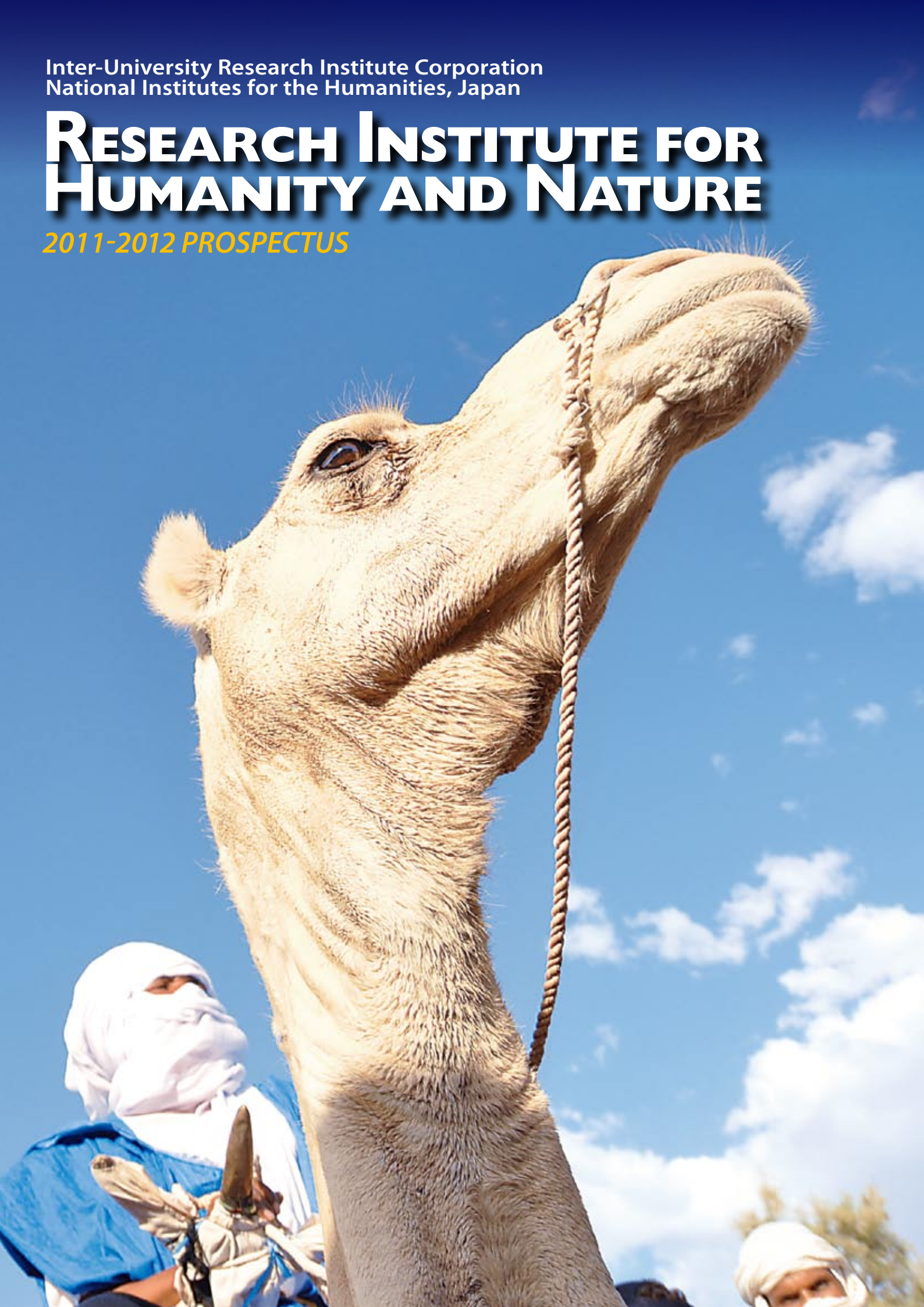
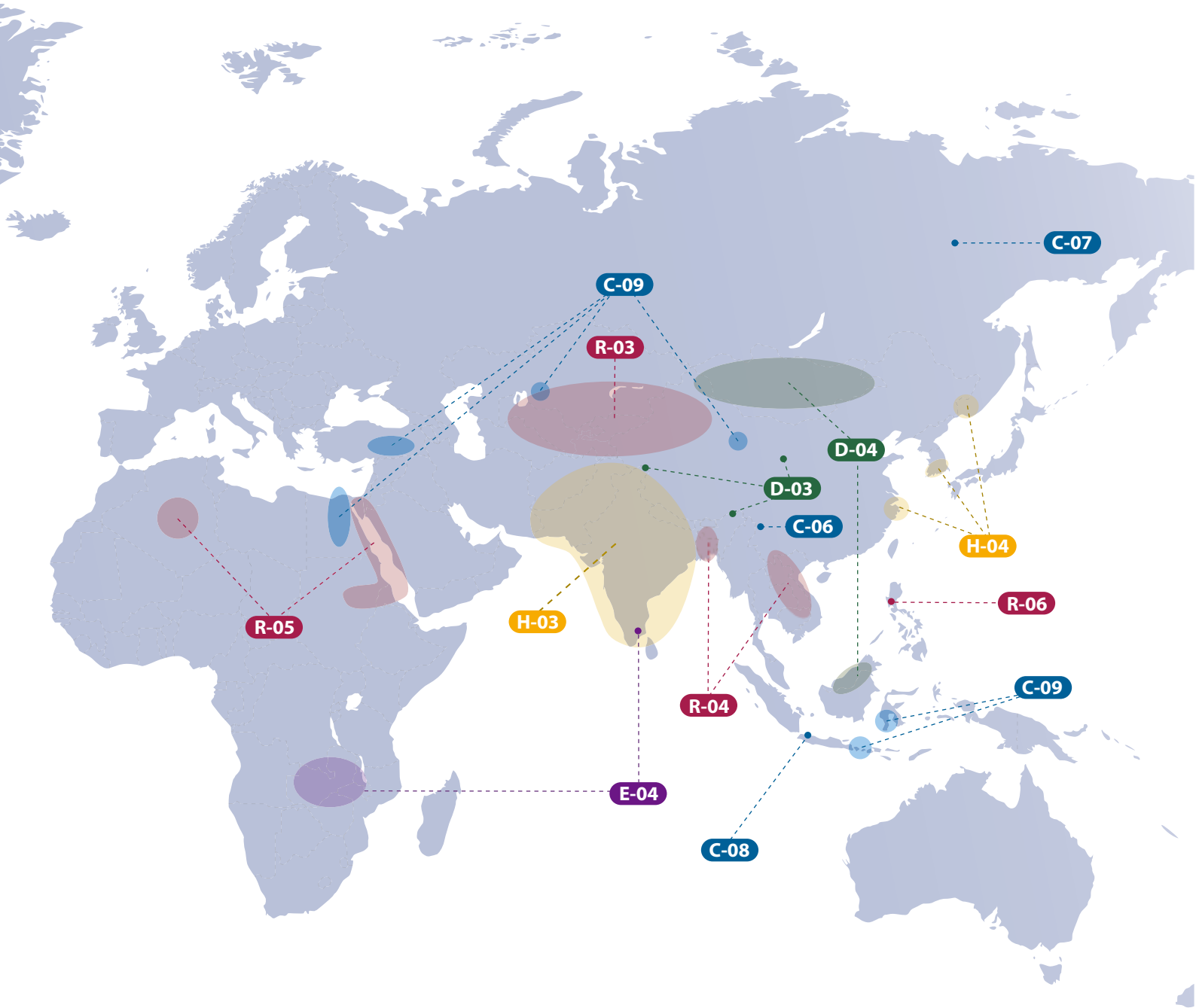
Inter-University Research Institute Corporation
National Institutes for the Humanities, Japan

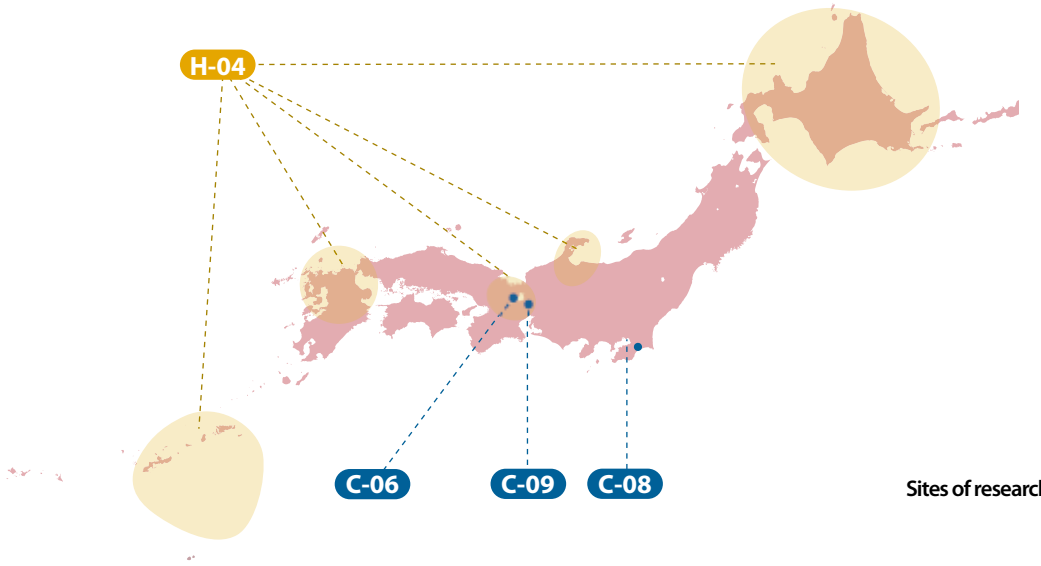
Research Institute for Humanity and Nature

2011-2012 PROSPECTUS



CONTENTS





Sites of research projects

Message from the Director-General

The Research Institute for Humanity and Nature (RIHN) was established in 2001 by the Government of Japan to promote 'integrated cooperative research toward the solution of global environmental problems' and to create the field of global environmental studies. RIHN's objective is to define, conduct and debate integrative research capable of describing the true dynamism of earth phenomena and humanity's place in it. To this end, RIHN solicits funds and hosts fixed-term research projects on key areas of interactions between humanity and nature.

This prospectus introduces RIHN's approach to environmental studies, one based in nuanced appreciation for past human success and failure, present social and biophysical processes, and their inevitable change and unknown future. We use the concept of futurability, a word coined in Japan as a translation of the ideographs for 'future' and 'potentiality,' to express the wide range of possibility in future development. Human societies must think boldly, and yet with humility, about their individual and collective futures in the midst of dynamic, changeable earth environments.

The year 2011 marks the opening of the RIHN's second decade. I would like to congratulate RIHN's many talented researchers on their impressive accomplishments to date. RIHN is also continually enriched through many individual and institutional academic collaborations and an emerging international network for transdisciplinary environmental studies. I should note the recent publication of "*The RIHN Encyclopedia of Global Environmental Studies*", a formidable synthesis of current environmental thought in Japan and a fitting commemoration of RIHN's first decade. The entire RIHN research community can take pride in such accomplishments, and yet much work remains. RIHN's intellectual goals and research structure continue to evolve as we consider how to enable the future potential in, and enhanced design of, interactions between humanity and nature.

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

TACHIMOTO Narifumi

Integration

Integration entails the assimilation of multiple knowledge traditions – those stretching back millennia as well as those of the contemporary natural and human sciences – into a single framework. In contemporary terms, the challenge is not just to link knowledge of complex natural processes with that of the lifestyle and culture of different regional communities, but to build holistic knowledge frameworks that allow for qualitative leaps in the human ability to solve environmental problems. RIHN is developing the transdisciplinary field of *Environmental Humanics of the Earth System*, to describe this merging of cognitive and design sciences.

International Networking

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

Leadership

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

Fluidity

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

RIHN research projects are organized through five research Domains: Circulation, Diversity, Resources, Ecohistory and Ecosophy. As RIHN enters its second decade, we seek greater integration both within and between Domain-based research projects and have developed a new set of initiatives, the Futurability Initiatives, in order to accomplish this task.

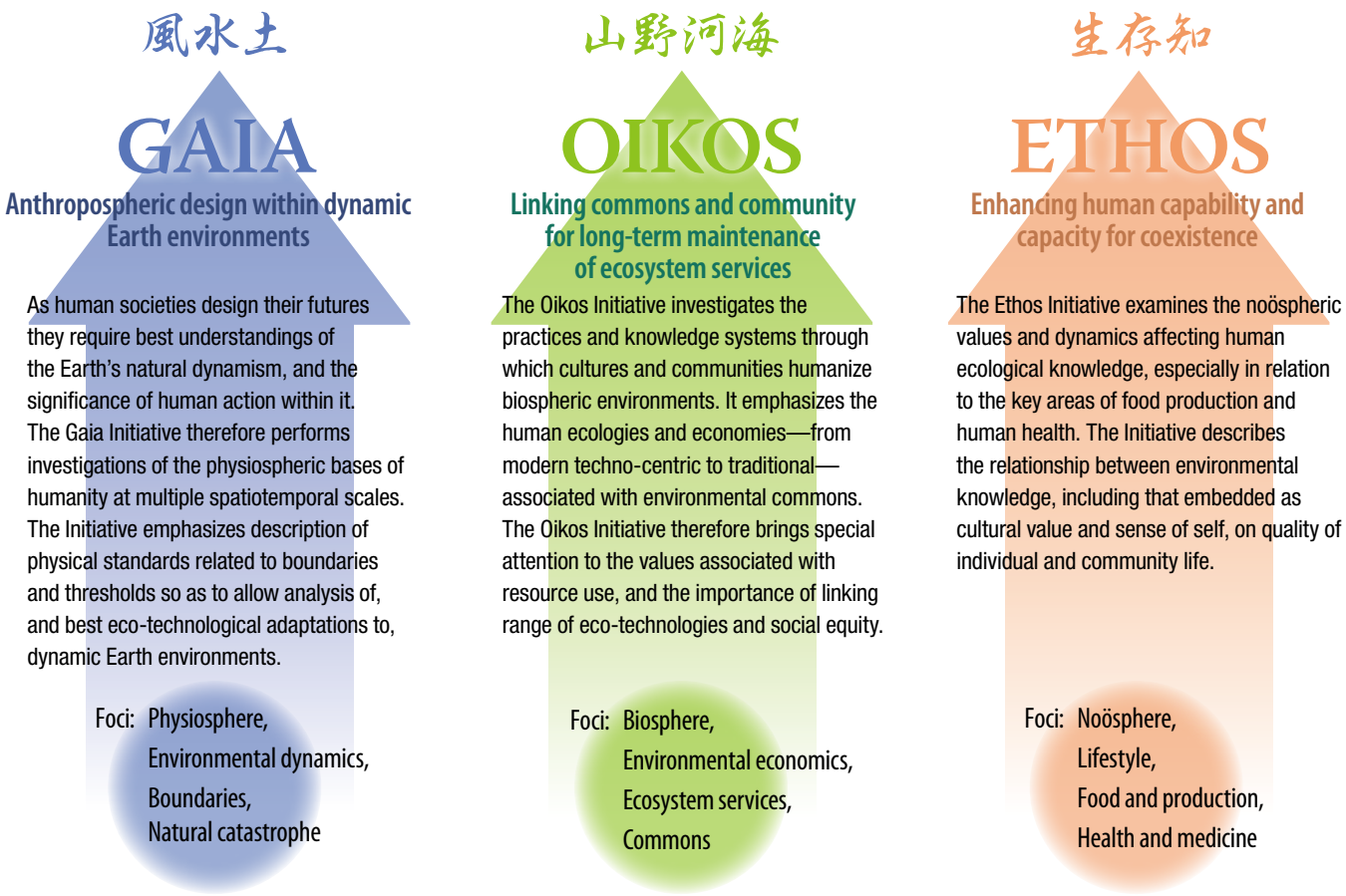
First phase research projects

In the first phase, individual projects conducted multidisciplinary and interdisciplinary research on key areas of environmental concern, including hydrological cycles, climate, variability, subsurface environments, ecosystems and landscape change, food production systems, disease ecology, and environmental history.

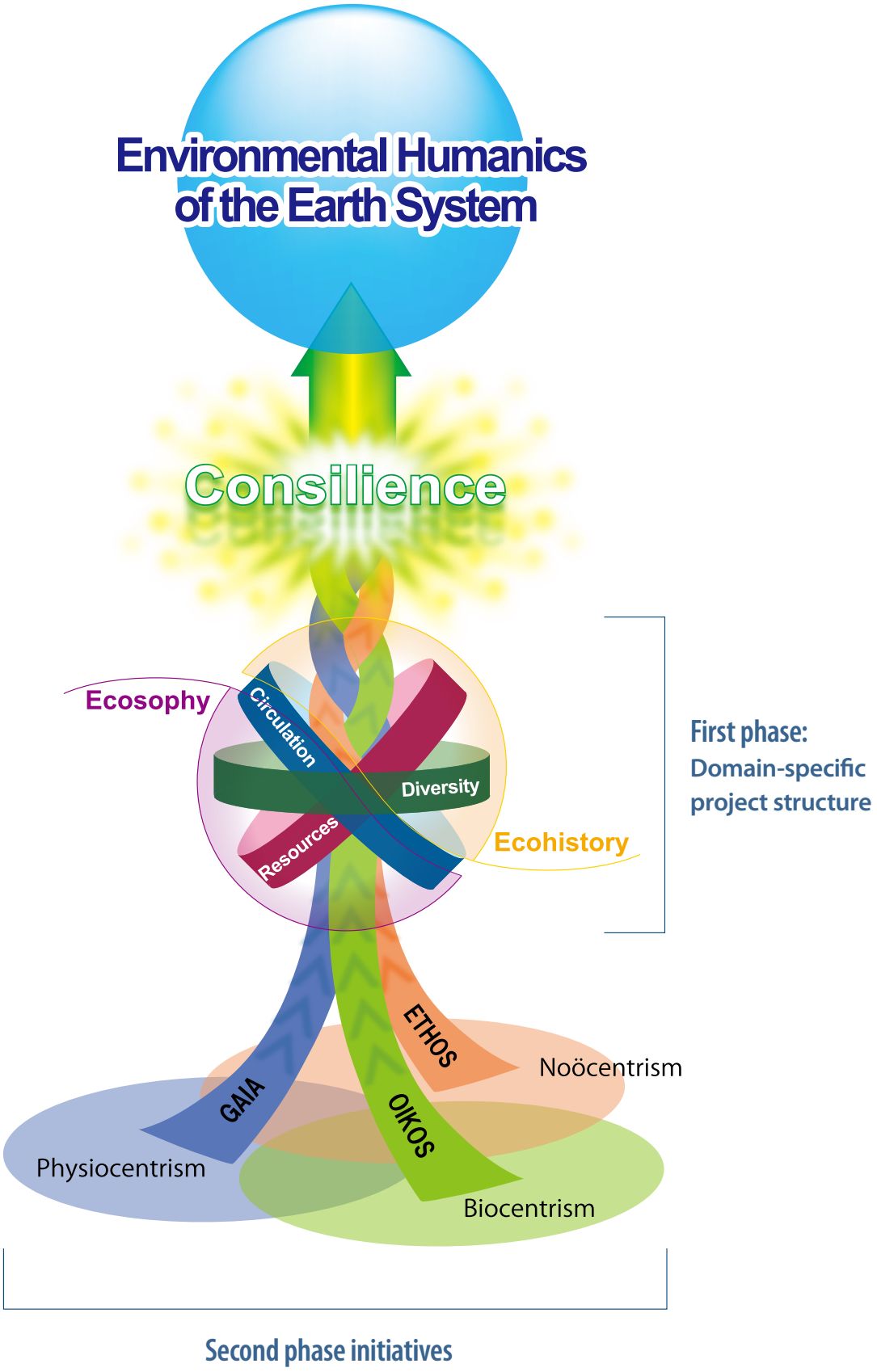
Second phase initiatives

We now focus our efforts on conjoining the existing Domain Programs through a set of cross-cutting initiatives. The Futurability Initiatives emerge from our conviction of the need for design-oriented science. Whereas cognitive science has conventionally been employed to describe 'what is', design science asks 'what ought to be' the character of interactions between of humanity and nature.

The Futurability Initiatives are organized by the Core Research Hub of the Center for Coordination, Promotion, and Communication.The Initiatives will allow academic researchers to identify and develop key ideas, topics and fields of study arising within and between past and present Domain-based research projects. The Initiatives are therefore dedicated to consilience, "a jumping together of knowledge ... across disciplines to create a common groundwork for explanation" (E.O. Wilson 1998) and intended to enhance design-oriented, problem-solving approaches to contemporary environmental problems. Each Initiative focuses on a major field of thought roughly analogous to the ancient Greek realms described by Gaia, Oikos and Ethos.



