Sciences, The University of Tokyo
6. Institute of Low Temperature Science, Hokkaido University
7. Tropical Biosphere Research Center, University of the Ryukyus
8. Graduate School of Science, Tohoku University

A Guide to the Facilities

Research rooms on the RIHN campus are designed to provide a sense of openness. The design concept is to allow projects implemented to be loosely interconnected as they occur in one large curved space 150 m in overall length. The facilities will 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. In other words, this particular layout enables joint research while maintaining the independence of individual projects. 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 that fits in with 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.



Main building entrance

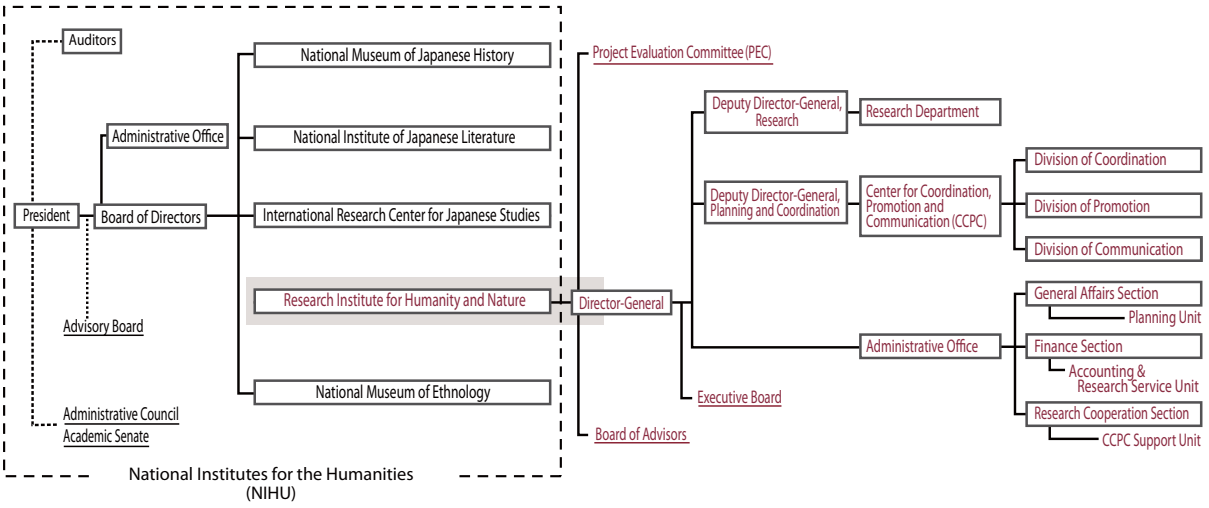
Detached "floating" meeting room

Laboratory

RIHN House

Organization

Organization



Financial Information

■ Segmental Financial Information (Fiscal Year 2007)

Operating Expenses

Category	Amount (Yen in thousands)
Operating Expenses	2,172,191
Inter-University/Joint Research	1,130,294
Educational/Research Aids	60,396
Outsourced Studies	43,089
Outsourced Operations	412
Personnel	937,998
General Management	160,496
Financial Expenses	76,862
Total Expenses	2,409,551

Operating Income

Category	Amount (Yen in thousands)
Subsidy for Operation	2,138,122
Contract Research, etc.	55,004
Contract Operations, etc.	412
Donations	5,089
Others	239,502
Total Earnings	2,438,131

Operational Balance 28,580

■ External Sources of Funding

(Fiscal Year 2007)

Category	Amount (Yen in thousands)
Fund for Promotion of Academic and Industrial Collaboration	55,005
Grants-in-Aids for Scientific Research	94,214
Donations for Research	2,500

* 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, plannng, 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
UEDA Hiroshi
Director, Hydrospheric Atomspheric Reearch Center,
Nagoya University
WASHIDA Kiyokazu
President, Osaka University
YOKOYAMA Toshio
Professor, Kyoto University Graduate School of Global Environmental Studies
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.

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OHTSUKA Ryutaro
Advisor, National Institute for Environmental Studies
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Professor, School of Science, The University of Tokyo
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Professor, School of Archaeology and Anthropology,
The Australian National University, Australia
FU, Congbin
Director, START Regional Center for Temperate East Asia, China;
Research Professor, Institute of Atomospheric 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

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Oversees administrative operation of the institute.