The Futurability Initiatives


Environmental Humanics
of the Earth System
Consilience
Ecosophy
Circulation
Diversity
Resources
Ecohistory
First phase:
Domain-specific
project structure
GAIA
ETHOS
OIKOS
Noöcentrism
Physiocentrism
Biocentrism
Second phase initiatives

Research Project Structure in the Second Phase

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

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

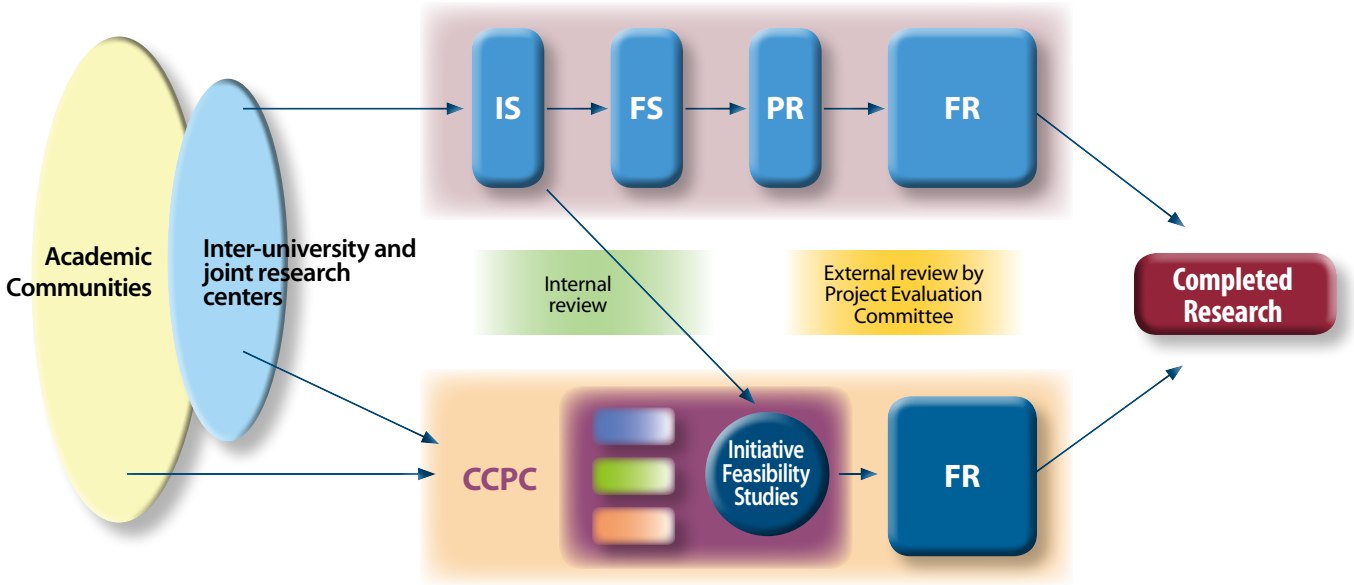
Domain-based Projects

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

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

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

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

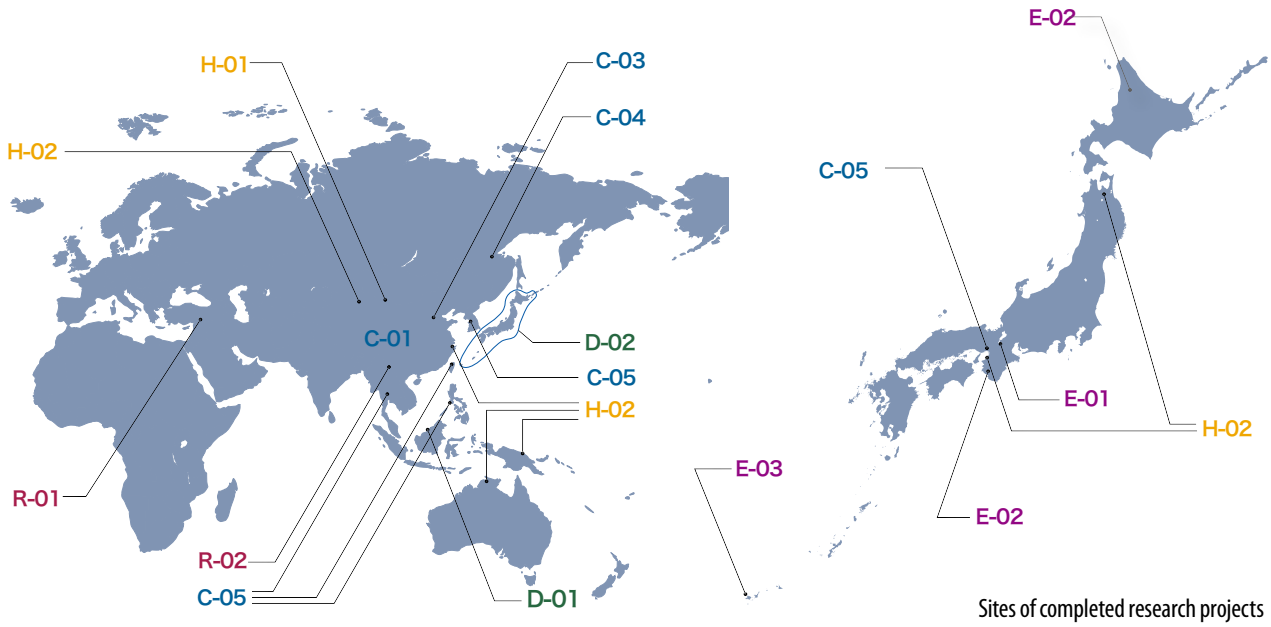


Initiative-based Projects

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

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

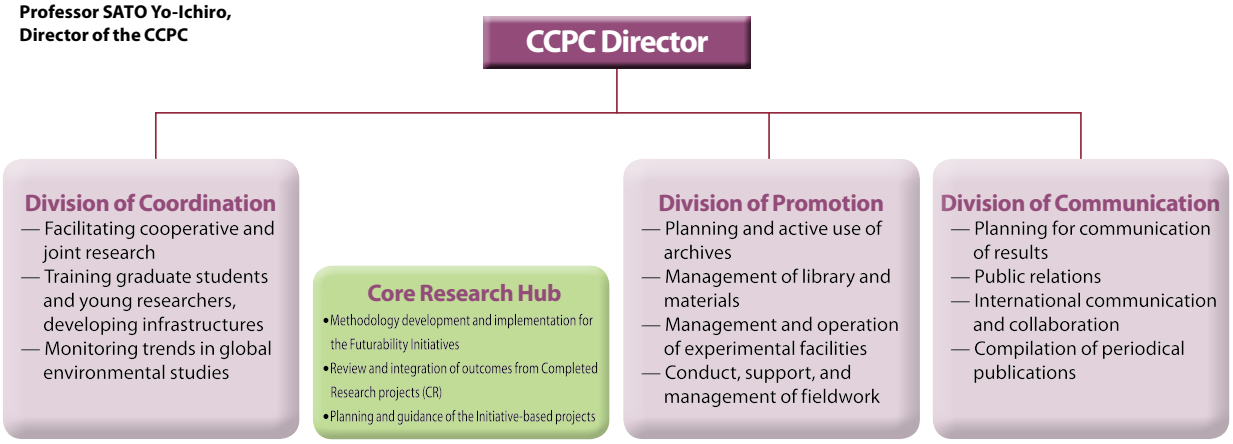
Fiscal Year Completed	Leader	No	Research Project
2006	HAYASAKA Tadahiro	C-01	Emissions of Greenhouse Gases and Aerosols, and Human Activities in East Asia
	KANAE Shinjiro	C-02	Global Water Cycle Variation and the Current World Water Resources Issues and Their Perspectives
	WATANABE Tsugihiro	R-01	Impact of Climate Changes on Agricultural Production System in the Arid Areas
	NAKAWO Masayoshi	H-01	Historical Evolution of the Adaptability in an Oasis Region to Water Resource Changes
	YACHI Shigeo	E-01	Multi-Disciplinary Research for Understanding Interactions between Humans and Nature in the Lake Biwa-Yodo River Watershed
2007	FUKUSHIMA Yoshihiro	C-03	Recent Rapid Change of Water Circulation in the Yellow River and Its Effects on Environment
	ICHIKAWA Masahiro	D-01	Sustainability and Biodiversity Assessment on Forest Utilization Options
	AKIMICHI Tomoya	R-02	A Trans-Disciplinary Study on Regional Eco-History in Tropical Monsoon Asia: 1945-2005
2008	SEKINO Tatsuki	E-02	Interaction between Environmental Quality of the Watershed and Environmental Consciousness
	TAKASO Tokushiro	E-03	Interactions between Natural Environment and Human Social Systems in Subtropical Islands
2009	SHIRAIWA Takayuki	C-04	Human Activities in Northeastern Asia and their Impact on Biological Productivity in the North Pacific Ocean
2010	TANIGUCHI Makoto	C-05	Human Impacts on Urban Subsurface Environments
	YUMOTO Takakazu	D-02	A New Cultural and Historical Exploration into Human-Nature Relationships in the Japanese Archipelago
	SATO Yo-Ichiro	H-02	Agriculture and Environment Interactions in Eurasia: Past, Present and Future



Sites of completed research projects

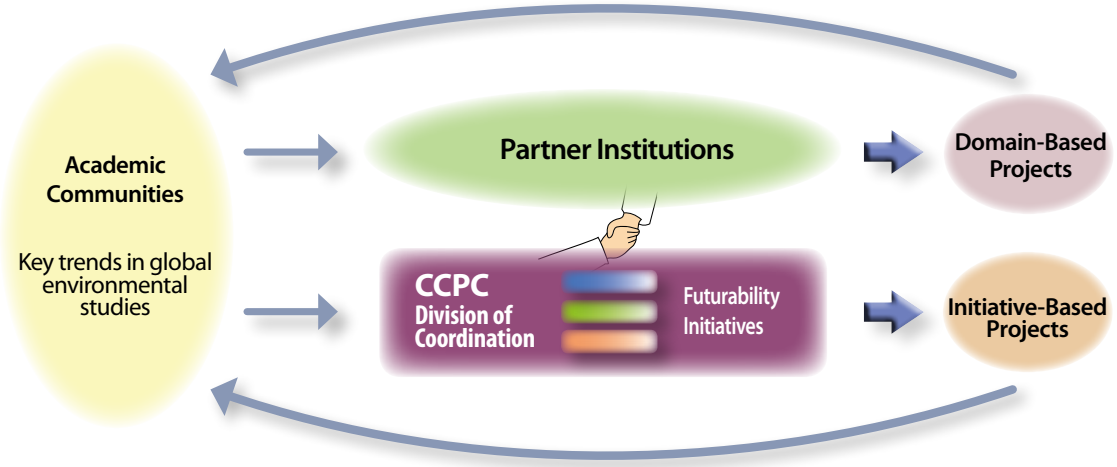
The Center for Coordination, Promotion and Communication (CCPC) is responsible for a wide spectrum of cross-project, cross-domain investigations, research, and supports that concern the entire institute. It has three divisions. The **Division of Coordination** maps out RIHN's mid- and long-term research trajectory and facilitates the cooperative arrangements necessary for its realization. The **Division of Promotion** develops and maintains the laboratory facilities necessary for research and fieldwork, and builds the databases and archives supporting past and ongoing research. The **Division of Communication** decides how the fruits of research may be best communicated in appropriate academic and popular fora. Several recent activities are described in the pages on Science Communication (pages 58-59). The CCPC also collaborates with the RIHN Research Department and Administrative Office to coordinate the task forces, working groups and administrative units involved in RIHN's day-to-day operation.

Professor SATO Yo-Ichiro, Director of the CCPC



Key Research Tasks

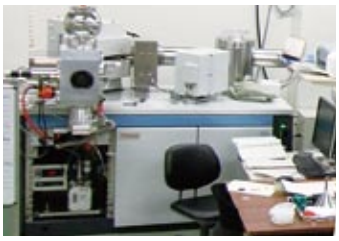
In RIHN's second phase, the Core Research Hub will be established within the CCPC. Its tasks are the realization of the Futurability Initiatives introduced on pages 4-6, review of Completed Research projects, and facilitation of the Initiative-based projects adopted within them. These tasks will require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



Building Research Data Networks

The CCPC plays a key role in facilitating RIHN's environmental networking and communication, especially between academic institutions, cultural institutions, and the general public. It is involved in the creation and maintenance of Asian environmental databases and project archives. It also supports the development of environmental studies curricula in Japan's public elementary, junior high and high schools. The CCPC promotes cooperation between RIHN and research institutes both at home and abroad. One such activity is the Regional Environmental Information Network, a project to create environmental information networking nodes among twenty-four research centers at nineteen universities in the greater Asian region.

Facilities and Equipment



Thermal-ionization mass spectrometer

Double-focusing high precision ICP multi-collector mass spectrometer

The Division of Promotion maintains eighteen laboratories in the ground level of RIHN's main building, including specialized facilities for DNA and stable isotope analysis and mass spectrometry, as well as several rooms for chemical and biochemical analysis, microscopy, incubation, hazardous materials, fieldwork preparation, sample preparation and cold storage (please also see pages 62-63).

Environmental Poster Contest

The RIHN archive holds about 200,000 posters created by children from around the world and submitted since 1991 to the United Nations' Environmental Poster Contest. Posters are evaluated by a UN-appointed council and especially notable contributions are exhibited at the UN Building and published as calendars and postcards.

Peer-to-peer environmental education

RIHN has also incorporated these posters into the traditional Japanese memory game "karuta" and held karuta-playing workshops in elementary schools in Japan and the US. As the posters reflect the child-artists' geographic area, culture, age, and perception of nature and environment, playing the game gives children insight into the environmental experiences of their peers around the world. Workshops have been held in Aichi, Nara and Kyoto prefectures, and at Atorium Elementary School in Cambridge and the Boston Children's Museum in the United States.

RIHN booth at COP10 (Nagoya, Oct. 2010)

Ecology Education Program: Karuta workshop using UN children's environmental art (Atrium Elementary school, Boston, USA, Jan. 2011)

Flood-Damaged Town
Leh, India
Massive flood struck this area on Aug. 6, 2010, killing around 600 people. Many bodies were never recovered and remain buried in this area. The Dalai Lama visited the area immediately after the disaster
NARAMA Chiyuki

Alone in the Andes Misti volcano
Arequipa, Peru
Carlos Renzo Zeballos Valarde

Moon in Ladakh
Leh Castle
View from Leh Castle. With no vegetation, Ladakh seems like a city on the moon
HAMADA Atsushi

Continuation of a Dream
Ankara, Turkey
The old typical houses, or gecekondus, are being demolished and replaced with new buildings
MATSUNAGA Kohei

Circulation Program

Program Director **NAKANO Takanori**

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

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

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

Completed Research	Leader	Title
C-04	**SHIRAIWA Takayuki**	Human Activities in Northeastern Asia and their Impact on Biological Productivity in the North Pacific Ocean
C-05	**TANIGUCHI Makoto**	Human Impacts on Urban Subsurface Environments
Full Research	**Leader**	**Title**
C-06	**KAWABATA Zen'ichiro**	Effects of Environmental Change on the Interactions between Pathogens and Humans
C-07	**HIYAMA Tetsuya**	Global Warming and the Human-Nature Dimension in Siberia
C-08	**MURAMATSU Shin**	Megacities and the Global Environment
C-09-Init	**WATANABE Tsugihiro**	Designing Local Frameworks for Integrated Water Resources Management

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

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

Project Leader: **SHIRAIWA Takayuki** Institute of Low Temperature Science, Hokkaido University

Achievement of the project

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

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

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

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

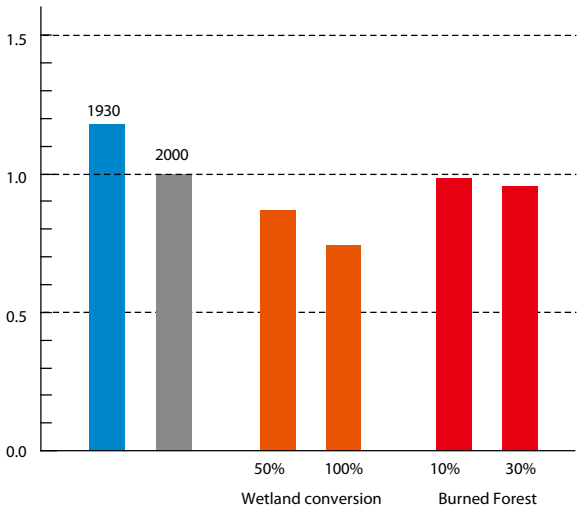


Figure 1 **Simulated results of land cover conversion in the Amur River Basin on iron flux**
Iron flux in 2000 (■grey bar) is compared to that estimated in 1930 (■blue bar) and under several land change scenarios. ■Orange bars show potential decrease with 50% or 100% decrease in wetland area; ■red bars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

Human Impacts on Urban Subsurface Environments

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

Project Leader: **TANIGUCHI Makoto** RIHN

The great coastal cities of Asia place substantial burdens on subsurface environments, but little is known of the impact or its environmental or potential social significance. This project was therefore designed to reveal the groundwater recharge rate, storage, redox and other natural subsurface capacities in Tokyo, Osaka, Seoul, Taipei, Bangkok, Jakarta and Manila, and to measure the pace and scale of human disturbance of subsurface environments in these cities in the past century.

Summary of research findings

Cumulative human impacts on subsurface environments were documented at depths of up to 200-300 meters. Groundwater circulation was accelerated by more than 10 times in the past century. Subsurface thermal storage due to surface warming, such as by the urban 'heat island effect', is two to six times that attributable to global warming. Numerical modelling of the subsurface environment in Tokyo, Osaka, Bangkok, and Jakarta allowed evaluation of groundwater recharge rate and area, residence time, and exchange of fresh/salt water between land and ocean. GRACE satelite data was scaled down to the Chaopraya basin, Thailand, allowing comparison with basin models. Creation of a 0.5 km grid GIS database based on nine categories of land cover/use in three different historical periods (1930s, 1970s, and 2000s) allowed evaluation of water, materials, and heat exchange between surface and subsurface environments in each city.

Research significance

Natural resource capacity and social and environmental development indices allowed integration of findings. In total, the indices in our five-stage urban development and DPSIR (Driving force, Pressure, State, Impact, and Response) models described patterns of land subidence, groundwater contamination, and subsurface thermal anomaly, and allowed us to suggest a range of suitable policy approaches, taking account of latecomer's benefits, patterns of development, and natural resource capacities.

In total, project findings highlight the importance of careful public cross-boundary surface-suburface environmental management. We conclude that subsurface environmental processes can be sucessfully managed, especially in their critical capacity in providing water, if policies correspond to actual material flows across surface-subsurface and land-marine boundaries. In regard to water quality, human societies should pay closer attention to the subsurface accumulation of contaminats and heat, especially as these loads can often be controled or managed from the surface. Designing such policies, however, depends on accurate assessment of the stage of urban growth in relation to natural capacities and social capabilities.

Research communication

Project research findings have been disseminated widely in a variety of fora. The project has convened five international symposia, the third as a side event of COP13 and the fifth in colaboration with UNESCO-International Hydrological Programme. Project researchers have published more than 120 peer-reviewed scientific papers, five books (three in Japanese and two in English), a special issue of the journal STOTEN, and a CD-Book with multilayer contents for beginners to experts. Feedback seminars were organized to discuss project findings with local administrators and policy makers in Manila, Jakarta, and Bangkok. The utility of such seminars, and perceived value of comparative discussion of subsuface urban issues, now inspires the creation of a consortium concerned with urban water management in Asia.

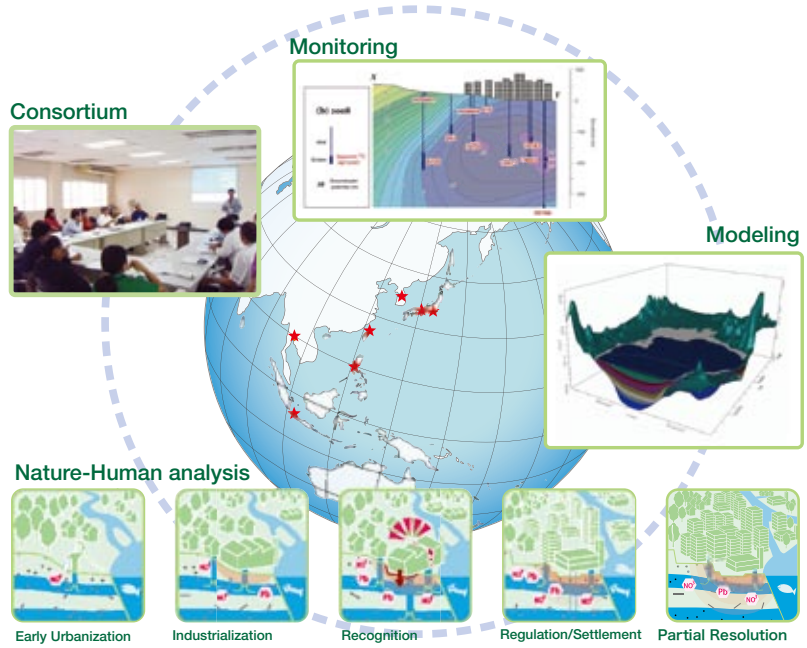
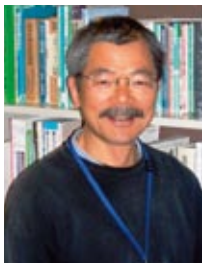


Figure
The project's major components

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 humans that may create or alleviate 'fertile' disease environments – is necessary for prediction and prevention of new disease outbreaks. This project develops a model of environment-pathogen-human interactions based on our intensive examination of the ecological and social causes and effects of Koi Herpes Virus disease in Lake Biwa, Japan. This model will allow us to suggest ways to prevent or minimize the emergence and spread of infectious diseases.



Project Leader
KAWABATA Zen' ichiro RIHN

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

Sub-Leader
MINAMOTO Toshifumi RIHN
Core Members
ABE Akira RIHN
ASANO Kota Graduate School of Human and Environmental Studies, Kyoto University
ITAYAMA Tomoaki Nagasaki University
KAKEHASHI Masayuki Graduate School of Health Sciences, Hiroshima University
KONG Hainan School of Environmental Science and Engineering, Shanghai Jiao Tong University, China
MATSUOKA Masatomi Asahi Fishery Cooperative, Shiga
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
YAMANAKA Hiroki Department of Environmental Solution Technology, Ryukoku University

Objectives

The rapid spread of emerging infectious diseases is threatening humans, wildlife, and livestock worldwide. Koi Herpes Virus (KHV) is a pathogen responsible for episodic mass mortality of common carp (*Cyprinus carpio carpio*) (Photo 1) since the late 1990s. The common carp is the original domesticated aquaculture species, and an important source of protein today (Photo 2). To predict outbreaks of infectious disease and to prevent epidemics, it is essential to conduct pathological studies and to understand the environment-pathogen-human interactions that cause and spread infectious disease.

This study has three main objectives. It first describes KHV disease ecology, including: the specific links between anthropogenically-caused changes to freshwater ecosystems and the emergence and spread of KHV disease; the impacts of KHV disease on local ecosystem services; the social and cultural attempts to address KHV disease; and the environmental changes associated with human mitigation or adaptation (Fig. 1). Based on this description of the human and non-human factors affecting KHV disease ecology, it then describes a general model of environment-pathogen-human interaction (Fig. 2). Finally, it will suggest how these interactions may be modified in order to mitigate the damages associated with infectious diseases.

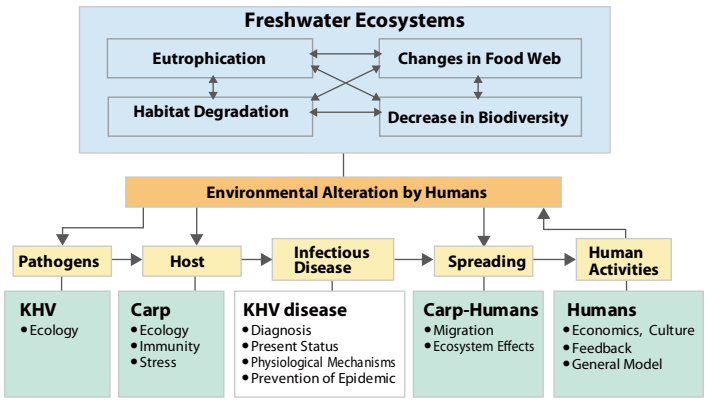


Figure 1 **Interactions between KHV disease and humans**

Research methods and organization

Fields survey is conducted at Lake Biwa, Japan. 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 carp.

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

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

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

The Feedback Group examines the environmental changes associated with human response to loses caused by KHV disease.

The Executive Group develops the model of pathogen-human interactions by coordinating the activities of each group.

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

Main results to date

1) We found that gentle gradient lakeshores provide a wide range of thermal conditions, suggesting that fish can choose tempertures to alleviate stress associated with unfavorable water temperatures, and thus reduce susceptibility to KHV (Yamanaka et al., 2010).
2) We established an innovative method to quantitatively detect KHV in natural environments (Minamoto et al., 2009 (Fig. 3); Honjo et al., 2010). The method revealed that since it was first detected in 2003, KHV is now found throughout the Lake Biwa ecosystem, including in plankton and sediment, lagoons and ponds, and now in almost all the rivers in Japan. We

Photo 1
Carp killed by KHV disease
Lake Biwa, 2004
(Masatomi Matsuoka)

Figure 2 **Relationship of our model to a general human pathogen model**

Photo 2 **Carp dishes: Carp is an important ingredient in many food cultures**
At a restaurant beside Lake Erhai, Dali City, Yunnan, China, Nov., 2010 (Zen'ichiro Kawabata)

Photo 3 **A carp laying eggs on the stems of reed**
Lake Biwa, May 2009 (Kimiko Uchii)

Photo 4 **A survey on a mass death of Tilapia**
The Pin River, Chaing Mai, Thailand, July 2010 (Zen'ichiro Kawabata)

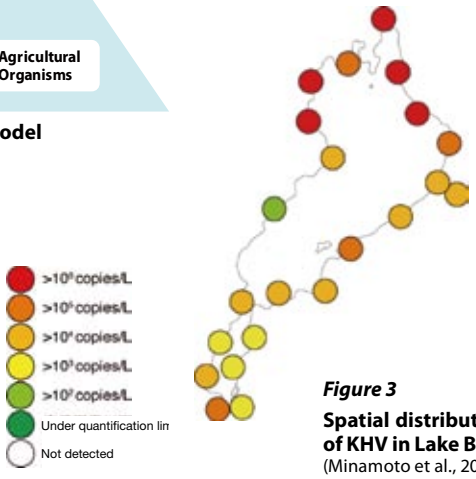


Figure 3
Spatial distribution of KHV in Lake Biwa
(Minamoto et al., 2009)

demonstrated that it is impossible to eliminate KHV, but that precautionary environmental management can eliminate "fertile" disease environments.

3) We have developed a preliminary break-through method allowing determination of the number and location of carp in their natural environments.
4) We found that breeding habitats can become hot spots for transmission of infectious diseases if hosts aggregate for mating and pathogen activation occurs during the host breeding season (Uchii et al., 2011) (Photo 3).
5) We developed a non-invasive method (i.e., a method that does not require handling fish) to quantify how water conditions stress carp. Using this method we found that changes in water temperature do induce stress.
6) We applied a Based on our assessment of KHV disease in Lake Biwa, we applied our conceptual model of linked environment-pathogen-human interactions to Lake Erhai, China, schistosomiasis in Kenya, fish diseases in the Pin River at Chaing Mai, Thailand (Photo 4), and Legionella disease (Yamaguchi et al., 2010), MRSA, Norovirus disease, and nontuberculous mycobacteria disease (Ichijo et al., 2010) in Japan. These applications helped us understand how pathogens interact with humans and suggested environmental conditions that might prevent disease outbreaks and spread as well asstrategies for safe coexistence of humans with pathogens.
7) By combining the results from each work group, ranging from molecular biology to environmental sciences to human society, we are providing evidence to support the hypothesis that anthropogenic environmental changes promote disease outbreaks.
8) We have presented our findings at national and international conferences of the linkages between the environment, pathogens and humans, emphsizing their significance to prevention and control of infectious disease.

Research objectives in 2011

1) Refine a method to quantify carp spatially and temporally and innovative methods to describe our conceptual model of environment-pathogen-human linkages including a development of micro-device capable of *in-situ* measurment of KHV incidence and infectivity.
2) Determine the environmental factors involved in KHV abundance and its infectivity, and in carp population density and its susceptibility.
3) Conduct controlled experiments to reveal the relationship between water temperature, carp stress and susceptibility to KHV.
4) Assess the economic and cultural impacts of carp die-offs.
5) Apply the conceptual model of environment-pathogen-human linkage to other infectious diseases; KHV disease in Lake Erhai, China, Schistosomiasis in Kenya, fish diseases in the Pin River at Chaing Mai, Thailand, and *Legionella* disease, MRSA, Norovirus disease, and nontuberculous mycobacteria disease in Japan, and then describe the common parameters of KHV disease and other infectious diseases.
6) Continue to explore evidence that anthropogenic environmental changes can mediate disease outbreaks.
7) Synthesis of results of the work groups in order to develop a set of recommendations designed to minimize the emergence and spread of infectious diseases and facilitate the safe coexistence of humans with pathogens.
8) Publish our results in international journals and books in order to disseminate the concepts and practical measures that can aid the control of "fertile" disease environments.
9) Organize a national and international symposium on environment-pathogen-human linkage to develop a network for this field of study.

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

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

Project Leader
HIYAMA Tetsuya RIHN

Professor Hiyama's specialties are ecohydrology and hydrometeorology. He is interested in vulnerability assessment of shallow groundwater, especially in permafrost regions affected by global warming. He is also interested in atmospheric boundary layer meteorology and terrestrial-climate interactions, especially energy/water/carbon exchanges. Eastern Siberia is the most important region for his field research, and he has conducted field observations of the atmospheric boundary layer over several regions including Eastern Siberia for around twenty years.

Sub-Leader
FUJIWARA Junko RIHN
Core Members
YAMAGUCHI Yasushi Nagoya University
SASAI Takahiro Nagoya University
YASUNARI Tetsuzo Nagoya University
OHTA Takeshi Nagoya University
SUGIMOTO Atsuko Hokkaido University
YAMAZAKI Takeshi Tohoku University
TAKAKURA Hiroki Tohoku University
OKUMURA Makoto Tohoku University
TATSUZAWA Shiro Hokkaido University

Background and project objectives

The Lena River Basin in Eastern Siberia is covered in larch forest but receives little precipitation. Permafrost provides moisture to the forest. The area is thus an ideal setting in which to study the effects of climate warming, as the forest-permafrost symbiosis is extremely susceptible to abnormal variations in temperature. Abnormally high temperatures have been recorded in the region in recent years, and changes in the ecosystem and cryosphere environment, such as forest degradation and frequent flooding, are evident.

This research project takes natural and social science perspectives on three aspects of climate-associated environmental change. The project is designed to: 1) describe current variation in water and carbon cycles and predict likely variation in the near future; 2) make field observations of the effect of carbon and hydrologic variabilty in Eastern Siberian landscapes, and identify key exchanges or driving forces; and 3) examine the capability of the multi-ethnic Siberian peoples, and their distinct social economies, to adapt to predicted change in their climate and terrestrial ecosystems.

Three research groups are organized in order to realize these goals (Fig.1). The *Siberia bird's-eye group* (Group 1) uses climatic and satellite remote sensing data to describe change in climate and in principal patterns of human adaptation. The *Water cycle and ecosystem interaction group* (Group 2) uses dendrochronology, isotope-analysis, flux monitoring, and hydrological analysis in order to examine interaction between climate and vegetation. The *Human ecology group* (Group 3) elucidates the impact of climate and ecological change described above on the residential life in urban and agricultural districts in Eastern Siberia and the cultural practices and social systems of local minority peoples related to their capacities for adaptation.

Research outcomes

The Siberia bird's eye group

Analytical emphasis is on flood, as flood impacts are significant and climate change increases flood frequency and intensity. Flood frequency and extent are described through remotely sensed and field based data (Fig. 2). Data show a recent gradual increase in upstream air temperature (in the southern part of the Lena River Basin) yet little change in air temperature downstream (northern part of the basin near the Arctic Ocean). River ice-jam floods along the Lena River were detected by satellite each thaw season. In addition, a spatio-temporal survey of flood around the Alazeya River Basin was conducted (Fig. 3).

Field surveys and remote sensing determined that insect damage and forest fires were major causes of forest degradation. A dynamic vegetation model of Eastern Siberia, including forest fire and soil freezing and thawing, predicted that an annual mean air temperature

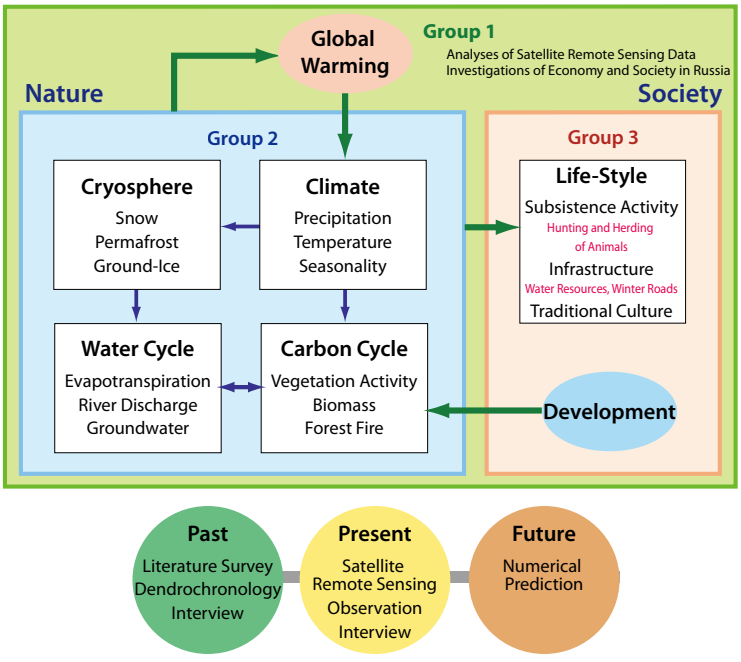


Figure 1 **Project structure and research targets**

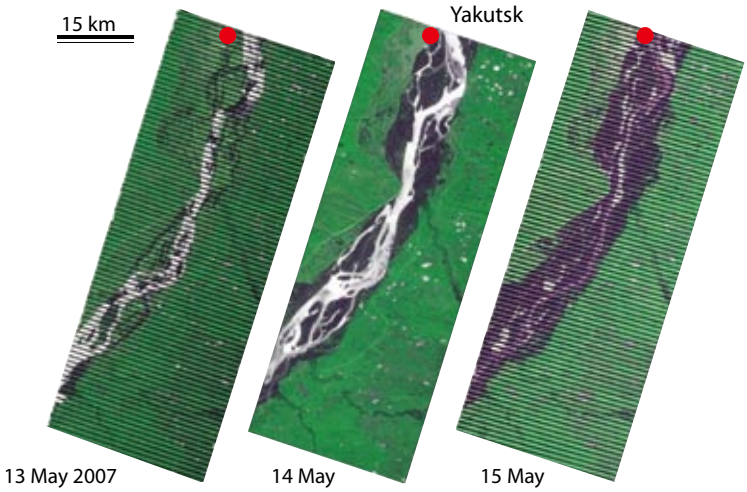


Figure 2 **River ice-jam floods along the Lena River at around Yakutsk city, observed by satellite**

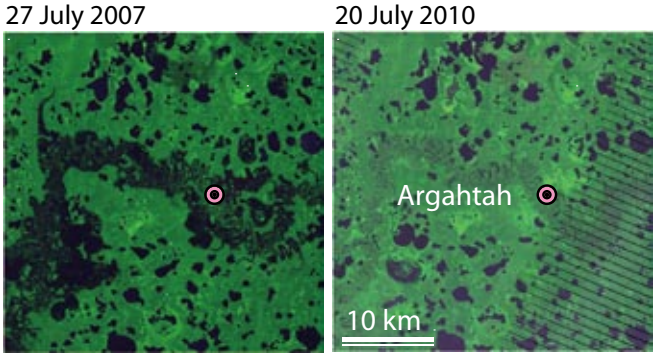


Figure 3 **Variation of water-covered areas at the Alazeya River Basin**

Photo 1 **Permafrost and ground ice around Yakutsk, Eastern Siberia**

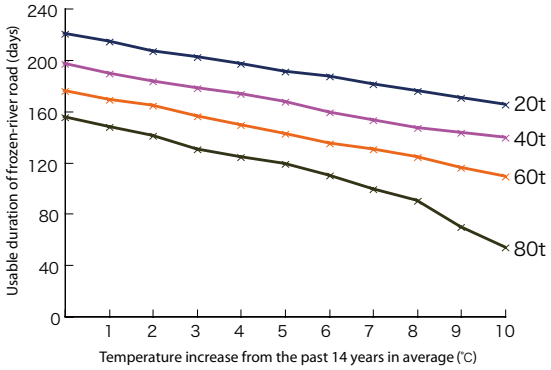


Figure 4 **The predicted effect of increasing annual mean air temperature on availability of frozen-river roads in winter**

rise of more than 2° C will thaw permafrost to a depth prohibiting larch forest growth.

The water cycle and ecosystem interaction group

Cellulose carbon isotope samples taken from larch forest in the Siberian tundra-taiga transition zone described inter-annual variations of precipitation and soil moisture. Changes in the seasonal larch growth pattern are clearly associated with water stress. Based on this analysis, the group made point-scale measurements of inter-annual variations in soil moisture from 1950s to 2000s.

A new monitoring site was established in the middle reaches of the Aldan River (Ust' Maya), where precipitation is high in relation to that at Yakutsk, in order to clarify the precipitation-forest reponse relationships. The new flux-tower (in addition to the one operating at Yakutsk) allowed continuous measurement of hydro-meteorological elements, sensible heat, latent heat (evapotranspiration), and carbon dioxide fluxes. Numerical simulation based on a regional (non-hydrostatic) climate model revealed that increases in surface wetness due to global warming would not significantly increase precipitation through evapotranspiration. Extensive land cover change from taiga forest- to grass-cover or water surface would have a much greater positive impact on precipitation in Eastern Siberia.

A newly established research contract between RIHN and the Melnikov Permafrost Institute, Siberian Branch of the Russian Academy of Sciences, has allowed joint study of permafrost groundwater and ground ice in central Eastern Siberia (Photo 1). As a first step, the age of groundwater found in several natural springs was established as a few tens of years. Researchers from both institutes also made improvements to the conventional water circulation model allowing better prediction of the Lena River Basin water cycle.

The human ecology group

This group documented the folk knowledge of middle Lena River Basin peoples related to river ice-jam floods. Group researchers combined field data and newspaper reports with remotely sensed data in order to develop a graphic display of recent flooding patterns, and so the influence of global warming on the frozen water environment. The group analyzed the traffic density, vehicle type, and quantity of freight travelling over the frozen Lena River in winter. Such frozen-river "roads" are the most important public transport in the region, but access to them will be dramatically decreased with global warming (Fig.4).

Transmitters attached to wild reindeers will reveal their pattern of movement in relation to environmental variables such as vegetation status and snow depth. Direct observation of reindeer herders and investigation of hunting and traffic in furs and of salmon havests will clarify dynamics affecting these three important areas of human-animal interaction. Disaster-driven emigration is a new indicator of adaptation and maladjustment to climate change, and field research is now underway in villages experiencing significant out-migration.

Future research issues

It is necessary to examine local media for environment- and climate-related reports, development plans and policies in Siberia. The apparent path of industrial development, especially in relation to energy and road infrastructure, will likely have a significant effect on Eastern Siberian social life and water environments.

Megacities and the Global Environment

Cities today support half of the Earth's population. This project investigates the causes and effects of rapid urbanization in the megacity of greater Jakarta, and the kinds of governance and everyday human practices that can address, in a unified manner, the urban ecosystem and the key human institutions affecting it. In this context, this project describes megacities as dynamic environments comprised of both human and non-human elements; the challenge is to develop conceptual and practical tools that can support harmonious relations within and between these elements. The project is therefore fundamentally interdisciplinary, historical, spatial, driven by real problems in the world, and solution-oriented.

Project Leader
MURAMATSU Shin RIHN

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

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

Background and objectives

The great amount of human activity concentrated in megacities causes environmental problems at local to global scales. Megacities consume great quantities of material, and produce great quantities of waste; they simultaneously cause some of the most pressing environmental problems and are the sites of significant environmental degradation. Many megacities are emerging in developing countries in the tropical monsoon region characterized by highly dynamic biophysical environments. Social practices and urban management methods are often not adequate to the pressures of megacity systems.

The central study area is Jabodetabek, the metropolitan area surrounding Jakarta, Indonesia, where, despite fast-paced urban development and in-migration, paddy rice cultivation remains a principal source of livelihood. The direct and indirect environmental impact of urban expansion, increasing demand for basic needs and services such as food, water and shelter, and the need to maintain and create viable human livelihoods often involve undesirable trade-offs. As cities continue to increase in size and number; their success depends on humanity's ability to increase and make use of its archive of 'urban knowledge'. Meanwhile, the cumulative wisdom that enabled humankind to coexist with ecosystems through great periods of time, what we here call 'eco-knowledge', has been gradually buried deep within the collective human memory.

In this context, project research will describe the historical conditions associated with megaurbanization in Indonesia, as well as the recent and contemporary factors contributing to Jabodetabek's most significant environmental problems, including frequent flood, heat island effect, loss of biodiversity and social disparity linked to urban vulnerability. The project uses a GIS to describe the spatial growth of the city and its impact on surrounding environment. Project researchers are also interested in the scalar dynamics revealed by examining

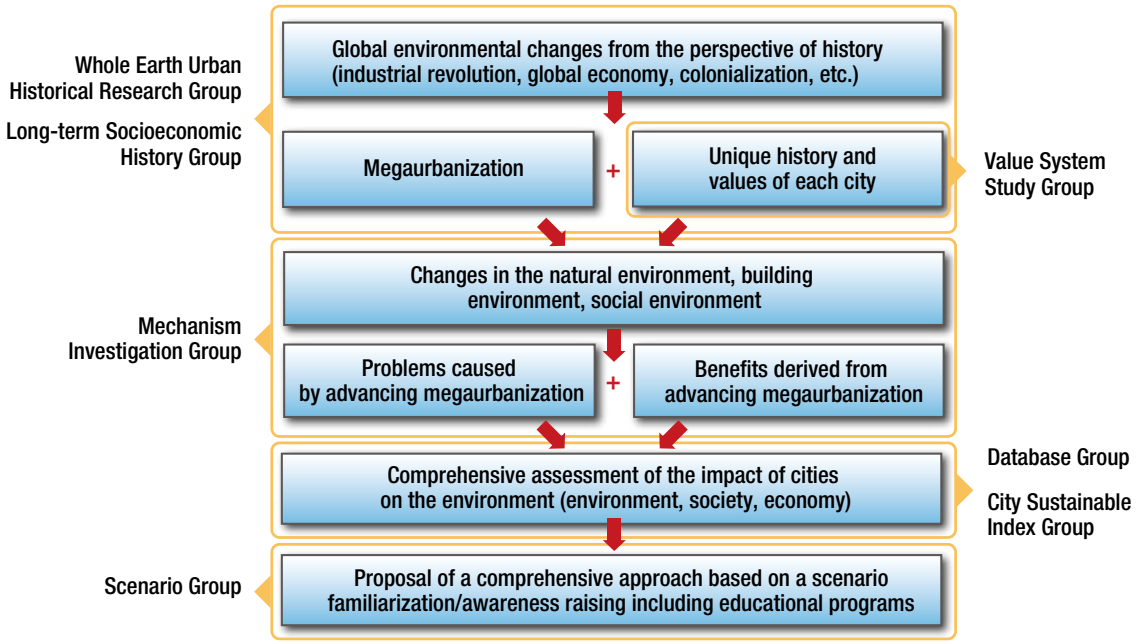


Figure 1 **Organization of the project**

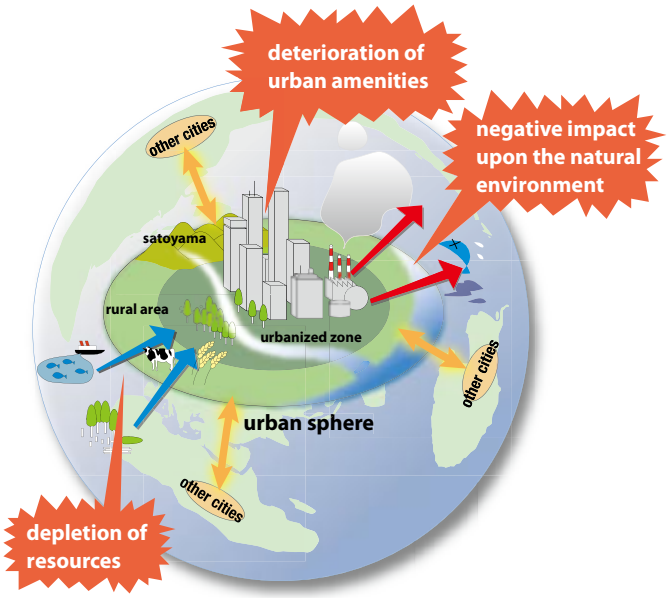


Figure 2 **Environmental problems associated with cities**
Cities have a large impact on the global environment but they also provide great benefits to humanity. They do not simply cause problems, but also contain solutions.

environmental problems from the perspectives of several different stakeholders and communities.

Project approach

This project is designed to develop a common understanding of a city beyond the limits of specific disciplines (Fig. 1). Much project research is based in the natural and social sciences, including researchers from ecology, hydraulic engineering, architectural planning, urban history, distributive sociology, fisheries science and urban sociology. And yet, since complex environmental problems cannot be remedied by single solutions, such direct descriptive methods of modern science are combined with fundamental methods linked to social consciousness, such as education and community studies. At the same time, a wide range of local ecological knowledge can also found in cities. If recognized, such knowledge can also be applied to local problems. In eliciting and combining multiple traditions of knowledge, the project seeks to develop flexible methods relevant to the everyday lives of individuals, and that can also scale up to address the livability of the city as a whole (Fig. 2).

Recent achievements and coming tasks

The last academic year saw the following three achievements:

1) Development of methods for analyzing variations in environmental load due to changes in the built environment

Jabodetabek is experiencing a significant amount of building activity. The project's Built Environment Team is calculating the total volume of building material stock in Jakarta, the volume of CO_2 generated in the use of construction materials, and the vulnerability of city buildings to various disasters, including earthquakes.

2) Impact assessment of environmental warming due to urbanization

The Natural Environment Group is analyzing the impact of advancing urbanization on the heat island problem, increase in flood risk, and decline in biodiversity. With the Jakarta suburbs as target area, researchers have used interviews, field survey, satellite image analysis, 3D CAD simulation and other methods to describe abandonment of rice paddies, their conversion to housing blocks, and the decrease in wooded areas in the last thirty years.

3) Literature review and analysis for establishing a sustainability index (CSI)

The Urban Assessment Index Team analyzed almost twenty existing urban sustainability indices, including an environmental sustainability index (ESI) and an environmental performance index (EPI), in order to describe the need and goals for a new City Sustainability Index (CSI).

Project researchers have also been preparing to conduct intensive micro-scale field work in Jakarta's high-density, low-income areas. As the CSI advances, it will be possible to begin to build a comparative database with megacities in China, India, and Latin American countries.

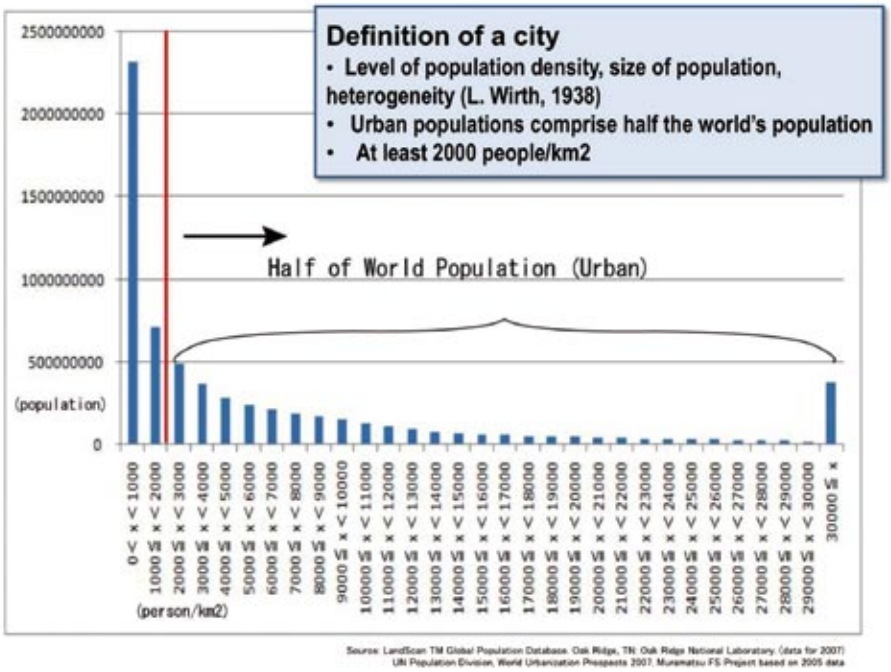


Figure 3 **World population distribution by population density (per kilometer)**

Designing Local Frameworks for Integrated Water Resources Management

This project investigates the pressing need for integrated water and land management and improved human-water-land relationships. It is based on the results of several completed RIHN research projects related to basin resources management. Project research entails interdisciplinary investigation of the merits and demerits of distinct water management regimes, especially related to irrigation, in several semi-arid and humid environmental contexts. Main research foci are agricultural productivity, water balance and environment, management institutions and organizations, and human behavior and consciousness. Field and modeling studies are integrated to develop an advanced description of the knowledge systems affecting water management; it will allow comprehensive analysis of the key elements in improved management of basin water resources and in human-water-land relationships more generally.