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Program Director
TANIGUCHI Makoto
Program Director
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Program Director
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Program Director
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Director, Administrative Office

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International Affairs Subsection
Head OGATA Rika
CCPC Support Unit
Head ISHIDA Yataro
CCPC Support Subunit
Head ONO Futoshi

RESEARCH DEPARTMENT

*As of June, 2009
*in alphabetical order

Program Directors

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

Professors

INOUE Gen	Atmospheric Chemistry
KAWABATA Zen'ichiro	Microbial Ecology
KINOSHITA Tetsuya	History of Chinese Philosophy
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

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

Assistant Professors

ENDO Takahiro	Political Science
KATO Yuzo	Legal History
YATAGAI Akiyo	Meterology, Climatology

Visiting Professors

GOTO Tamon	Chinese History, Film Making
IEDA Osamu	East European Area Studies, East European Economic History
MITSUTANI Takumi	Dendrochronology
SHIBAYAMA Mamoru	Area Informatics
SUDA Kazuhiro	Ecological Anthropology
UNO Takao	Archaeology

Visiting Associate Professors

ISHIKAWA Satoshi	Conservation Ecology, Global Fisheries Science
SATO Tadashi	Genetic Ecology

Visiting Reseach Fellows

AIZEN, Vladimir B.	Glaciology, Hydrology, Climatology
BOERZHIJIN, Wuyunbilige	Mongolian History
C. R. Ranganathan	Mathematics
FULLER, Dorian	Archaeobotany
MERTZ, Mechtild	Wood Anatomy, Ethnobotany, East Asian Art History
WITZEL, Michael	Indology

Senior Project Researchers

CHENGZHI	Central Eurasian History
FUJIWARA Junko	Cultural Anthropology
HASEGAWA Shigeaki	Theoretical Ecology
KUME Takashi	Isotopic Soil Hydrology
KURATA Takashi	Philosophy
LEKPRICHAKUL, Thamana	Environmental & Health Economics
MAKIBAYASHI Keisuke	Archaeology
MINAMOTO Toshifumi	Molecular Ecology
MORI Wakaha	Linguistics, Sumerology
ONISHI Masayuki	Linguistic Typology
ONISHI Takeo	Hydrology
SAKAI Toru	Geoscience
ZEBALLOS VELARDE, Carlos Renzo	Urban Environmental Planning

Project Researchers

CAI, Guoxi	International Health & Public Health
HANAMATSU Yasunori	International Law
HAYASHI Kengo	Architectual History, South East Asia Urban History
HONJO Mie	Microbial Ecology
HOSOYA Leo Aoi	Archaeobotany, Ethnoarchaeology
ICHIJO Tomoaki	Environmental Microbiology
ICHIKAWA Tomo	History of Medicine
ISHIMARU Eriko	Zooarchaeology, Isotope Archaeology
ISHIMOTO Yudai	Ecological Anthropology
ISHIYAMA Shun	Cultural Anthropology
IWATANI Hirofumi	Cultural Anthropology
KAWASE Daiju	Plant Ecology
KIM, Heonsook	Atmospheric Modeling
KIMURA Emi	Japanese Culture History History of Tea Culture
KISHIMOTO Keiko	Entomology
KOBAYASHI Nakako	Forest Meteorology
KOIZUMI Miyako	Ethnobotany
KOSAKA Yasuyuki	Ethnobotany
MAEKAWA Ai	Cultural Anthropology
MIYAZAKI Hidetoshi	Soil Science
MURAKAMI Yumiko	Archaeology
NAKADA Satoshi	Physical Oceanography
NAKAMURA Oki	Archaeology
NAKAMURA Ryo	Cultural Anthropology
NARAMA Chiyuki	Physical Geography
NISHIMOTO Futoshi	Social Anthropology
OKAMOTO Masahiro	Area Studies, Anthropology
SAKAMOTO Ryota	Public Health
SASAKI Naoko	Vegetation History
SEO Akihiro	Plant Taxonomy
TAKAGI Mayumi	Literary Representation
TANAKA Katsunori	Plant Cell Genetic, Plant Breeding, Ethnobotany
TERAMURA Hirofumi	Archaeology
TOJO Bunpei	Area Studies
TOMOKAWA Sachi	Health Education
TOYOTA Tomoyo	Development Economics
TSUJI Takashi	Ecological Anthropology
TSUJINO Riyou	Plant Ecology, Mammal Ecology
UCHII Kimiko	Microbial Ecology
UESUGI Akinori	Archaeology
WATANABE Mitsuko	Physical Geography
YAMAMOTO Keiko	Geodesy
YAMANAKA Hiroki	Aquatic Ecology
YASUTOMI Natsuko	Meterology, Climatology

Project Research Associates

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KITAMURA Naoko
KOBORI Masako
MAEDA Mayumi
MATSUMORI Tomohiko
MUTO Chiaki
OKAMOTO Takako
OKITA Hiroko
OTANI Megumi
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SONODA Takeru
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YODEN Makoto

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

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Center for Coordination Promotion and Communication (CCPC)