Project Leader
WATANABE Tsugihiro RIHN

Tsugihiro WATANABE received his doctor's degree in agricultural engineering from Kyoto University. He was the leader of RIHN's Research Project "Impacts of climate change on agricultural production system in arid areas" (2002-2007). He is interested in irrigation as an expression of local wisdom regarding land and water.

Core Members

AKCA, Erhan	Faculty of Agriculture, Adiyaman University
GUNDUZ, Mustafa	Faculty of Sciences and Letters, Adiyaman University, Turkey
KAGAMI Haruya	Graduate School of Letters, Kanazawa University
MIZUTANI Masakazu	Faculty of Agriculture, Utsunomiya University
MOLDEN, David	International Water Management Institute
NAGANO Takanori	Faculty of Agriculture, Kobe University
NAITO Masanori	Graduate School of Global Studies, Doshisha University
OKI Taikan	Institute of Industrial Science, the University of Tokyo
RAMPISELA, Agnes	Hasanuddin University, Indonesia
SETIAWAN, Budi	Faculty of Agriculture, Bogor Agricultural University
TAKAMIYA Izumi	Faculty of Literature, Arts, and Cultural Studies, Kinki University
TAKARA Kaoru	Disaster Prevention Research Institute, Kyoto University
TAMURA Ulara	Graduate School of Human and Environmental Studies, Kyoto University

Background and objectives

World water and food resources are under pressure. Population growth and development will increase aggregate demand for freshwater just as climate change is predicted to affect the historical spatial and temporal patterns of water availability. Since hydrologic cycles and agricultural systems are so closely linked, human societies must plan for change in both in relation to increasing demand and predicted increases in water-related disasters such as flood and drought. There is great need for integrated water resources management (IWRM). To date, however, IWRM has not achieved its potential (Fig. 1).

This project conducts extensive historical and contemporary evaluation of several local- and basin-scale agricultural water management regimes, seeking principles that promote, or blockages that hinder, efficient water-use. Combining best quantitative measures of water flow, use and quality, irrigation engineering, historical description and institutional analysis in several case-study sites, it evaluates and describes scenarios for culturally relevant and institutionally and economically feasible re-design of local water management regimes. It seeks to improve the IWRM framework's adaptability to local cultural and economic contexts, as local management performance directly affects local livelihoods and environment, and to highlight linkages between local and higher-scale management practices and contexts. In collaboration with users and authorities, the project then turns to fundamental re-design of local land and water management systems in relation to the combined social, economic and environmental challenges of the future.

Main results to date

Under the aegis of the RIHN GAIA Initiative, project researchers have conducted extensive review and discussion of completed RIHN projects, developing

Figure 1 **Project objectives**
Many water-related global environmental problems can be attributed to unsustainable local level water management. IWRM provides a template for integration of both local- and larger-scale concerns, but it must be refined through in-depth local study and can only be implemented with cooperation from local populations.

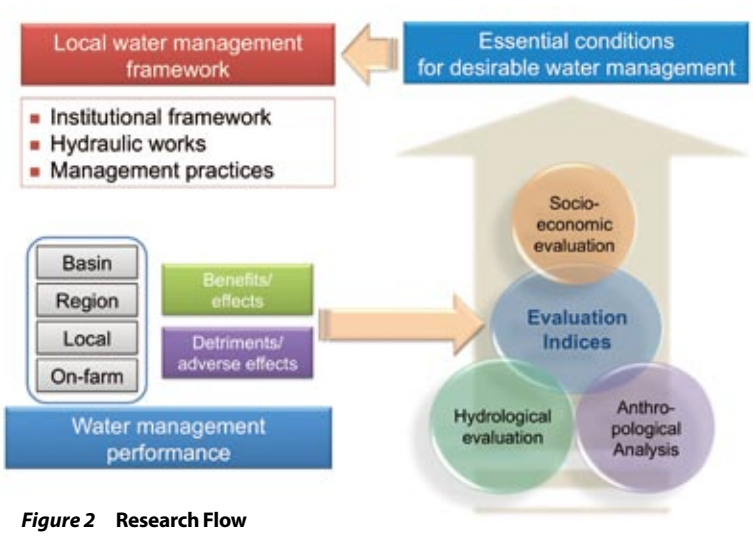


Figure 2 **Research Flow**

The research strategy to examine local water management consists of three frameworks, and integration of these works leads to design of the management system: 1) hydrological evaluation, 2) socio-economic evaluation, and 3) anthropological analysis of the structure and function of local "wisdom" on water management. An emphasis is placed upon the extent to which water management can be designed to reflect the interwoven three main themes in each region of interest.

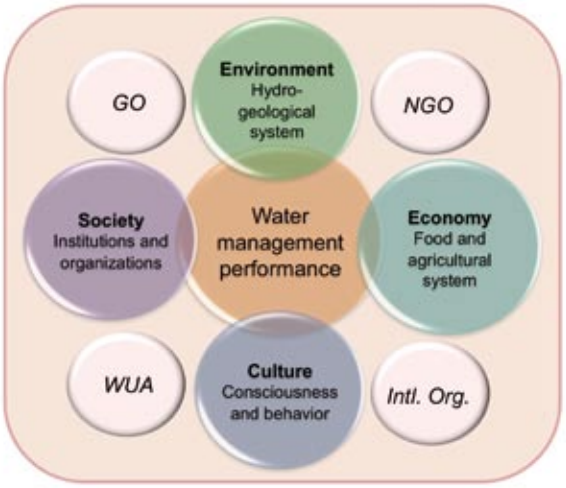


Figure 3 **Project organization**

Photo 1 **Field application in a large-scale irrigation scheme in Turkey's lower Seihan Plain**

Photo 2 **Diversion works of a small-scale irrigation system in Bali, Indonesia**

Figure 4 **Main case study areas**

analysis allowing for refinement of this project's objectives and methods. Based on this analysis, we have set up the framework research organization and are ready to make rapid progress with researchers from universities, governmental and non-governmental organizations in the case-study areas, as well as several relevant international organizations such as the International Water Management Institute (IWMI) and the International Commission on Irrigation and Drainage (ICID) (Figs. 2, 3).

Research plan

Six major case study areas are selected according to conditions of topography, hydrology, regional meteorology, scale and history of the system, and recent development progress (Fig. 4). Water management systems in each location are to be examined according to the following four main themes; 1) environment (soil and water use, hydrology); 2) economy (agriculture, regional economy); 3) society (organizations, governing institutions); and 4) culture (consciousness, behavior). A dedicated sub-team will investigate each theme at each study site; sub-teams are to share, integrate and communicate their findings, tasks overseen by the Site Research Coordinator. Cross-site integration is overseen by a Central Coordination Committee composed of researchers from each of the study sites as well as representatives of relevant international agencies.

This research project will contribute to the design of place-specific water policies and practices and to the concepts, models and theories that describe the multi-scale and linked nature of human-ecological systems. The case studies are designed to illuminate challenges in specific social and environmental contexts; at the same time the emphasis on scale and place integration should contribute to IWRM wherever it is applied. The project is therefore of relevance to local communities, decision makers, and international donor and aid organizations.

D Diversity Program

Program Director **KAWABATA Zen'ichiro**

Humanity and nature have evolved together. Nature is the source material of human perception and culture, and nature's rich diversity—both biotic and abiotic—has cultivated cultural diversity. Yet nature is transformed through human activity: it is both source and subject.

Biological diversity composes the planet as we know it; it is the foundation of all society and human reliance on it is inestimable. Meanwhile, cultural diversity, including ideas, languages, technologies, ways of living and systems of belief have been passed from people to people through time, and have enriched human quality of life and understanding of the cosmos. In acknowledging this role of cultural diversity we recognize the basic human rights to safe, healthy, fulfilling lives, peace of mind and just social systems, for these are the essential conditions in which people can live with hope and pride.

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

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

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

The Japanese Archipelago has been densely populated since the Neolithic Age, and its natural environment has been greatly influenced by human activities. In spite of intensive human intervention in the natural environment, the area is still rich in biota. More recent patterns of interaction between humanity and nature, however, have placed many plants and animals in danger of extinction. This project described 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

Project objectives

The main objective of the project was to describe the history of human-nature relationships in the Japanese Archipelago. Project researchers examined 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 were used to indicate past human perception, knowledge and skills regarding nature in general, and the human effect on key plant and animal species. This combination of biophysical and human cultural history will enrich appreciation of human-environmental history in the archipelago.

Results

In the history of the Japanese Archipelago, there are examples of both long-term sustainability and collapse. The common view that pre-modern or indigenous humans lived in harmony with nature, a harmony disturbed by modern science and technology, is partially true. Human ability to modify nature increased dramatically through time, and the earlier incentives to utilize local bio-resources in a sustainable way were displaced by growing access to global economies and trade. Traditional knowledge does not guarantee sustainable resource utilization, however; traditional systems sometimes have led to over exploitation of resources. Project research found that the level of community governance plays a critical role in sustainable use of ecosystem services: non-local systems of governance frequently led to collapse. Such findings strengthen the case for enhanced support of community or local governance, espcially by the people suffering most from current and future ecosystem service degradation. In some cases, long-term sustainability or recovery from collapse was achieved through collaboration of actors sharing both traditional and scientific knowledge, including, for example, that allowing alignment between local and non-local layers of governance.

Research communication

Project results have been published as Japanese books "35,000 Year History of the Japanese Archipelago" (in Japanese, six volumes). Important conclusions and messages were contributed to the report "Satoyama-Satoumi Ecosystem and Human Well-Being: Socio-ecological Production Landscapes of Japan (Summary for Decision Makers)" for the Convention of Biodiversity (COP10), held in Nagoya, October 2010.

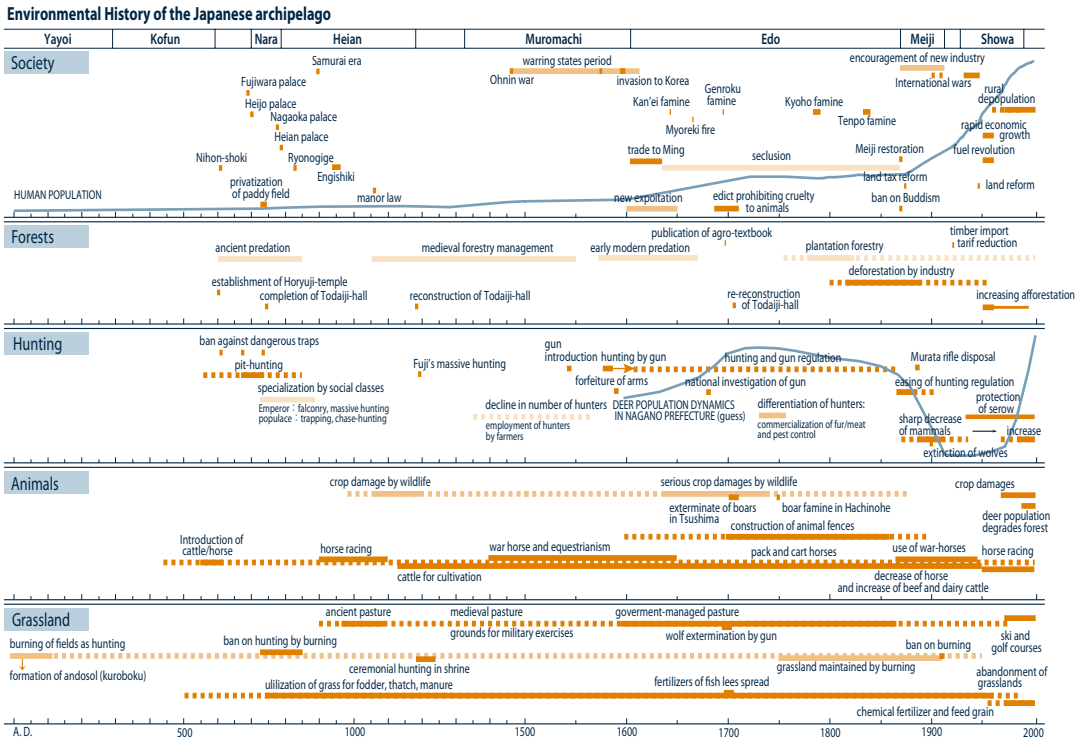


Figure 1
Chronological chart showing the history of 2000 years of human-nature relations in the Japanese Archipelago

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

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

Project Leader
OKUMIYA Kiyohito RIHN

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

Sub-Leader

SAKAMOTO Ryota	RIHN

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
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

This project explores new perspectives on human lifestyle in high-altitude environments where oxygen levels are low and natural resources are limited. Project research focuses on aging problems and lifestyle-related diseases, which are regarded as manifestations of global environmental issues evident in the human body. We aim to clarify the concept of "highland civilization", defined in relation to social, ecological and cultural adaptations to high-altitude environments, and to examine human physiological adaptations to high altitude environments and how recent changes in lifestyle have affected the health and quality of life (QOL) of the elderly.

Ecological and cultural adaptation to the high-altitude environment and recent lifestyle change

Subsistence lifestyle and economic conditions were studied in three ecologically distinct zones in Himalaya-Tibet region: a forest in Arunachal Pradesh and Bhutan, the Ladakh oasis, and the grasslands of Qinghai. Distribution of vegetation, ethnic groups, patterns of subsistence and alien plant invasion were described from 200 to 4000 m in Arunachal Pradesh (Kosaka 2010). Detailed household interviews and analysis of satellite imagery revealed a recent decrease in the number of livestock, increasing use of chemical fertilizer, and an expanding pattern of abandoned land at Domkhar village in Ladakh (Fig. 4). Shortage of fodder, heavy snowfall, and limited access to social services were identified as causes of outmigration of pastoral people from the Changthang highland to Leh city in Ladakh. In Ladakh, researchers assessed the risk of glacial lake collapse, documented damage due to flood (Yamaguchi 2011) and analyzed the role of climate as a cause of natural disaster (Fig. 3).

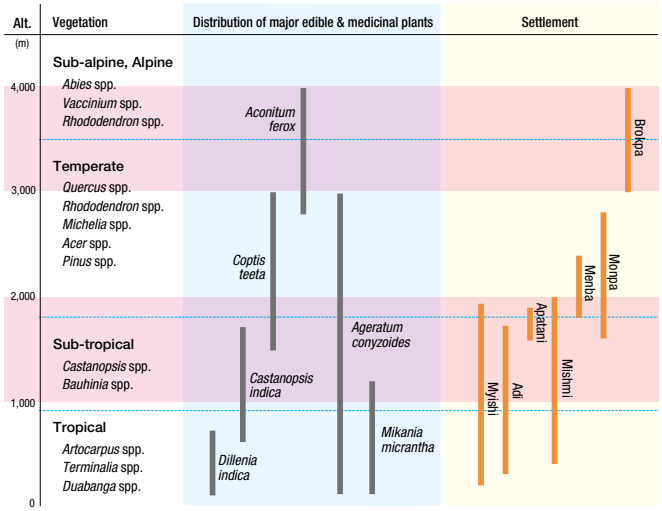


Figure 1 **Vertical distribution pattern of edible and medicinal plants**

Trade networks of ethnic groups distributed important edible and medicinal plants throughout the steep Arunachal Pradesh landscape (Kosaka et al., 2011).

The "Himalaya model of lifestyle-related diseases": Interaction between long-term physiological high-altitude adaptation and recent lifestyle change

We have documented a relationship between physiological hypoxic adaptation and lifestyle-related diseases. Han people had higher hemoglobin concentration compared with Tibetans in Qinghai. Increasing prevalence of diabetes mellitus was strongly associated with increases in hemoglobin levels related to adaptation to hypoxia in Ladakh, Yushu, and Arunachal (Okumiya 2010).

There is association between high-altitude and lifestyle-related diseases. High blood sugar, pulmonary disorder caused by dust, sleep disorder (in Ladakh), hypertension and hyperlipidemia (in Arunachal) were more prevalent among higher-altitude dwelling people (Ishimoto 2011).

There was association between ecological context, globalization and food diversity. Food diversity was highest in humid Arunachal, moderate in semi-arid Qinghai and lowest in arid Ladakh. Rural areas in Ladakh show less food diversity than urban areas.

There was association between settlement, livelihood change and lifestyle-related diseases. Lifestyle-related diseases were more prevalent in urban area of Yushu than rural area of Haiyan in Qinghai (Okumiya 2010). Official workers and monks had higher prevalence of obesity,

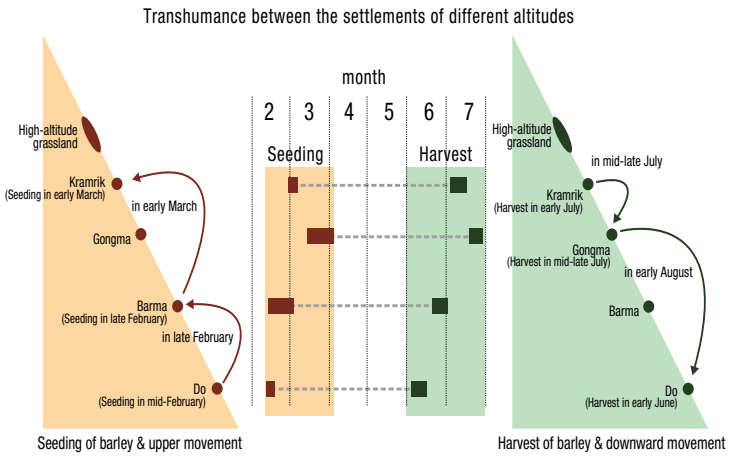


Figure 2 **Agro-pastoral linkage**

Transhumance of Ladakh pastoralists is closely linked to the agricultural cycle at each settlement of different altitudes (Hirata 2011).

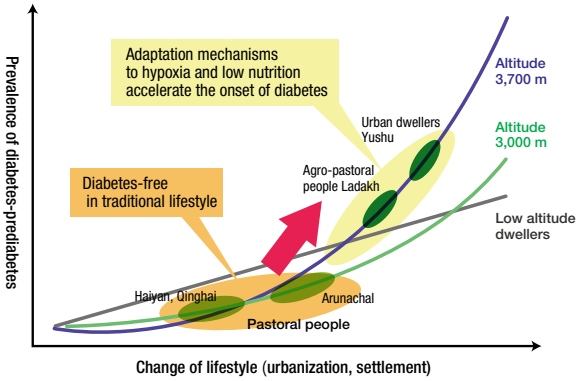


Figure 5 **Diabetes acceleration hypothesis**

In high altitude Himalaya regions, after rapid changes in lifestyle, adaptation mechanisms to hypoxia and low nutrition may have accelerated the onset and aggravation of diabetes. This is "the Himalaya model of lifestyle-related diseases" -"diabetes acceleration hypothesis" (Okumiya 2011).

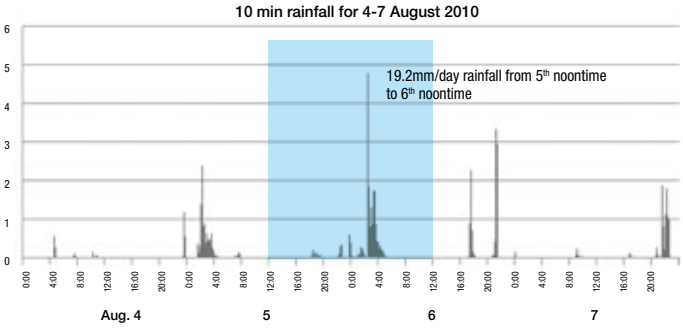


Figure 3 **Vulnerability and flexibility in relation to disaster**

Analysis of weather-monitoring data indicated the vulnerability of less vegetated oasis zones to mudflow disaster even with moderate rainfall in Ladakh (Yatagai et al., 2011). On the other hand, health examinations detected fewer mental stresses among disaster victims there than in other regions, which suggested a psychological coping capacity related to the sense of value and flexible social support in Ladakh (Ishikawa 2011).

Photo 1 **Local participants and health staff in a medical camp in Domkhar, Ladakh**

Follow up monitoring of body weight, physical activity and blood pressure is now underway.

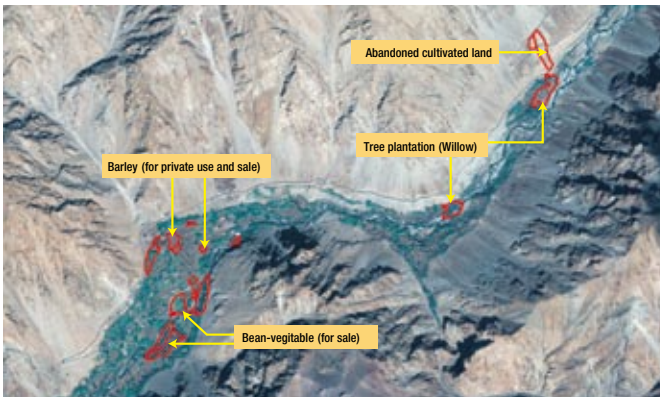


Figure 4 **Land use in a household with cases of lifestyle-related diseases**

This household in Ladakh had one case with polycythemia and high blood sugar and another case with obesity and hypertension. Nutritional survey revealed high intake of carbohydrate, lipid and salt. A land use survey revealed cultivation of cash crops and abandoned land related to labor shortage. Elderly agro-pastoral people adapted to hypoxic conditions suffered from lifestyle-related diseases associated with changes of diet and activity (Nose, Takeda 2011, Fukutomi, and Kimura 2011).

hypertension and diabetes than agro-pastoral local people in urban areas of Yushu and Leh.

The prevalence of diabetes was low among pastoral peoples following the traditional lifestyle in Arunachal and Haiyan (3000 m. altitude). In Ladakh (2900-3800 m) the prevalence of prediabetes in Ladakh was high, however. The difference may be related to the scarcity of natural resources in Ladakh, and their fragility in relation to contemporary change in lifestyle. There was greater prevalence of high hemoglobin level and high blood sugar with obesity and hypertension in Yushu (3600 m) than in Ladakh. Rapid change of lifestyle in hypoxia-adapted people may accelerate lifestyle-related diseases, as according to our "Diabetes-acceleration hypothesis" (Fig. 5).

Aging with high QOL: Health care design for the highland elderly

With the collaboration of local health staff in Ladakh we initiated follow-up monitoring of blood pressure, body weight and amount of exercise (Photo 1). Comprehensive geriatric functional analysis in all elderly people in Khaling, Bhutan was conducted and we are developing a geriatric care system in collaboration with local health staff, including traditional medical practitioners and monks, to promote health, high spirituality and quality of life (Sakamoto 2011).

Schedule in 2011/2012

Global environmental changes associated with socioeconomic globalization and climate warming are manifest in the human bodies of highland peoples. In the coming period of research, we will examine the difference between adaptation and maladaptation in relation to our hypotheses of Himalaya lifestyle-related diseases and diabetes acceleration. In this task, we will continue to integrate the research and findings of the medical and cultural/ecological teams. In describing a model of health care that is culturally and ecologically suited to the challenges of highland civilizations, and that is based in the wisdom of the elderly concerning quality of life, aging, and death, we will reflect on present lifestyles and the future of not only highland civilization but also modern civilization.

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 ecological research on ecosystem degradation has primarily focused on its direct cause and effect in a particular place. This project applies new network science to the problem of ecosystem deterioration and collapse, and to the prospect of ecosystem restoration. The project examines social-environmental interactions in two distinct areas where humans are dramatically altering ecosystems, and attempts to identify general characteristics leading to 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 of social-ecological systems, for example, modeling population migration between urban and rural areas, and different use of private and common lands. I like football, and still play with the RIHN researchers on our small field sometimes.

Sub-Leader

SAKAI Shoko	RIHN

Core Members

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

Project background

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

The key concept of our project is the ecosystem network, a concept describing ecosystem change in relation to a linked set of subsystems comprised of interacting social and ecological phenomena. Two ecosystem networks are investigated: those describing forest ecosystems in Sarawak and pastures in Mongolia (Fig. 1). Land-cover degradation is associated with intensifying land-use in both networks. Project research involves diversified field surveys, remote sensing and examination of existing literature in order to identify the most significant components and interactions causing degradation in each network. These indices then allow description of several possible future scenarios. As a whole, the two area studies enable construction of a general theory of ecosystem conservation.

Research sites

Field research takes place in tropical rainforests in Sarawak, Malaysia, and the grasslands of Mongolia. Export of raw materials is central to both economies. In the last few decades, social and environmental conditions in both places were profoundly affected by resource extraction, which has recently intensified in relation to new global economic demand. The ecological characteristics of these two places, including regeneration time of vegetation and position of humans in the food web, are quite different, but both ecosystems are critical to local livelihoods. Ecosystem degradation therefore dramatically affects local practices and prospects.

Research progress to date

In Mongolia, pasture degradation, especially near Ulan Bator, is the most serious environmental problem; it is caused by overgrazing linked to increasing populations of livestock, especially goats (Photo 1A). We observed patterns of livestock movement in order to understand

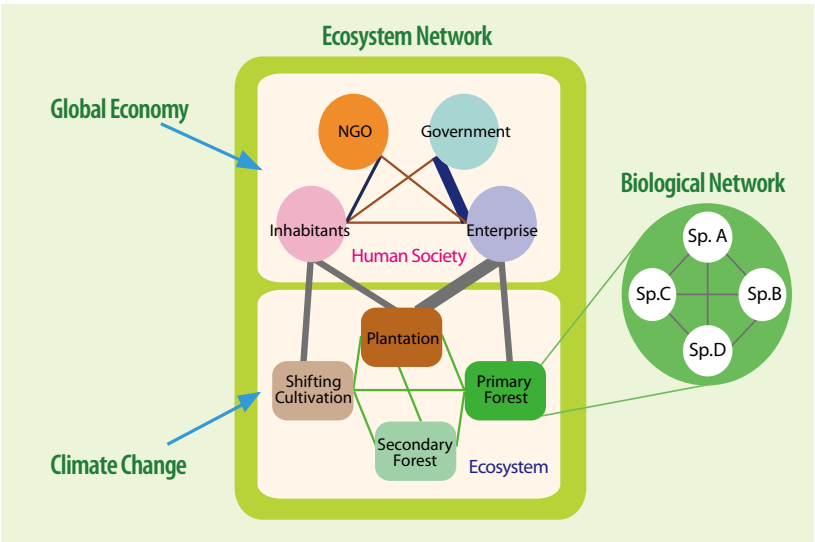


Figure 1
The ecosystem network concept

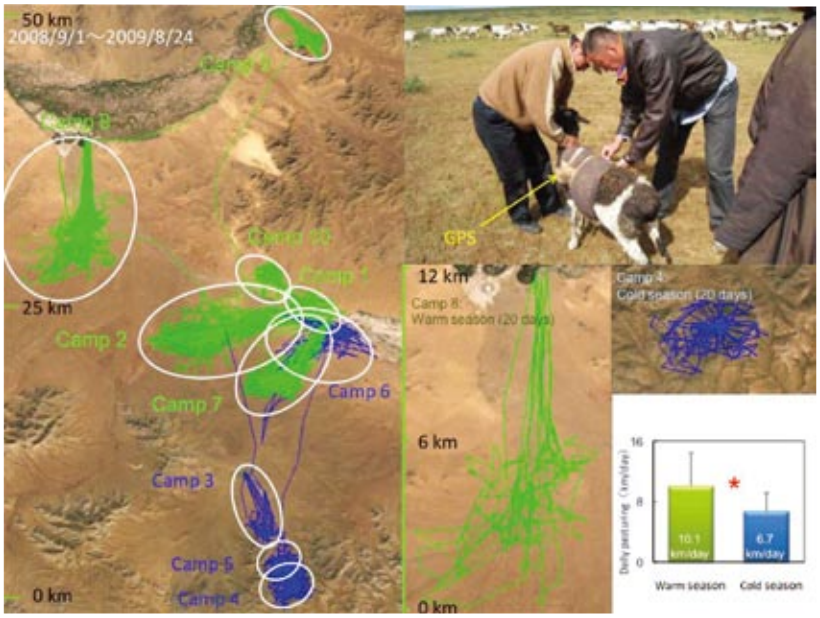


Figure 2 **Spatial patterns in nomadic life with livestock**

Mongolian nomadic people move livestock seasonally to maximize access to plants and water. Pasturing patterns were monitored by GPS installed on sheep. Daily pasturing distance was significantly greater in the warm seasons.

Photo 1 **Recent environmental problems *in Mongolia and Sarawak***

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

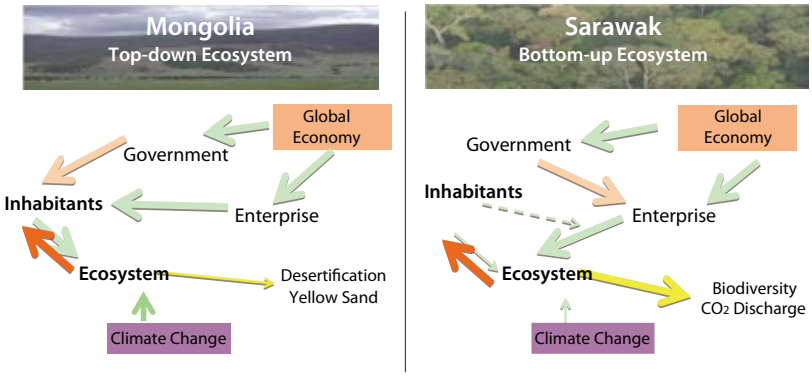


Figure 3 **Different ecosystem networks in Mongolia and Sarawak**

actual utilization of grasslands (Fig. 2) and documented the social factors leading to concentrations of livestock near urban areas, causing pasture degradation. We also analyzed climate data in order to describe how forests and shrubs affect pastures, and conducted scenario analysis of the effects of several possible policies affecting use of pasture, such as limiting the total number and movement of grazing livestock, on pasture degradation.

In Sarawak, expansion of palm plantation and its negative effect on biodiversity and forest resources available to local inhabitants, is the most serious environmental problem (Photo 1B). Research therefore entailed questionnaire surveys in communities located along the Rajang and Baram rivers, two of the main rivers in Sarawak, in order to identify the factors allowing plantation expansion in those areas. We also conducted surveys in order to describe the effect of plantation expansion on local biodiversity, and noted a decrease in biodiversity in areas of higher intensity human activity. Finally, we conducted scenario analysis of the effects of several contemporary endeavours, such as forest certification and bio-prospecting, in mitigating plantation development.

We have begun to develop a general theory of ecosystem network conservation based on the Mongolia and Sarawak case studies. We note remarkable difference in grassland and forest ecosystem networks (Fig. 3). In Mongolia, grassland vegetation itself has no direct value to humans: its value is realized in livestock that feed on the grasses. Global demand for livestock products, especially cashmere, therefore affects the behaviour of dispersed local inhabitants, leading to overuse of the vegetation and degradation of the grassland. In this case, an effective solution to grassland degradation should involve behaviour-change of land managers, but this change is clearly linked to their collective position within the cashmere commodity-chain. In Sarawak, economic value resides directly in the forest trees. There is great economic incentive in clearing forest, with clear negative impact on biodiversity and the amount of forest available to inhabitants. Effective solutions in this case should involve direct regulation of enterprises and governments, perhaps linked to greater recognition of the indirect economic value of forests.

Future issues

We have identified several potential scenarios in each ecological network under study, and now attempt to describe key scenario features, including prevalence of biodiversity, economic status of inhabitants, and continuation of traditional cultural practices related to long-term forest utilization. Even with extensive background data, predicting ecosystem network change is a challenge, as networks are dynamic and complex in themselves and also susceptible to external forces. General theories of ecosystem change will be improved through continual comparative analysis.

Making dried fish
Alazeya River area, Sakha Republic, Russia
Salmon are filleted, sliced and then hung to dry. Fresh salmon caviar is eaten with the day's lunch
FUJIWARA Junko

Tree-lined road
Xiangcheng, Henan, China
Recently planted trees around farms make for beautiful scenery.
At the same time, timber for fuel and construction is in short supply
MAKIBAYASHI Keisuke

Disappearing island
Kiribati, Central Pacific Ocean
Islanders say that this island has been slowly disappearing in the past 30 years. Seabirds now can be seen perched on the exposed coral reefs, appearing almost as a new island
NAKATA Satoshi

Our Father's Cow
South of Zambia
Brothers playing on the back of their father's cow
ISHIMOTO Yudai

Resources Program

Program Director **MOJI Kazuhiko**

The Resources Program examines global environmental issues related to the use and conservation of natural resources. Human beings have always made use of—and changed—the environments in which they lived. Such change occurs as people appraise the qualities of the plants, animals, waters and soils that surround them, and develop the tools that allow them to make use of those qualities. Perception and use of resources is therefore related to a people or society's immediate need for survival and to its knowledge of the natural world. Resource use is also guided by cultural preferences, including favored tastes and forms of social organization, as well as a people's collective sense of its place and role within the larger world.

Human ability to perceive the dormant utility in the natural world has led to the domestication of plants and animals and the control of water and energy. Paradoxically, humanity's great advances in environmental knowledge and resource control have also led to environmental problems of unprecedented scale and magnitude. In aggregate, it appears that humanity is using many resources and taxing ecological services at a pace beyond their capacity for renewal or absorption.

Excessive resource use cannot simply be explained in relation to population or economic growth; instead we must look to the roots of the interactions between humanity and nature for explanation. Identifying solutions to contemporary resource problems will require close attention to specific patterns of human-environmental interaction, for there are great disparities between and within individual societies that prevent equal access to the benefits of the global environment and the solutions devised to address environmental problems.

Research projects in the Resource Program therefore make critical and creative assessment of resource-use processes and problems. Projects put special emphasis on water and food resources, especially as they are so closely linked to human health, daily life and wellbeing, and on the new infrastructures that will enable efficient resource use and improve quality of life.

Full Research	Leader	Title
R-03	**KUBOTA Jumpei**	Historical Interactions between Multi-Cultural Societies and the Natural Environment in a Semi-Arid Region in Central Eurasia
R-04	**MOJI Kazuhiko**	Environmental Change and Infectious Disease in Tropical Asia
R-05	**NAWATA Hiroshi**	A Study of Human Subsistence Ecosystems in Arab Societies
R-06	**KADA Ryohei**	Managing Environmental Risks to Food and Health Security in Asian Watersheds

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 surroundings. 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.

Sub-Leader

WATANABE Mitsuko	RIHN

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	Institute for Research in Humanities, Kyoto Univ.
CHENGZHI	RIHN

Background and objectives

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

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

Research area and groups

Research centers on the Ili River watershed area extending from China to Kazakhstan, and surrounding areas, including Kyrgyzstan and Uzbekistan. Throughout human history, Central Eurasia has been a key site of the civilizations of East and West. In more recent times, the development policies of modern states have led to severe environmental degradation.

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

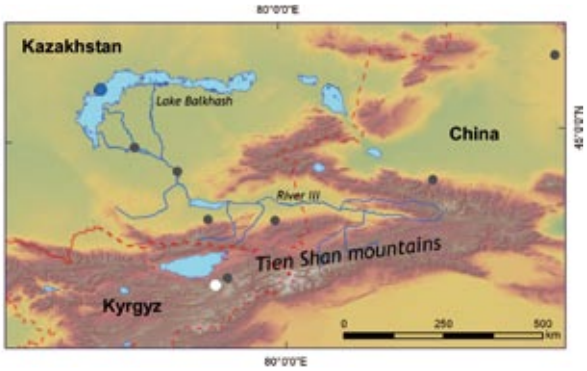


Figure 1 **The Tian Shan Mountains and Ili River**

● Lake sediment core ○ Ice core ● Other study sites

Progress to date

Project researchers have used several proxies to reconstruct climate change in the area in the past 1,000 years. This reconstruction forms the basis of our understanding of historical interaction between human activities and the environment. Reconstructed temperature and precipitation, and estimated river discharge, indicated that the period AD 1000-1500 was warm and dry, while the Little Ice Age (LIA, AD 1500-1850) from 1500 to 1850 was cold and wet. After the LIA, the climate became wet and warm. This long-term trend corresponds well with the reconstructed level of Lake Balkhash, which was determined by analysis of the ratio of saline and planktonic diatoms, indicating a decreasing trend of lake level in the 10th to 13th centuries. After this significant regression, the lake level showed rapid recovery and remained relatively high. Results from other proxies, such as dust and retrieval of glaciers support this description.

A chronological database was developed to describe the rise and fall of settlements. In the northern piedmont of the Tian Shan Mountains, oasis cities, which were agricultural centres, and trading bases in the Syr Darya basin of western Turkestan, flourished from the 7th century; settlements in the Ili River basin were the next to be blessed with prosperity. Most of the settlements were not founded on agricultural bases, but were nomadic and trading posts with military utility. In medieval times, agricultural and nomadic peoples lived separately, making full use of environmental variation. Interactions between the two peoples were complementary in terms of natural resources use. Climate change had both negative and positive effects on agricultural and nomadic production. A

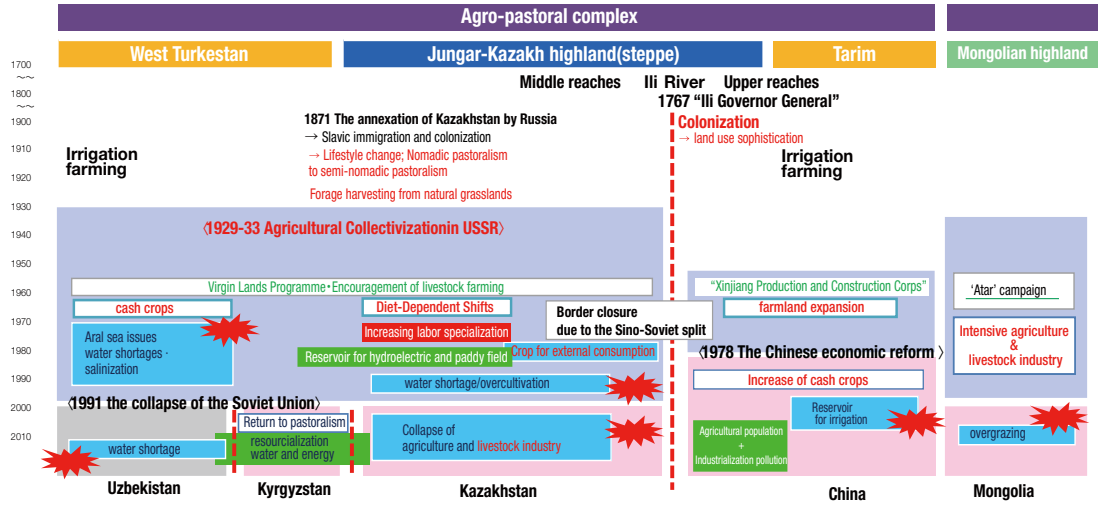
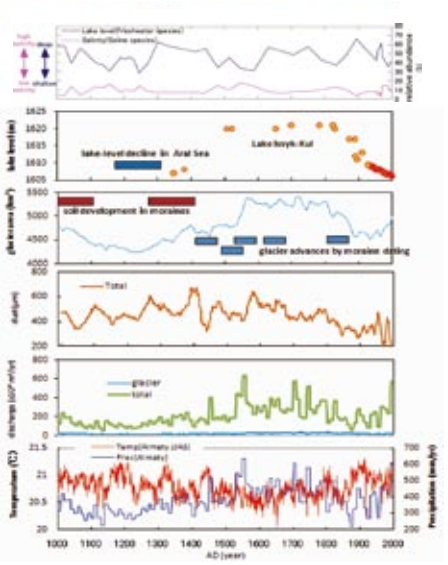


Figure 2 **Transition of social systems, subsisistence and environmental conditionsin Central Eurasia**



Ratio (%) of saline and planktonic diatoms shows that the lake-level in Lake Balkhash declined in the 11th-13th century and increased in the 17th-18th century.

Lake terrace and historical maps show changes of water level in Issyk-Kul Lake was high (around 1620m) in AD 1500-1850. Climate was wet in this period.

Glacier model shows glacier area in Iri river basin expanded in AD 1500-1850 during the Little Ice Age. Based on moraine dating, maximum glacier advances in the Gissar-Alay and Tien Shan occurred in the first period (AD 1450-1650) of the Little Ice Age.

Dust flux from Gregoriev ice core in Tien Shan. Increasing of dust flux in AD 1000-1400 shows a dry climate condition.

Glacial and total river runoff in the Ili river basin. Increased river runoff AD 1500-1850 shows a wet climate in this period.

Reconstructed summer temperature at Almaty from tree-rings (Esper et al., 2003) and precipitation from Guliya ice core (Thompson et al., 1995). Climate conditions were warm/dry in AD 1000-1500, cold/wet in AD 1500-1850, and warm/wet in 1850-2000.

Figure 3 **Long-term reconstructions of climate and environmental change in Central Eurasia**

warm and dry climate in early medieval times might have accelerated the development of agricultural and trading activities, and consequently contributed to the area's flourishing, especially of oasis cities in the Syr Darya basin of western Turkestan. The cold and wet climate in the early LIA might have accelerated the decline of oasis cities and the increase of nomadic activities in the Ili River basin and Dzungaria.

Relocation and change in subsistence patterns were major adaptations of these periods. This adaptive capacity, and so the direct impact of longer term patterns of environmental change, was drastically altered following the division of the area between Russia and Qing China, however.

In Kazakhstan, several stages of subsequent change can be identified. After Russian expansion, there were attempts beginning in the late 19th century to settle pastoral nomadic peoples and make them agriculturalists. Collectivization of the agricultural sector beginning in 1929 triggered serious social confusion in Kazakhstan, resulting in the loss of a large number of nomadic populations. Khrushchev's Virgin Lands Programme determined that Kazakhstan would become one of the Soviet Union's major crop production areas. The policy was conceived and implemented without regard for the area's traditional inhabitants or environmental capacity, and both suffered its successes. The newly adopted production systems were based on strict divisions of labour and required emigration of skilled peoples from other lands to serve as leaders of collective farms. These systems therefore did not promote accumulation of agricultural knowledge, while simultaneously undermining traditional knowledge of pastoralism.

With the collapse of the Soviet Union, the terms of trade in the agricultural sector deteriorated, state subsidies and purchases decreased, and many farmlands developed during the planned economy were abandoned. Abandonment reduced the pressure on natural resources, resulting in ecosystem recovery. At the same time, people labouring in state farms were provided rather small farmlands after privatization, but their experience as agricultural labourers was not adequate to the task of whole farm management. The area suffered general economic crisis, making transition even more difficult.

In China, modern development did not start until the 1950s. While plains grassland was converted to cereals agriculture in a first development period in the 1960s, the traditional nomadic pastoral system and natural grasslands were well preserved in the mountains. A second stage of development emphasized conversion of cereals to other cash crops, again causing no serious damage to natural resources such as land and water. Industrial development since 2000 however, has been very active and is expected to increase demand for natural resources and pollution in the region.

Environmental Change and Infectious Disease in Tropical Asia

The RIHN Ecohealth Project examines the effects of climate/environmental and social change on the ecology of human infectious disease in tropical monsoon Asia. Key drivers of ecological change in this area include climate change, population increase, deforestation, resettlement, urbanization, expansion of wet rice cultivation, changes in water management, economic development and livelihood/lifestyle changes. Prevalent diseases associated with such ecological change include malaria, liver fluke infection, and diarrhea. The study will offer new ecologically-based insights for the evaluation and control of infectious disease in relation to both local and global environmental changes.

Project Leader
MOJI Kazuhiko RIHN

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

Sub-Leader
NISHIMOTO Futoshi RIHN

Core Members

KOBAYASHI Jun	National Center for Global Health and Medicine
KOBAYASHI Shigeo	Kyoto University
IIJIMA Wataru	Aoyama Gakuin University
ITOH Makoto	Aichi Medical University
TOMITA Shinsuke	University of Tokyo
ASAKURA Takashi	Tokyo Gakugei University
YAMAMOTO Taro	Nagasaki University
KANEKO Satoshi	Nagasaki University
HASHIZUME Masahiro	Nagasaki University
SUNAHARA Toshihiko	Nagasaki University
AHMED, Kamruddin	Oita University
BOUPHA, Boungnong	National Institute of Public Health, Lao PDR
KOUNNAVONG, Sengchanh	National Institute of Public Health, Lao PDR
PONGVONGSA, Tiengkham	Savannakhet Malaria Station, Lao PDR
ISLAM, Sirajul	ICDDR,B, Bangladesh
HUNTER, Paul	University of East Anglia, UK
MASCIE-TAYLOR, Nick	Cambridge University, UK
HOSSAIN, Moazzem	Institute of Allergy and Clinical Immunology, Bangladesh
RAHMAN, Mahmudur	IEDCR, Bangladesh
ZHANG Kong-Lai	Peking Union Medical College, China
ZHANG Kaining	YHDRA, China
ICHIKAWA Tomo	Shanghai Jiao Tong University, China
CAI Guoxi	RIHN
TOJO Bunpei	RIHN

Project background

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

Progress to date

The RIHN Ecohealth Project is studying major infectious diseases in tropical monsoon Asia (Table 1).

Several research groups comprise our project. The Lahanam Study Group's research in Savannakhet Province, Laos, examines patterns of liver fluke infection of *Opisthorchis viverrini* (Ov), a parasital infection associated with consumption of raw freshwater fish. In 2011 the principal objectives of this group are to:

1) Maintain and expand the Lahanam Health and Demographic Surveillance System (HDSS) and analyse life expectancy and causes of death;
2) Study the relation between modern irrigation/wet-rice cultivation and liver fluke infection (Fig. 1);
3) Study fish and snail ecology, fishery ecology, and consumption of fish, and;
4) Determine feasible educational, behavioural, and/or environmental control of liver fluke infection.

Studies on young children and school health and nutrition are also underway.