DIRECTOR AKIMICHI Tomoya

Professors

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

Associate Professor

SEKINO Tatsuki	Information Science

Assistant Professors

KOHMATSU Yukihiro	Ecology, Geography
NILES, Daniel	Geography

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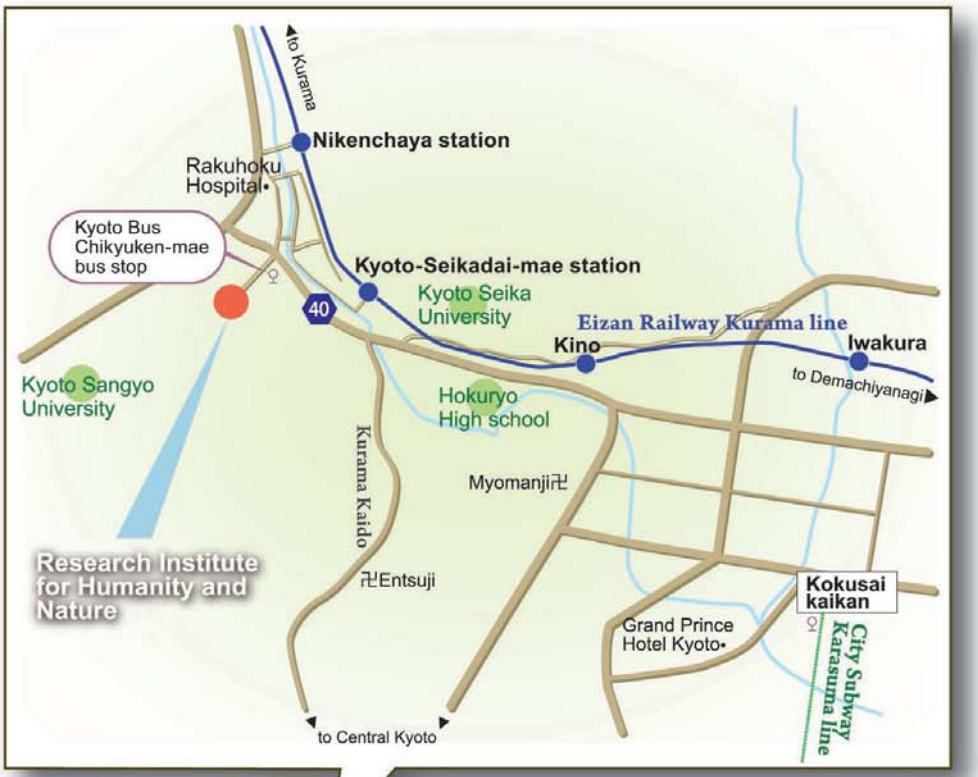

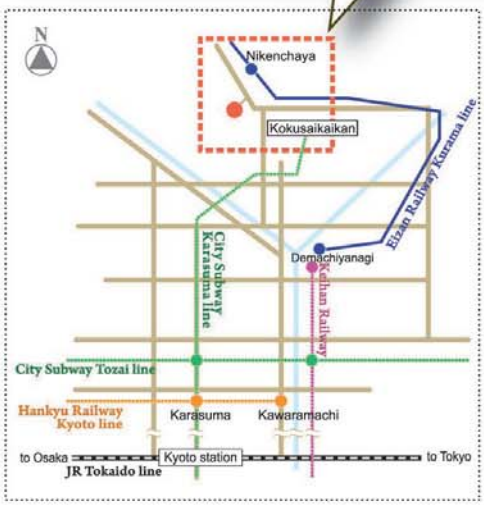

By City Subway

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

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.

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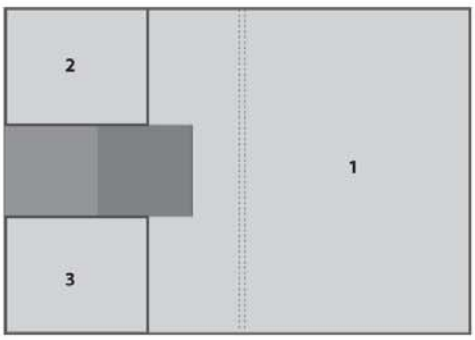

1. In a floodplain of Zambezi River in western province, Zambia, people gather water lily stalks as the floodwaters recede. Water lily stalk has a bitter and unforgettable taste. (Photo by OKAMOTO Masahiro)

2. Remains of Zyndan glacial lake Ysyk-Kol region, Kyrgyzstan. Water broke through the melting ice that formed this glacial lake. Approximately 440,000 m^3 of water was released in this "outburst flood," dropping the lake level by 21 meters and damaging agricultural crops, animals, houses, bridges, and roads below. Here, two people visible in the bottom left of the picture are measuring the lake's new size. (Photo by NARAMA Chiyuki)

3. Yaks in the Tibetan Plateau near the transverse mountains. (Photo by OKUMIYA Kiyohito)

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