The Sepone Study Group's work in Savannakhet Province, Laos, is developing an integrated ecological and medical approach to malaria control and elimination in Southeast Asia. This group established a mobile phone-based health information network system covering all 158 villages in Sepone. Land-cover studies and satellite image analysis (ALOS) were conducted in Lahanam and Sepone. In 2010 this group found the very high mortality of young children among mountain farmers. The principal objectives of this group in 2011 are to:

1) Maintain the Sepone Health Information Network in order to monitor monthly incidence of malaria and other diseases;
2) Analyze the relation of forest cover change, settlement, subsistence, mosquito population/ecology with malaria endemiology/epidemiology;
3) Analyze the environmental and societal changes within the Banhiang River catchment area (a tributary of the Mekong River), including rainfall, flood, land- cover/use, and water quantity and quality;
4) Analyze the effects of the Vietnam War on the occurrence of malaria (Fig. 2).

The Vietnam Study Group is focusing on transmission of new human malaria, *Plasmodium knowlesi* (Pk) in humans as well as in monkeys. The group found a very high mix-infection of Pk with *P. vivax* in humans. The group therefore has begun to analyse Pk incidence through a multi-disciplinary approach including malariology, entomology, primatology, forestry, epidemiology and social sciences. The team also is assessing the prevalence of Pk near the Sepone border of Laos.

The Bangladesh Study Group is working in collaboration with the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR, B) to study the relationship between the Indian Ocean Dipole and the incidence of cholera in Dhaka. This group is also studying the

Table 1 **Target diseases of the RIHN Ecohealth Project**

Diseases (pathogens)	Vector/Fomites	Reserch field	Environmental factors	Research strategies	Interntional parters
malaria (*P. falciparum*)	mosquito (*A.dirus*)	Lao, Sepone Distirct	forest, swidden cultvation, bomb holes	mobilephone network, malaria-ecological survey	NIOPH, SVKPHD-MS, CIMPE
zoonotic malaria (*P. knowlesi*)	mosquito (*A.dirus*)	Vietnam, Khanh Phu Commune	forest, wild monkey, illegal logging	malaria analisis	Khanh Phu Malaria Station, NIMPE
malaria in the 20th C (*P. falciparum/ P. vivax*)	mosquito (*A.sinensis*)	China, Yunnan	forest retardation, subsistence transition	Chinese historical records	Yunnan University
cholera and other diarrhea	water, food	Bangladesh, Dhaka	climate change, flood, estreme events	climatological data and hospital data	ICDDR,B, London University
diarrhea, chronic diseases, total mortality	water, various	Bangladesh, Matlab	flood in 2004	epidemiological survey in HDSS	ICDDR,B, London University
rotavirul infection	water, food	Sri Lanka	refugee camp, tsunami effects	molecular epidemiology	University of Colombo
filariasis	mosquito (*Curex spp.*)	Bangladesh, Northwest region	poverty, discrimination, living condition	urine antibody analysis, mobidity control, control of mosquitos	Government of Bangladesh, JICA
neglected tropical diseases (NTDs)	dogs (rabies) snake bite etc.	Bangladesh (all country)	hot and humid environment of tropics, poverty, poor health system	health Information system, preparedness of environmental sanitation	Government of Bangladesh
liver fluke infection (Ov.)	snail, carp	Lao, Savannakhet	flood, irrigation, defecation places	parasitological-ecological approach	NIOPH, SVKPHD, Mahidol Univ.
soil transmitted helminsiasis (STH)	water, food	Lao, Savannakhet	defecation, animal husbandary, environmental sanitation	HDSS, stool exam copro-DNA	NIOPH, SVKPHD, Mahidol Univ.
maternal and child/vaccine preventable diseases	various factors	Lao, Savannakhet	nutrition, health services, tradition	HDSS, cause of death analysis	NIOPH, SVKPHD
dengue fever/ dengue haemorrhagic fever	mosquito (*Aides spp.*)	Lao, Savannakhet	urbanization, water containers	nutrition, malaria co-infection	SVKPHD-MC
HIV/AIDS, STI, viral hepatitis	sexual contact, IVDU	China, Yunnan	poverty, TB, mobile population	molecular, social and behaivioral epidemiology	China CDC・YHDRA
schistosomiasis (*Schistosoma japonicum*)	snail (*Oncomelania*)	China (Yunnan and Jiangnan)	aquatic system, irrigation, dams,	historical records & oral history	Shanghai JT Univ.; Yunnan Univ.
health effects of environmental pollutants	occupational exposure	China and Lao (Savannakhet)	livelihood, pesticide, fertilizer,	analysis of bio-samples & water	Univ. of Tokyo ENVRERA project

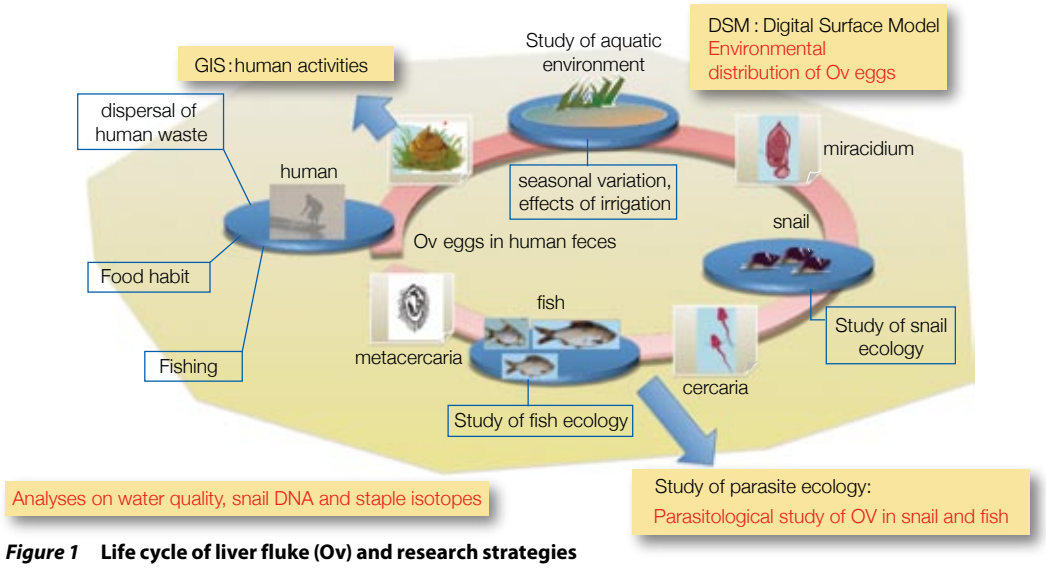


Figure 1 **Life cycle of liver fluke (Ov) and research strategies**

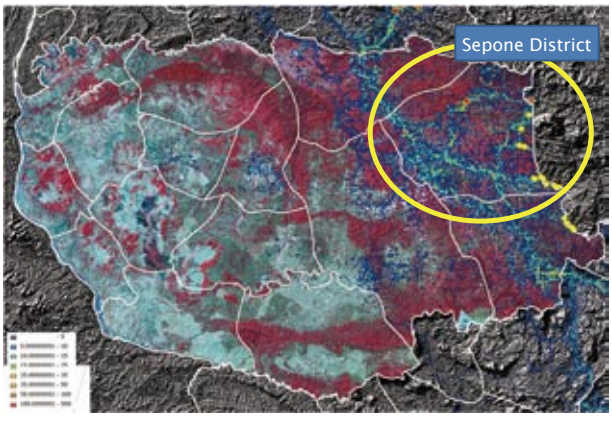


Figure 2 **ALOS image of Savannakhet Province of Lao PDR with density of bombing during the Vietnam War**

Table 2 **Disease profile of Indochina in 1922**

Disease	Inpatients	Deaths
Malaria	16,703	1,451
Tuberculosis	2,360	626
Dysentery	3,157	546
Beriberi	2,018	356
Leprosy	1,090	352
Cholera	479	310
Opium addict	953	135
Syphilis	5,024	107
Plague	118	75
Smallpox	432	74
Influenza	927	62
Total	33,261	4,094

Source: Annuaire statistique de l'Indochine

long-term effects of flood on morbidity and mortality in Matlab. In collaboration with the Ministry of Health and Welfare, a subgroup is studying epidemiology of rabies in the entire nation, and of filariasis in the north-west of the country.

The China Study Group investigates how social and environmental change affects health in the Greater Mekong Subregion. There are many vulnerable populations, including male and female commercial sex workers, IV drug users, migrant urban labourers, poor rural farmers and international migrants. The Yunnan Health and Development Research Association (YHDRA) is conducting research to improve the ecohealth of such vulnerable populations, and Ecohealth Project researchers are also describing the prevalence of HIV/AIDS among vulnerable peoples in the region. The China History Study Group is making a database documenting control of malaria and schistosomiasis in the 20th Century. The disease profile of colonial Indochina is also described (Table 2).

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 the 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.

Sub-Leader
ISHIYAMA Shun RIHN

Core Members
KAWATOKO Mutsuo Research Institute for Islamic Archaeology and Culture
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
BABIKER, Abdel Gabar E. T. Sudan University of Science and Technology
ABU SIN, Abdalla M. A. Gezira University
LAUREANO, Pietro World Bank
BENKHALIFA, Abdrahmane Centre National de Développement des Ressources Biologiques, Ecole Normal Supérieure, Algeria

Background

For political, social, economic and environmental reasons, the Middle East now faces a turning point in modern oil-based development. Fossil fuel-based interdependencies must now be transformed into new relations that can support viable future societies.

This research project focuses on human subsistence ecosystems of the region: low energy-intensity life-support mechanisms and modes of production, such as hunting, gathering, fishing, herding, farming, and forestry. In doing so it also reflects on the role of advanced technologies in economic development, and assesses measures adopted thus far to combat desertification. Field research investigates keystone species, ecotones, and traditional knowledge. In sum it examines the sustainability of subsistence economies under site-specific conditions.

Research methods and organization

The study is developed along three principal axes (Fig. 1): 1) botanical and ecological study of the alien invasive species mesquite, with emphasis on comprehensive measures for its control; 2) environmental impact assessment of development programs in coastal zones of the arid tropics; and 3) sharing of research results to support local decision making. Field research examines subsistence ecosystems, focusing on keystone species such as camels, date palm, dugong, mangrove, and coral reefs, and ecotones such as wadi beds, riverbanks, mountainsides, and seashores.

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

1. Alien invasive species control
A team of Japanese and Sudanese hydrologists, plant physiologists, weed scientists, remote-sensing specialists, range managers, agricultural economists, nutrient physiologists, and cultural anthropologists conducted field surveys at riverbanks, wadi beds, seashores and mountainsides in arid to semi-arid areas of Sudan. The group has developed a detailed description of the human and ecological factors affecting mesquite growth in several distinct environmental contexts, and suggested several potential measures that may be used for its control.

2. Environmental assessment in coastal zones
Forest structure, morphology, and water use of the keystone mangrove species Avicennia marina in the southern Egyptian Red Sea coast were studied in collaboration with the Nature Conservation Sector of the Egyptian Environmental Affairs Agency. Ten microsatellite markers on DNA analysis were found on collected samples. Parent-child relationship of A. marina may be revealed in further study at the RIHN laboratory. Local environmental researchers and administrators have begun extension courses to promote mangrove re-forestation along the Red Sea coast in Egypt and Saudi Arabia. Anthropological study on maritime societies demonstrates a high level of traditional ecological knowledge, particularly in regard to coral reef environments.

3. Support for local decision making
Three sites have been selected for field surveys: In Belbel, Matriouen and Aoulef. Surveys are to describe the Sahara oasis subsistence ecosystems in light of recent historical change (Fig. 3). Fieldworkers are anthropologists, biologists, geographers and historians; practitioners, consultants and motivated farmers also participate. Researchers from the Centre National de Développement des Ressources Biologiques (CNDRB) are to inventory fauna and flora at the sites and draft conservation projects involving local inhabitants.

Figure 1 **Field survey areas**

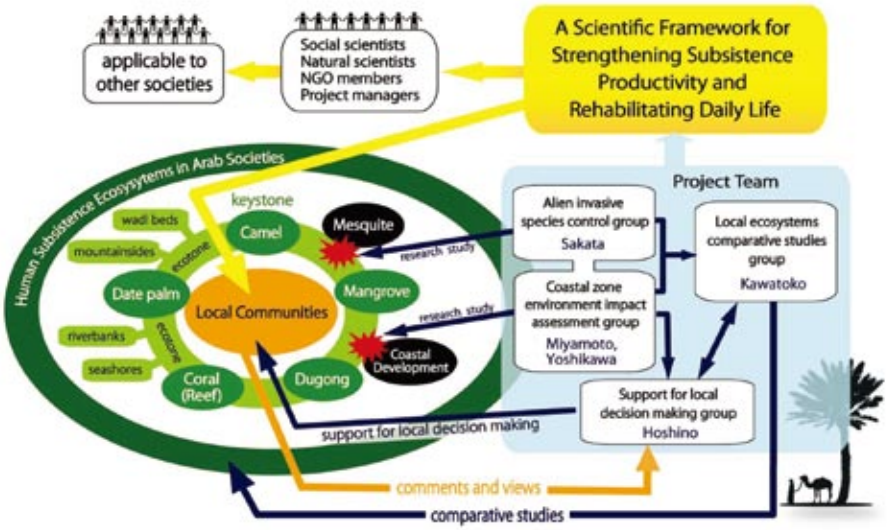


Figure 2 **Research methods, approaches, and organization**

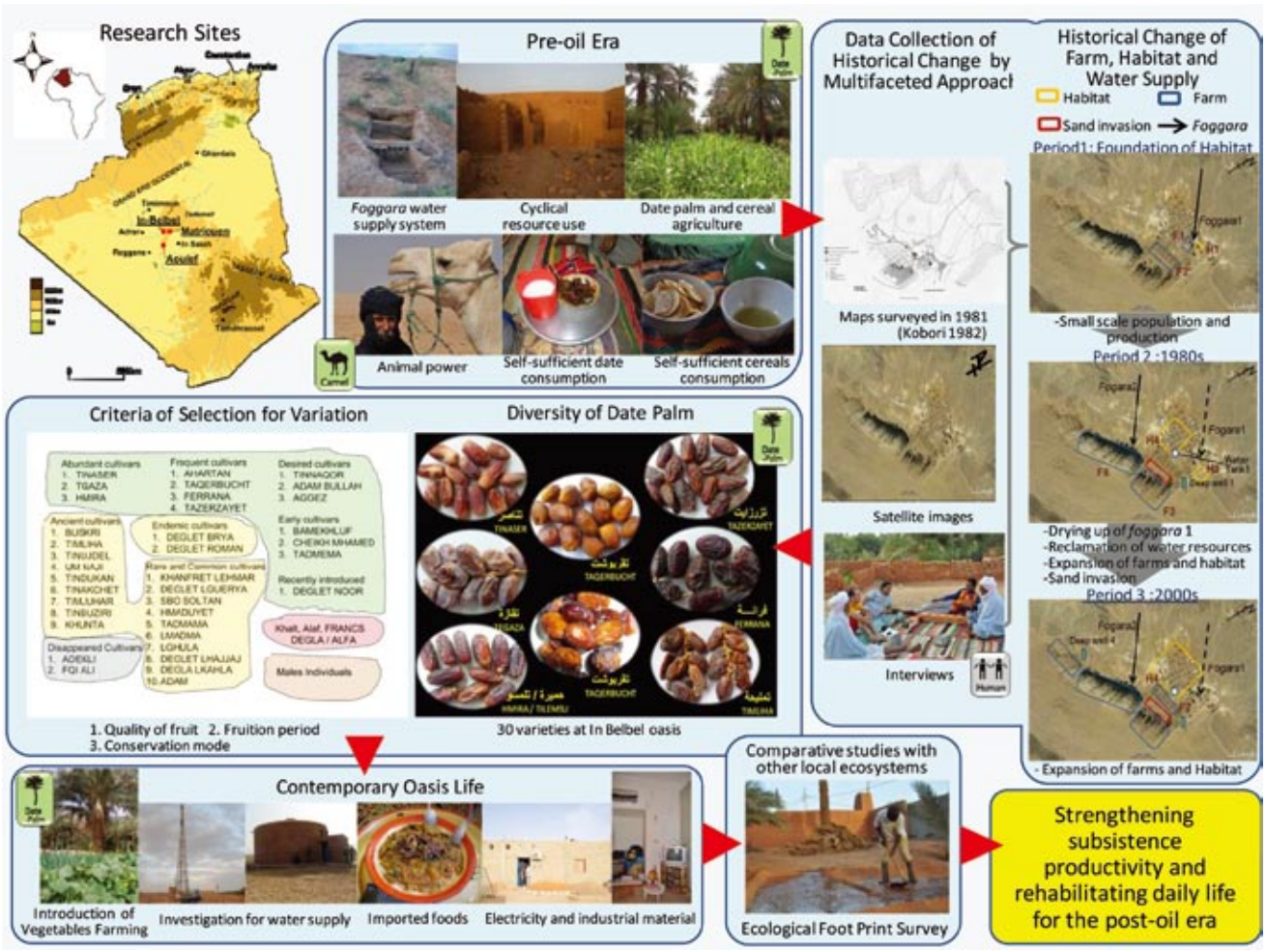


Figure 3 **Design and progress of survey in Algeria**

Research shows that in pre-oil era (more than 50 years ago), human subsistence was based on self-sufficient social-ecological systems. Life depended on oasis resources. Date palm agriculture and groundwater-based irrigation systems, called *foggara*, were indispensable. There were also extensive extra-local networks based on camel transport. This mode of life has changed dramatically since the 1970s. The use of deep-water pumps has allowed oasis agriculture to expand, but new water sources are often not dependable. The use of *foggara* has declined. Date palms have become a commodity for export, not local consumption. Cous-cous, an imported food, is now a staple. Since October 2010 we have analyzed the ecological footprint associated with this conversion at a deep-pump irrigated date palm farm in Aoulef.

Future tasks

Full-scale field surveys are now underway in each research area. In the next year we will begin comparative data analysis and consideration of best ways to disseminate findings. In particular, we are investigating potential alternative uses of uprooted invasive mesquite trees; Sudanese researchers are examining the species potential as fodder and charcoal. Another key task is the design of a coastal mangrove management and afforestation regime based on traditional uses.

Managing Environmental Risks to Food and Health Security in Asian Watersheds

This project combines the social, medical and physical sciences in order to develop strategies of ecological risk management for sustainable food, health security and watershed planning in the Laguna Lake region, the Philippines. In addition to the dense population and urbanization, the continuing deforestation, upsurge in inland fisheries, and unabated abuse of the land uses surrounding the lake have aggravated the deposition of the sediments and resulted in the rapid deterioration of water quality. Organized by Japanese and Filipino researchers, this project aims at critically examining resource degradation and pollution, its origin and effect on aquatic life, food production and quality, and subsequently on public health in the Laguna Lake watershed area.

Project Leader
KADA Ryohei RIHN

Professor Kada joined RIHN as leader of the Food and Health Risk Project in July 2010. He also teaches at the Graduate School of Environment and Information Sciences, Yokohama National University. From 2001-2004 he served as Policy Research Coordinator at the Policy Research Institute, Ministry of Agriculture, Forestry and Fisheries (PRIMAFF), Japan. For nearly 25 years he has been researching and teaching agriculture and food policy at the Graduate School of Kyoto University, and has also held posts at Kasetsart University in Thailand and the University of Wisconsin-Madison. With B.S. and M.S. degrees in agricultural economics from Kyoto University, he received his Ph.D. from the University of Wisconsin-Madison in 1978.

Sub-Leader
RAZAFINDRABE, Bam H.N RIHN
Core Members
YUMOTO Takakazu RIHN
NAKANO Takanori RIHN
ARIMA Makoto Yokohama National University
MASUNAGA Shigeki Yokohama National University
MIZUSHIMA Shunsaku Yokohama City University
TANAKA Katsuya Shiga University
GALVEZ-TAN, J. University of the Philippines-Manila
RANOLA, Roberto University of the Philippines-Los Baños
CONCEPCION, Rogelio N. University of the Philippines-Los Baños
SANTOS-BORJA, A.C Laguna Lake Development Authority

Background and research objectives

This research project investigates the direct and complex links between environmental change, ecological degradation, food availability and quality, and human health. Research is conducted at three sites in the Laguna Lake region, a highly populated and variegated region in which rich ecological resources are threatened by rapid land use change, urbanization and industrialization. Study sites are representative of the challenges facing many other Asian watersheds.

The project has four principal objectives: 1) to document the current levels and pathways of heavy metals pollution in the aquatic resources of Laguna Lake; 2) to investigate the health condition of local residents and their perception of food risks; 3) to analyse the ecological effects of agrochemical inputs, and their cumulative impact on food production and relation to subsequent ecosystem deterioration; and 4) to describe land use change in the Laguna Lake area and its impact on material cycles directly related to agricultural productivity, such as sedimentation and groundwater level and quality.

Research organization

Five research teams are comprised mainly of researchers at RIHN, Yokohama National University and University of the Philippines; they work in collaboration with government agencies such as the Laguna Lake Development Authorities (LLDA) and local government units. The *Environmental Risk Assessment Team* identifies the exact sources of, and factors responsible for, particular pollutants in the food chain. The team uses stable isotope and other analytical techniques to investigate how land use change is associated with downstream pollution. The *Socio-Economic Evaluation Team* explores how market- and non-market-based instruments can be used to improve water quality, food security and public health. The *Health Risk Evaluation Team* describes human nutrition, history of disease, and life expectancy in the region, especially in relation to socio-economic dynamics. The *Payment for Ecosystem Services Team* (PES) investigates the design of ecosystem service payment programs that may support robust regional agroecologies. The *GIS-based Risk Mapping Team* supports the entire research

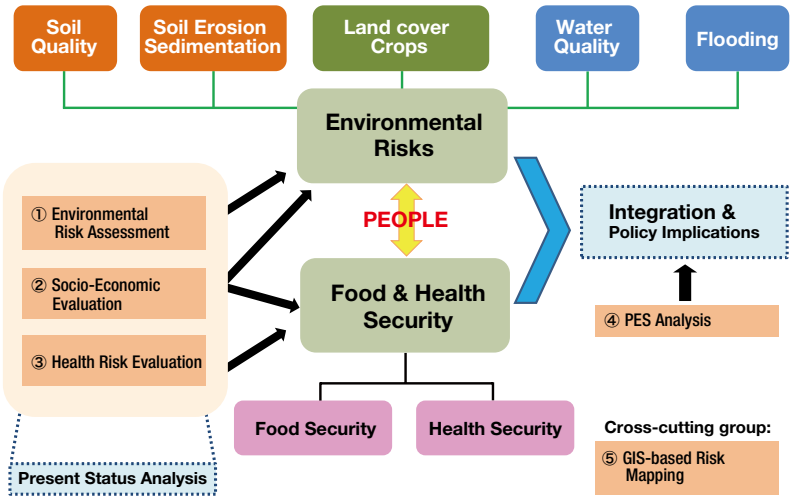


Figure 1 **Basic Research Flow and Organization**

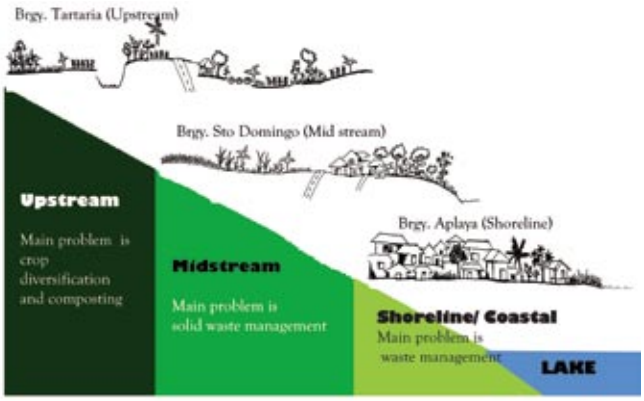


Figure 2 **Transect Map of the Village PRA Sites**

Figure 4 **Extent of flood in the village of Applaya, Santa Rosa, Laguna**

Flood Water Foot Print of Typhoon "Milenyo": Coastal Flooding in Brgy. Aplaya, Sta. Rosa City, Laguna Province

Figure 3 **Participatory Rural Appraisal Activities**

project by creating a spatially-explicit database of key variables associated with risk in the food chain.

Progress to date

Although research is still at an early stage of implementation, initial findings indicate that industrial and agricultural pollution is a major environmental issue in the region. Unsafe concentrations of heavy metals such as lead, chromium, cadmium, arsenic, and mercury have been found in the lake water column. Toxic concentrations of lead are now found in tilapia sampled in markets and caught in open water, as well as in some local crop plants such as *kangkong* (*Ipomoea aquatica*) and *kamote* (*Ipomoea batatas*). In quantity, however, most pollution is associated with untreated human waste; water-borne pathogens thus pose significant human health risk. Environmental degradation throughout the watershed has reduced resource availability to local residents. There is a danger of feedback cycles between resource deterioration and decreasing household income, access to food and public health. As a consequence, many households are exposed to health risks and food insecurity. Survey respondents, especially those dependent on fisheries and upland agriculture, reported significant concern for their ability to improve, protect and expand their current resource base.

The GIS team has begun spatial description of human and environmental health risks. Their database will allow integration and analysis of multivariate data, including resource presence and availability, community health and nutritional status, food availability and quality, and other factors affecting vulnerability to ecological risk. GIS analysis should also aid in identification of unforeseen transboundary risks associated with current and future land use changes in the target areas.

Plans for Full Research

The Environmental Risk Assessment Team takes a geochemical approach to the study of interactions between humans and nature. Using techniques of stable isotope analysis, it describes the pathways of multiple elements through water and soil environments. It also assesses water quality in relation to basic water quality criteria, trophic state parameters and phytoplankton communities, and aquatic macrophyte biosorption in order to address issues of stream turbidity, eutrophication and heavy metal pollution.

Socio-Economic Evaluation Team: (i) characterization of other critical watersheds surrounding Laguna Lake; (ii) food risk assessment; (iii) bio-economic modeling of the effects of land use patterns on lake water quality and commercial fish productivity; (iv) assessment of household and community vulnerability to environmental risks induced by changing land uses in the Dampalit Subwatershed, Los Baños.

The Health Risk Evaluation Team will continue with its baseline evaluation in order to clarify the type and severity of environmental exposure(s) affecting human health. It will describe community exposure to environmental pollutants near Laguna Lake and assess the health risks posed by consumption of fish and other local food products, such as shellfish and duck eggs, contaminated by heavy metals.

The PES Analysis Team will use municipality-level socio-economic statistics and/or interview data in order to examine the value of potential ecosystem services. It will also estimate the impact of different land use and policy options, from no conservation to full conservation, on farmer livelihoods.

The GIS-based Risk Mapping Team will enhance its ability to describe the benefits and risks associated with particular patterns of land use change, especially in relation to transboundary water-related disasters such as flooding, and to support development of comprehensive land use plans in selected municipalities in the region.

H

Ecohistory Program

Program Director **TANIGUCHI Makoto**

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

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

Completed Research	Leader	Title
H-02	**SATO Yo-Ichiro**	Agriculture and Environment Interactions in Eurasia
Full Research	**Leader**	**Title**
H-03	**OSADA Toshiki**	Environmental Change and the Indus Civilization
H-04	**UCHIYAMA Junzo**	Neolithisation and Modernisation

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

Agriculture represents a fundamental change in relations between humanity and nature. This research project examined historical interplay of agriculture and environment, focusing on the relation between climate, crops and food consumption in three major agricultural zones of Eurasia: the rice, Mugi, vegeculture zones. Project research was designed to reconstruct the human-environmental histories of these zones in the last ten-thousand years. We suggest that such histories can provide important insight into the contemporary and future challenges to agricultural production and food consumption.'Genetic diversity' was s a key concept in the study.

Project Leader: **SATO Yo-Ichiro** RIHN

Project achievements

Project research successfully modeled agriculture-environment interactions involving multiple inter-woven factors, or what was termed the "Human Food Web". Based on extensive field work and genetic analyses conducted on materials collected from all three agricultural zones, it was clearly shown that genetic diversity has decreased significantly in the course of agricultural development. Past collapses of food production indicate that epidemics were a substantial threat. The past suggests that current losses of genetic diversity increase the risk of collapse in agricultural production.

In the Rice Zone, natural and human disasters frequently disturbed food production. Following disaster, however, human societies were able to recover production through the use of various techniques (called *shinogi* in Japanese) adapted through history. Such techniques can teach much to contemporary observers of food production. In the *Mugi* Zone, fieldwork revealed that the desert found throughout the region today is the result of past human over-use of lands in agriculture. This finding was based on substantial new data obtained by our research team. Such histories should lead to greater awareness of potential agricultural crisis and encourage critical reconsideration of our present agricultures. Research conducted in the Vegeculture Zone shed light on the origins of vegeculture, demonstrating that the process of plant domestication was a means of long-term environmental adaptation.

In total, our research indicates that in order to maintain food production and to address the difficult contemporary global environmental problems that humanity confronts today, we should not seek to "control" nature, but to coexist with nature. Specialists in agriculture should therefore promote the production of genetically diverse cultivars suited to local environments, and rooted in local traditional cultures. Project researchers have presented this message to the public through a number of publications (e.g. "Agricultural History in Eurasia" Vols. 1-5, 2008-2010) and a special exhibition at the National Museum of Nature and Sciences entitled "Food for Tomorrow: Biodiversity and Sustainability" (September 2010 – January 2011), which was viewed by more than 143,000 visitors.

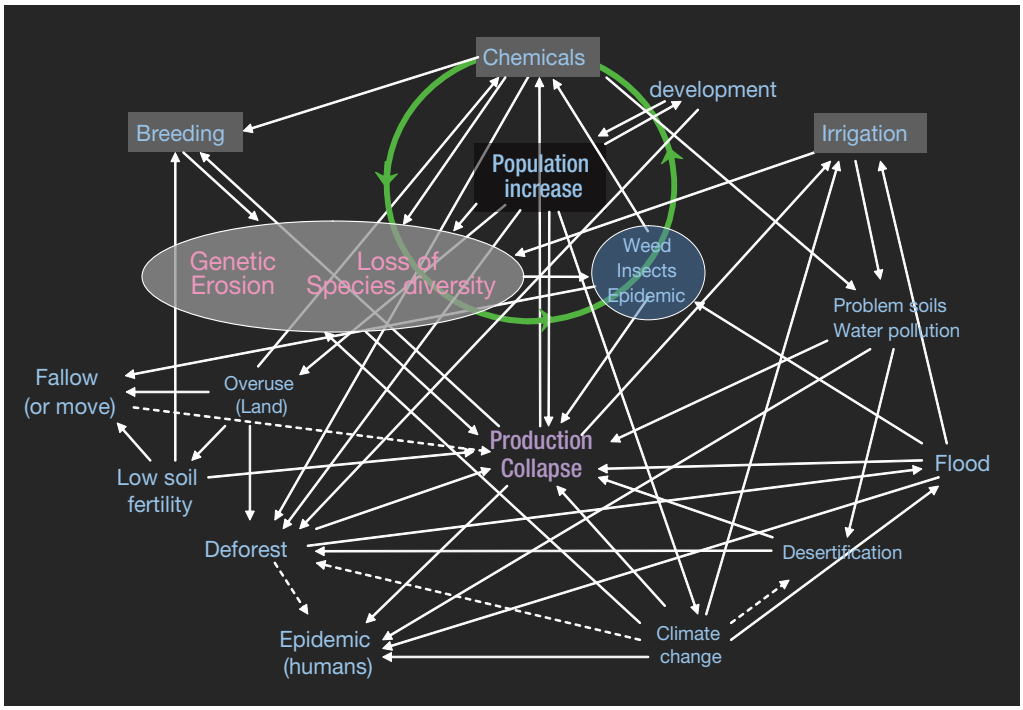


Figure 1 **Human Food Web**

The model indicates that the agricultural collapse is a key element in the Web. Collapse is both a cause and an effect of other events.

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 drain systems — and also for its brief tenure. The Indus civilization spread over an area of 680,000 km^2 along the Indus and Ghaggar-Hakra rivers and into Gujarat in Western India, but its urban phase lasted only 700 years, much shorter than any of its contemporaries. Drawing on archaeology, Indology, and palaeo-environmental investigation, this project reconstructs the social and environmental histories of several key Indus areas, and attempts to determine whether and how environmental factors contributed to their short life and rapid decline.

Project Leader
OSADA Toshiki RIHN

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

Sub-Leader
ONISHI Masayuki RIHN
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
OHTA Shoji Fukui Prefectural University
SAITOU Naruya National Institute of Genetics
SHINDE, Vasant Deccan College, Deemed University, India
UNO Takao International Research Center for Japanese Studies

Project structure and objectives

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

As shown in Fig. 1, our project collaborates with several universities and institutes in India and Pakistan as MOU partners. The project is divided into five research groups: (1) the Palaeo-Environmental Research Group (PERG); (2) the Material Culture Research Group (MCRG); (3) the Subsistence System Research Group (SSRG); (4) the Inherited Culture Research Group (ICRG); and (5) the DNA Research Group (DNAG). PERG analyzes palaeo-environmental data obtained from coring and other field study and MCRG works on cultural and biological data collected through archaeological excavations at Farmana (Haryana, India) and Kanmer (Gujarat, India). SSRG conducts both archaeo- and ethno-botanical study, while ICRG analyzes linguistic data obtained from ancient texts and field research. The newly formed DNAG is now conducting analysis of the human and cow bones discovered at the Farmana site. Each of these research groups uses its own methodology to investigate the following important subjects: ancient climate change; avulsion of the Ghaggar River; sea level change in Gujarat; and crop distribution in relation to the environment across the Indus region.

Major achievements

As regards the study of the natural environment surrounding the Indus civilization, PERG has produced a preliminary analysis of the sediment core samples obtained from the Rara Lake in the Lesser-Himalayan region in 2009. The sample reveals the overall monsoon pattern in South Asia in the last 4,500 years (Fig. 3). We wait for the results of further analysis of these data.

PERG has also established through the dating of sand dunes that, contrary to its description in the Rig-Veda text (which was transliterated by ICRG), the Ghaggar was not a large river, but a small one capable of providing water for agriculture only during the monsoon season. This finding indicates that the Indus civilization was not as dependent on large rivers as were the three other great ancient civilizations. MCRG analysis of archaeological artefacts from the Farmana site gives a good description of the resource base, society and economy of this region during the Indus period.

Figure 1 **Organization of research**


The Coastal Indus Looks West

Photo 1 **From SCIENCE 328:1100 (2010)**
Reprinted with permission from AAAS

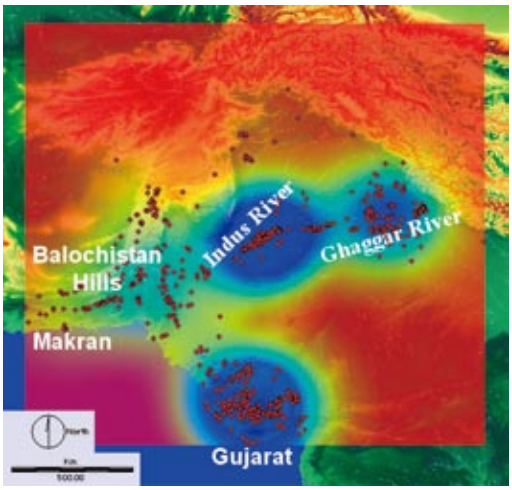


Figure 2 **Distribution and concentration of the Indus sites** (adapted from Teramura and Uno 2006)

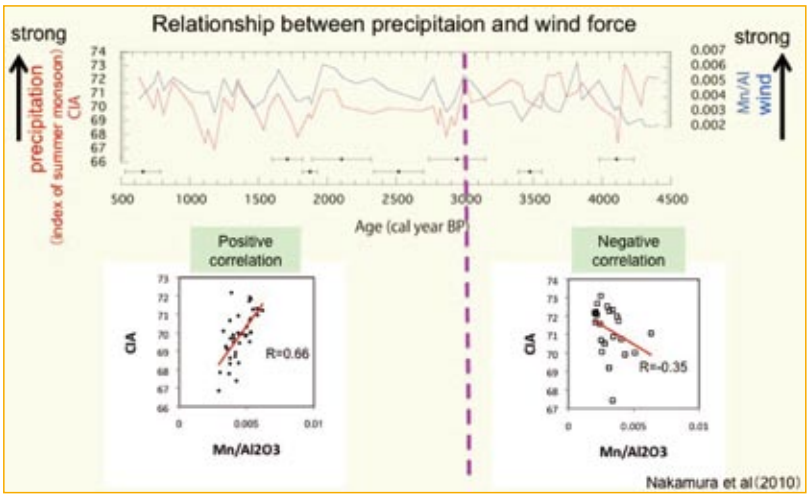


Figure 3 **Results of the preliminary analysis of a sediment core from Lake Rara** (Nakamura et al., 2010)

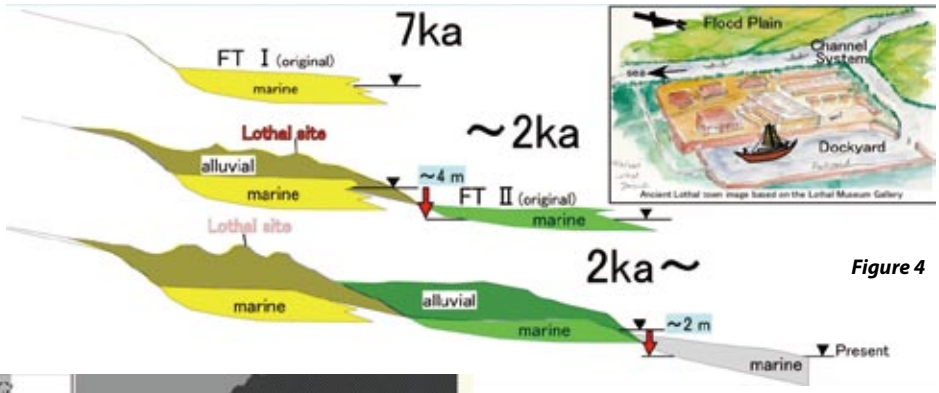


Figure 4 **Relative sea level change at Lothal (Gujarat)** (Miyauchi et al., 2010)

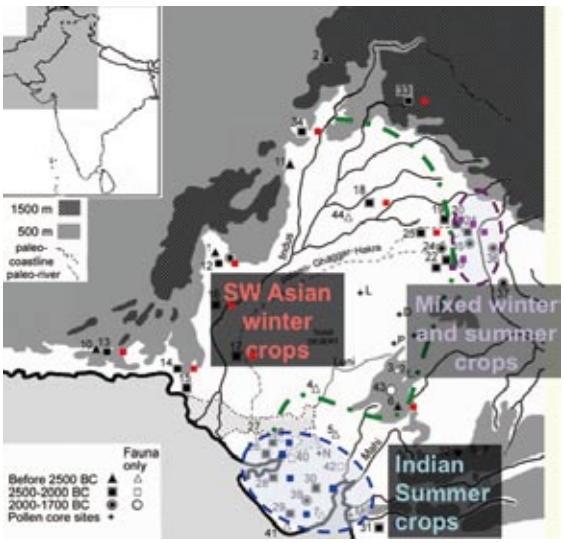


Figure 5 **Geographical distribution of crops in the Indus region** (adapted from Fuller 2006)

Another PERG team investigating the palaeo-coast of Gujarat has collected geological and topographical field data and analyzed satellite imagery. Their findings coincide with the result of hydro-isostatic modelling, suggesting that sea level in the Indus period was about two meters higher than it is in present-day Gujarat. Thus the ancient seaport of Lotal, Gujarat, an important base for trade with Mesopotamia, would have become inaccessible by the end of the Indus period (Fig. 4). The study of cuneiform texts conducted by ICRG members and archaeological data obtained at the Kanmer site help us establish the local evidence of this historical change.

Excavation at Farmana and Kanmer has now concluded. The MCRG uncovered a number of important structures and artefacts, including three seal-like pendants with Indus scripts (reported in *Science* in May 2010, cf. Photo 1), as well as many plant and animal remains. Analysis of these data will be published in two volumes in spring 2011 as part of the project's final report. Botanical research conducted by SCRG and philological research conducted by ICRG has allowed us to gradually reconstruct the ancient environment, subsistence systems and trade network of the Indus civilization, which show enormous diversity. For example, palaeo-botanical research conducted by SCRG established the geographical distribution of cultivated plants during the Indus period. Divided into winter, summer and mixed-crop regions (Fig. 5), the ancient boundaries roughly correspond to the present-day climate zones of South Asia. The ICRG linguists' subgroup published *The Language Atlas of South Asia*. A future task is to integrate SCRG's ethno-botanical data into this work.

Future activities

Major activities of each research group have concluded. The few remaining research tasks, such as the oxygen isotope analysis of otolith and DNA analysis of the human and cow bones, are pending laboratory results. We are now integrating all the findings of individual research groups into a Geographic Information System (GIS) in order to present a comprehensive picture of the Indus civilization and its decline.

Project findings have been consistently published in our Occasional Papers and Manohar Indus series and as many individual books and academic papers. Such publications will continue until the end of the project. PERG will present the outcomes of its palaeo-environmental research in a number of international conferences, including at the European Geosciences Union and as a special session at the American Geophysical Union 2011, and will subsequently publish these findings in major academic journals.

Neolithisation and Modernisation: Landscape History on East Asian Inland Seas

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

Project Leader
UCHIYAMA Junzo RIHN

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

Sub-Leader
LINDSTRÖM, Kati Institute of Philosophy and Semiotics, University of Tartu
Core Members
BAUSCH, Ilona Faculty of Archaeology, Leiden University
FUKASAWA Yuriko Graduate School of International Cultural Studies, Tohoku University
GILLAM, Christopher South Carolina Institute of Archaeology and Anthropology, University of South Carolina
HARUTA Naoki Faculty of Education, Kumamoto University
HONG, Sungheup Department of Anthropology, Chonnam National University
HOSOYA Aoi RIHN
IIDA Taku National Museum of Ethnology
IKEYA Kazunobu National Museum of Ethnology
KANER, Simon The Sainsbury Institute for the Study of Japanese Arts and Cultures
KIM Jangsuk Department of History, Kyung Hee University
KOYAMA Shuzo RIHN
MAKIBAYASHI Keisuke RIHN
NAKAI Seiichi Faculty of Humanities, Toyama University
NAKAJIMA Tsuneo RIHN
NAKAMURA Oki RIHN
POPOV, Alexander Museum of Archaeology and Ethnography, Far East National University
SEGUCHI Shinji Shiga Prefecture Cultural Properties Protection Association
YASUMURO Satoru Faculty of Economics, Kanagawa University
ZEBALLOS VELARDE, Carlos Renzo RIHN

Research background and objectives

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

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

Results to date

The project has eight regional work groups, each carrying out research in a key area of the East Asian Inland Seas (Fig.1b). Research focuses on four umbrella topics: (1) The birth and expansion of agriculture; (2) Waterfronts, including water bodies, waterways and rice paddies; (3) Migration and colonisation as forces of landscape change;

Figure 1a East Asian Inland Seas and Eight NEO-MAP Research Areas

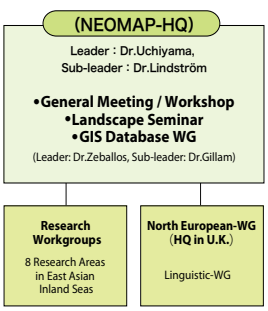


Figure 1b NEOMAP *Organization*

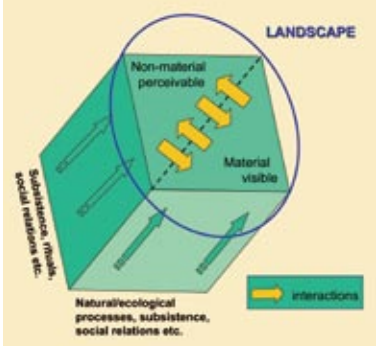


Figure 2 Concept of Landscape

Photo 1 **Shirakawa Village, Japan**

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

(4) Travel and creation of mental landscape images. Special attention has been paid to three following major aspects of landscape formation in the region.

(1) Modernisation as seen from Neolithisation

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

(2) The cultural functions of inland seas

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

(3) The creation of mental landscape images

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

Topics for the future

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

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

Waiting for high tide
Mafia, Tanzania
A wooden ship anchored on the mangrove flat
NAKAMURA Ryo

Fishing in rice paddies
Assam, India
Villagers fish in the rice paddies while planting rice in the monsoon flood season
KOSAKA Yasuyuki

Golf course? No, taiga in Siberia
Russia
Meadows, or alas, which are formed over several thousand to ten thousand years, found in the boreal forestland in East Siberia
HIYAMA Tetsuya

Water chestnut harvest
Vietnam
ABE Ken-ichi

Ecosophy Program

Global Area Studies

E

Program Director **YUMOTO Takakazu**

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.

Full Research	Leader	Title
E-04	**UMETSU Chieko**	Vulnerability and Resilience of Social-Ecological Systems

Vulnerability and Resilience of Social-Ecological Systems

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

Project Leader
UMETSU Chieko RIHN

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

Sub-Leader

MIYAZAKI Hidetoshi	RIHN

Core Members

EVANS, Tom	Department of Geography, Indiana University
ISHIMOTO Yudai	RIHN
KUME Takashi	RIHN
LEKPRICHAKUL, Thamana	RIHN
MWALE, Moses	mt. Makulu Central Research Station, ZARI
PALANISAMI, K.	International Water Management Institute
SAKURAI Takeshi	Institute of Economic Research, Hitotsubashi University
SHIMADA Shuhei	Graduate School of Asian and African Area Studies, Kyoto University
SHINJO Hitoshi	Graduate School of Agriculture, Kyoto University
TANAKA Ueru	Graduate School of Global Environmental Studies, Kyoto University
YAMASHITA Megumi	Survey College of Kinki
YOSHIMURA Mitsunori	PASCO Corporation

Research objectives: Building rural household and community resilience

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

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

Research outcomes to date and expected results

Project research is guided by four interrelated themes designed to describe how quickly agricultural households recover adequate food consumption after shocks such as drought or flood, and the mechanisms that allow or

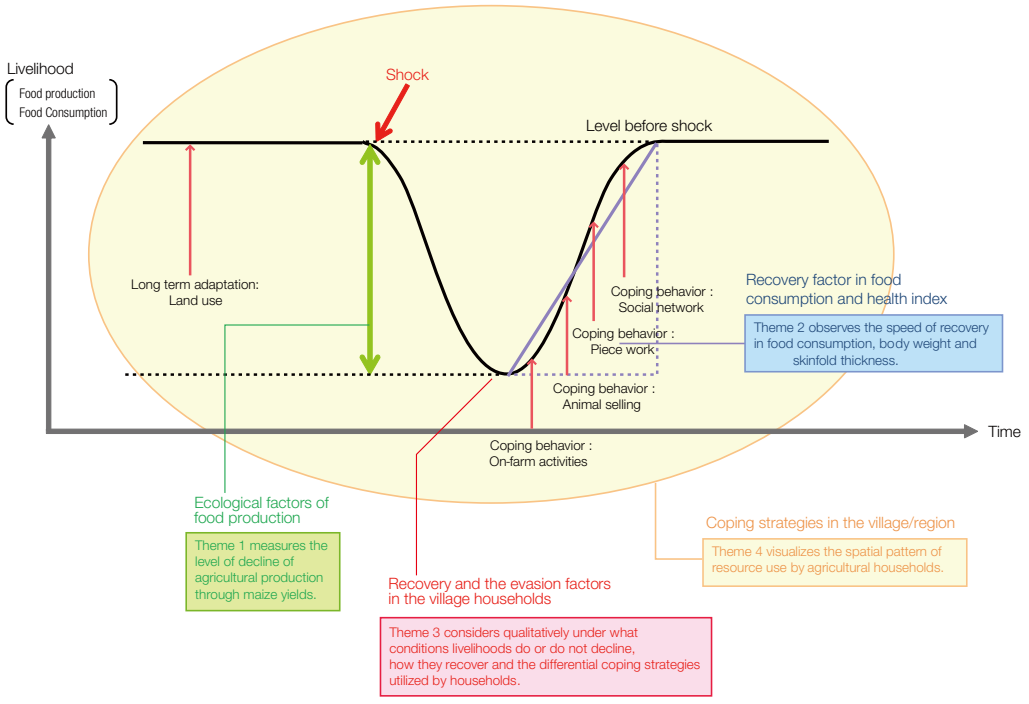


Figure 1 **Approaches to the study of resilience**

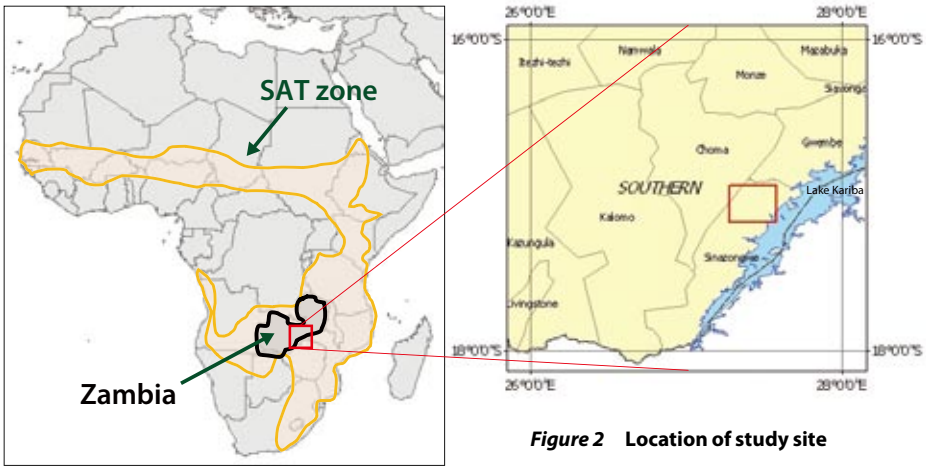


Figure 2 **Location of study site**

Photo 1 **Local fieldworkers take anthropometric measurements, Southern Province**

Photo 2 **The new bridge replacing the older one destroyed by heavy rains, Southern Province**

Photo 3 **Field day, Eastern Province**

Photo 4 **Household storage of harvested maize, Southern Province**


1


2


3


4

inhibit recovery. Theme 1 measures decline in maize yields—the staple consumption crop of the area—following environmental shock. Theme 2 measures the speed of recovery in household food consumption through changes in individual body weight and skinfold thickness. Theme 3 qualitatively assesses household resilience, analyzing the conditions affecting livelihood decline and recovery, and the range of household coping strategies. Theme 4 describes the spatial and dynamic pattern of resource use through analysis of land cover use and change, including household agricultural land use.

● Agricultural production

Field investigation in Southern and Eastern Province, where rainfed agriculture is the dominant production system, shows rainfall is the most significant limiting factor in maize yields, and thus on food availability, household consumption, and household livelihood. Maize yields are also affected by topography and temperature in Southern Province and by availability of soil nutrients following tree burning in the fields in Eastern Province. Reduced productivity associated with delayed planting indicated that sowing date is critical for maize yields.

● Rainfall variability

In the past, El Niño years saw reduced rainfall and La Niña years increased rainfall. While drought has been a major climatic shock in the region, in our study sites rainfall in the 2007/2008, 2008/2009 and 2009/2010 cropping seasons was higher than the annual average. The seasonal pattern of rainfall varied across these three rainy seasons.

● Heavy rainfall and its impacts on households production and food consumption

In December 2007, heavy rainfall affected maize production. Food consumption and body weight decreased as a result. In this situation, project researchers analyzed household resilience by focusing on adaptation and coping strategies and factors that affected the recovery of food production. Some farmers also shift topographical location of their fields as method of ex-ante adaptation.

● Household livelihood coping strategies after shock

In upper terrace areas, farmers affected by heavy rains often switched from maize to sweet potato cultivation. Households suffering significant crop losses tended to reduce consumption while increasing working hours. Analysis of livestock assets shows that poor farmers tend to maintain cattle by reducing household consumption; wealthier farmers tend to maintain household consumption by selling cattle. With yield declines, household heads try a range of other measures to secure access to food. In such conditions, cash-in-hand played a very important role in smoothing food consumption levels, especially of staple foods.

Aid agencies and local institutions and organizations involved in food distribution and access to resources also can improve household survival and the maintenance of livelihoods. The amount and timing of food distribution, however, tended to be too little and too late. Social networks also play an important role in securing goods and cash in times of need. Use of cellular phones now enables and extends household support networks.

● Recovery of food consumption

Long-term weekly survey interview data identified a rapid decline and gradual recovery of food consumption after heavy rainfall. This recovery path became the basis for quantitative analysis of resilience. Most households did not recover food consumption after extreme rainfall for one year, with poor households receiving the most severe and long lasting impacts.

● Assessing resilience through recovery in agricultural production and food consumption

Household assets in general, and land, livestock and cash-in-hand in particular, significantly affect resilience of food consumption. Regional infrastructure, including roads, also plays an important role in stabilizing food prices in times of shock.

● Future plans: Enhancing rural community resilience

We will continue with data compilation and analysis. Further integration of field and survey data will improve our comprehensive assessments, with qualitative and quantitative description of the factors that create vulnerability and the mechanisms enabling household and community resilience.

Lakes as Sources and Sinks: Social and Ecological Dynamics Affecting Downstream/Pollution-Accumulating Lakes

A downstream and pollution-accumulating lake (DPA lake) is an inland body of water that is both an active source of water for humans, agriculture and industry and a sink for upstream waste. This project investigates present and likely future (50-100 years) problems in DPA lake environments in the context of global environmental sustainability and regional development. It will propose a set of indices related to DPA lakes from which solutions or mitigations can be based, and which will guide the design of ideal governance of human-watershed systems.

Principal Investigator
FUKUSHIMA Takehiko
Graduate School of Life Environmental Sciences, University of Tsukuba

Core Members

TSUJIMURA Maki	Graduate School of Life Environmental Sciences, University of Tsukuba
YAMANAKA Tsutomu	Graduate School of Life Environmental Sciences (Terrestrial Environment Research Center), University of Tsukuba
KURODA Hisao	College of Agriculture, Ibaraki University
MARUOKA Teruyuki	Graduate School of Life Environmental Sciences, University of Tsukuba
ONDA Yuichi	Graduate School of Life Environmental Sciences, University of Tsukuba
IMAI Akio	National Institute for Environmental Studies
KOHZU Ayato	National Institute for Environmental Studies
OZAKI Noriatsu	Graduate School of Engineering, Hiroshima University
MATSUSHITA Bunkei	Graduate School of Life Environmental Sciences, University of Tsukuba
NISHIHIRO Jun	Graduate School of Agriculture and Life Sciences, University of Tokyo
SHIRAKAWA Naoki	Graduate School of Systems and Information Engineering, University of Tsukuba
ENDO Takahiro	Graduate School of Life Environmental Sciences, University of Tsukuba
IIJIMA Yoshihiko	Ibaraki Prefecture
HANAZATO Takayuki	Institute of Mountain Science, Shinshu University
TORIGOE Hiroyuki	Faculty of Human Sciences, Waseda University

Project overview

Water quality of downstream and pollution-accumulating (DPA) lakes is particularly vulnerable to degradation (Fig. 1). The number of DPA lakes is expected to increase in the world, particularly in and near the metropolitan cities that have poor water resources. The purposes of this study are to predict and discuss the problems specific to such lakes in the next 100 years, to propose appropriate governance techniques, and to design a human society that has a rich sense of futurability. Lake Kasumigaura northeast of Tokyo is a representative DPA lake (Photo 1).

We will test two working hypotheses. First, we hypothesize that increases in water use will accelerate accumulation of pollutants in the lake, which in turn will reduce availability of water. In order to test this hypothesis, we will construct a numerical model capable of simulating hydrological and biogeochemical cycles in the lake and watershed. This model will show both subsystems with short turnover times, such as precipitation and specific river and lake dynamics, and those such as groundwater and sedimentary processes with long turnover times and which are also affected by various stakeholders around the water environment (Fig. 2). The model will be used to indicate nutrient cycles in the watershed and to predict changes in water quantity. We will apply sustainability indices to DPA lakes in order to evaluate the watersheds in light of environmental factors and human development.

Secondly, we hypothesize that decreases in both the diversity of water use and human population in the watershed area will reduce the resilience of the lake, and thus the viability of the regional human-nature system. We will investigate water and lake uses and their change through time in order to test this hypothesis. Several lakes in Asian countries such as China and Indonesia will be considered as DPA lakes. We will conduct inter-lake comparisons based on indices that describe economic and environmental constraints such as global carbon limitation and population decline and aging.

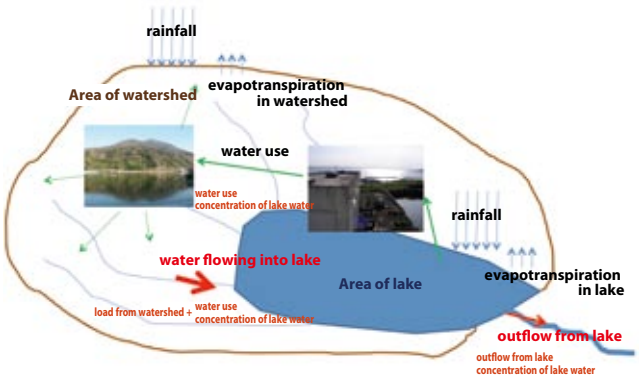


Figure 1 **Hydrological (black) and nutrient (brown) cycles in a DPA lake**

Photo 1 **Lake Kasumigaura at the time of an outbreak of Koi Herpes Virus (KHV) disease**

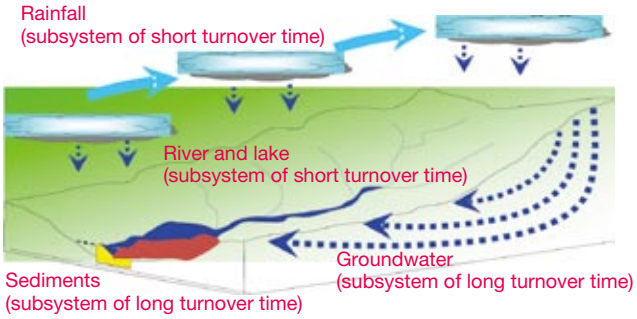


Figure 2 **Subsystems of short and long turnover times**

Coastal Area Capability Enhancement in Southeast Asia

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

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

Core Members

KUROKURA Hisashi	Graduate School of Agricultural and life Sciences, The University of Tokyo
KONO Yasuyuki	Center for Southeast Asian Studies, Kyoto University
IKEMOTO Yukio	Institute for Advanced Studies on Asia, The University of Tokyo
NISHIDA Mutsumi	Atmosphere and Ocean Research Institute, The 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
YAMADA Yoshihiko	School of Marine Science and Technology, Tokai University
KAWADA Makito	School of Contemporary Sociology, Chukyo University
KANZAKI Mamoru	Graduate School of Agriculture, Kyoto University
TAKAHASHI Hiroshi	National Fisheries University
MATSUOKA Tatsuro	Department of Fisheries, Kagoshima University
MOTOMURA Hiroyuki	Kagoshima University Museum
MUNPRASIT, Aussanee	Training Department, Southeast Asian Fisheries Development Center
TOLEDO, Joebert D	Aquaculture Department, Southeast Asian Fisheries Development Center

Purpose of the project

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

Research approaches

The study is developed in three components:

1) Ecosystem mechanisms and dynamism

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

2) Local livelihoods and adaptive management

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

3) Environmental governance and local community development

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

Photo 1 **Mangrove Reforestation and Fisheries Stock Enhancement Project site at Batang Bay, Panay Island, Philippines**

Photo 2 **Set-Net at Rayong area in Thailand**

Expected outcomes

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

Designing Agriculture in the Era of Petroleum Scarcity

How to feed the world in the 21st century? While increased food productions due to advancement of agricultural technology might pose an optimistic view to the world-wide food supply, energy resources such as petroleum is predicted to be inevitably depleted. This project will better understand human capabilities and agricultural capacities of maintaining food productions in the coming era of petroleum scarcity and will design how to transform our modern petroleum-dependent society into a future low-carbon society.

Principal Investigator
MATOH Toru
Graduate School of Agriculture, Kyoto University

Core Members
KAWASHIMA Hiroyuki Graduate School of Life Sciences and Agriculture, The University of Tokyo
SATO Tadashi Graduate School of Life Sciences, Tohoku University
MATSUDA Akira Agricultural Experimental Station, Yamagata Prefecture
MICHIHATA Miki Department of Tourism, Toyo University

Purpose of the project

The use of non-solar energy revolutionized all phases of agriculture, including irrigation, cultivation, harvesting, processing of harvested produce, transportation, and storage, thereby boosting labor and land productivity and supporting rapid increase in human population to its current level of approximately 6.8 billion. Contemporary agrisystems depend on petroleum-based sources of energy, but increasing petroleum scarcity is likely in the 21st century. Petroleum-based production systems are also considered incompatible with a low-carbon society. While there has been intensive debate of different scenarios of petroleum depletion and low-carbon society, there is less discussion of their significance to food production and consumption. This project therefore will reappraise and suggest the re-design of agriculture and food production systems to suit the coming era of petroleum scarcity and low-carbon society, and to create diagrams that promote such systems in specific communities.

Research approaches

We hypothesize that increasing scarcity of petroleum will lead to transformation throughout agricultural production and food consumption systems. Our research therefore will take the following two approaches:

Agricultural approach

Based on an exhaustive analysis of existing literature, we assume that changes in energy supply will lead to bottlenecks in food production. Project research will verify the effectiveness of non-carbon intensive agricultural substitutes, such as organic compost for chemical fertilizers, mixed cropping of susceptible-resistant varieties for pesticides, and biogas and/or bioethanol for agricultural machinery fuel. We propose to develop fertilizer-effect testing methods for converting organic wastes into fertilizer, and to examine optimal materials and varieties for these alternatives, such as high–yield varieties with low-fertilizer tolerance. Crop testing will be conducted in active commercial fields in Kyoto, Ayabe and Fukuchiyama cities, and will allow direct information exchange between farmers and scientists.

Social action approach

The project will also contribute to popular discussion of agriculture and food issues through a series of lectures and science cafes in both urban and rural areas. These discussions will be designed so as to include academics, farmers, gardeners and the general public, and so to deepen consideration of the everyday and longer-term motivations and goals of these different communities and of possible alternative scenarios. Specific models, such as the German 'kleingarten', can be discussed, as can methods for re-claiming the cultural significance of food.

Expected outcomes

Based on our field studies and structured discussions, we will design regional, low-carbon agricultural schemes in selected regions. In the process we will enhance popular consideration of the significance of agriculture and food in everyday life and contribute to the deeper discussion of the sources of energy that maintain human life.

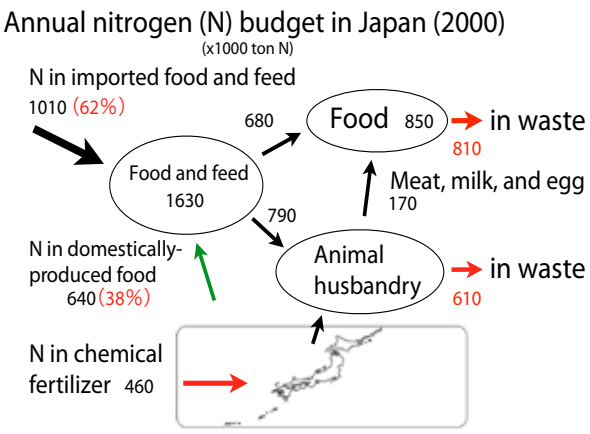


Figure 1 **Nitrogen budget in Japan in 2000**

Photo 1 **Rice-production fields in Udom Xai Province, in northern Laos**

Both highland swidden (background) and lowland riverine paddy (foreground) cultivations play significant roles in rice production. These paddies yield 3 - 4 tons of unhusked grains without any external inputs, compared to 6 tons in Japan, with use of machinery, irrigation, chemical fertilizer and pesticides. The Laos system is therefore a model for low-input, high-return agriculture.

Photo 2 **Animal husbandry in Japan largely depends on imported feeds, such as corn, soybean, wheat grains and hay**

Cycling manure back to fields could provide additional soil nutrients and reduce eutrophication in water sources.

The History of Human-Water Interactions in East Asian Livelihood Complexes

This project will describe a regional environmental history of human-water relationships within in a set of livelihood complexes found in four areas of the Loess Plateau. The area has a long history of human inhabitation, and several distinct livelihood complexes can be identified, as can a long sequence of both natural and anthropogenic environmental transformations. In particular, the availability and use of water has been a determining environmental factor throughout the history of the Loess Plateau, with great impact on human livelihood complexes. As many people continue to live in arid environments and are likely to experience even greater water scarcity in the coming decades, accurate understanding of the linked patterns of human and environmental change is necessary.

Principal Investigator
MURAMATSU Koichi
Research Institute for Oriental Cultures, Gakushuin University

Core Members

UEDA Makoto	Faculty of Letters, Rikkyo University
TSURUMA Kazuyuki	Faculty of Letters, Gakushuin University
BAO Maohong	Department of History, Peking University
YAMANAKA Norikazu	Arid Land Research Center, Tottori University
KITAGAWA Hideki	Faculty of Policy Science, Ryukoku University
AN Jiesheng	Institute of Chinese Historical Geography, Fudan University
IGURO Shinobu	Waseda Institute for Advanced Study
NAWATA Hiroshi	RIHN
HOU Yongjian	Center for Historical Environment and Socio-Economic Development in Northwest China of Shaanxi Normal University
MATSUNAGA Kohei	RIHN

Project overview

The objectives of this research are to describe the history of human-water relationships within a set of livelihood complexes in four areas of the Loess Plateau and to design a framework of practical countermeasures to solve environmental problems that emanate from the Plateau. In integrating environmental history arid-land forest science and environmental law and governance, we will link environmental and social dynamics in past, present and future.

Research methods

Project research takes place within the following dimensions:

Disciplinary dimension
Project research relies on the insights and methods of several academic disciplines, including environmental history, afforest science, and environmental law and policy. In combination, they will allow us to construct a detailed map of Loess Plateau environmental history, with particular detail regarding changes in plant ecology in relation to past and present human development in the area.

Time dimension
Project research pays particular attention to different forms of environmental knowledge, from traditional to futuristic, the ways in which this knowledge has changed through time, and the significance of different knowledge systems and change in specific environments.

Regional dimension
Yanan, Wuding Hu, Fen He, and Datong have been selected as case study sites. Research at these sites will allow a series of inter-comparison studies. As a whole, this inductive structure will produce a regional synthesis of human-water interactions on which practical countermeasures to environmental problems can be based.

Expected outcomes

We will construct a state-of-the-art map of environmental history of the Loess Plateau. An integration of environmental history, afforest science, and environmental law and policy is expected to contribute to a design-oriented, problem-solving approach to global environmental problems. Project research will be of special relevance to the current policy for converting farmland to forest and grasslands (*i.e.*, the Grain-for-Green Project), and in mitigating transboundary environmental problems that extend from the Loess Plateau to the Bohai Sea through the Yellow River.

Photo **A Loess Plateau landscape**

Water- and Food-Sheds in the Noto Peninsula: New Scales of Analysis in Global Environmental Studies

This project uses innovative technological and conceptual tools to describe interlinked human and biophysical phenomena in the Noto Peninsula, Japan. Research will combine stable isotope analysis and other fine-scale methods of biophysical system description with intermediate landscape-scale analysis, especially of water- and food-sheds. The project also includes description of the human cultural practices linked to key landscape processes. In total, the project develops in-depth description of the human-terrestrial-aquatic systems found in Noto, and also contributes to the establishment of the field of peninsula studies.

Principal Investigator
NAGAO Seiya
Institute of Nature and Environmental Technology, Kanazawa University

Core Members

NAKAMURA Koji	Institute of Nature and Environmental Technology, Kanazawa University
NAKAMURA Hiroyuki	Institute of Medical, Pharmaceutical and Health Sciences, Kanazawa University
KAGAMI Haruya	Institute of Human and Social Sciences, Kanazawa University
HAYAKAWA Kazuichi	Institute of Medical, Pharmaceutical and Health Sciences, Kanazawa University
KOBAYASHI Fumihisa	Institute of Science and Engineering, Kanazawa University
AOKI Tatsuto	Institute of Human and Social Sciences, Kanazawa University
MATSUKI Atsushi	Frontier Science Organization, Kanazawa University
SHIROUZU Satoshi	Faculty of Low, Chuogakuin University
NOGUCHI Akinori	Faculty of Biomass Environment, Ishikawa Prefectural University

Project overview

This project investigates the nature-society relationships in the Noto Peninsula, Japan. Jutting into the Sea of Japan from central Honshu, Noto Peninsula presents unique biophysical conditions and cultural-ecological history, but shares many economic and demographic features found throughout rural Japan. This project takes water- and food-sheds as central units of analysis. Comparative study of several shed-areas will allow description of the factors affecting hydrological and biogeochemical cycles in the peninsula. Research will describe biodiversity and hydrology in particular, and describe how they are affected by human action, institutions and structures. This description is linked to social features, especially demography, primary industry (agriculture, forestry, fishing and aquaculture), development, settlement, and cultural phenomena that may be associated with continued community life and sense of wellbeing. Circuits of food production and consumption are therefore of particular interest.

Research methods and organization

Key research objectives are the following:

1) Extensive field and stable-isotope analysis of hydrological and biogeochemical cycles, especially in relation to biodiversity;
2) Detailed description of the circuits of food production and consumption, with particular emphasis on local foodsheds, and their relationship to hydrology, biogeochemistry and biodiversity as well as to local health;
3) Description of local customs, festivals and lifestyle of residents and the relation between transportation systems and social transition.

In combining innovative technological and conceptual tools to describe interlinked human and biophysical phenomena in the Noto Peninsula, this project also contributes to the establishment of peninsula studies as an important field for future human-environmental inquiry.

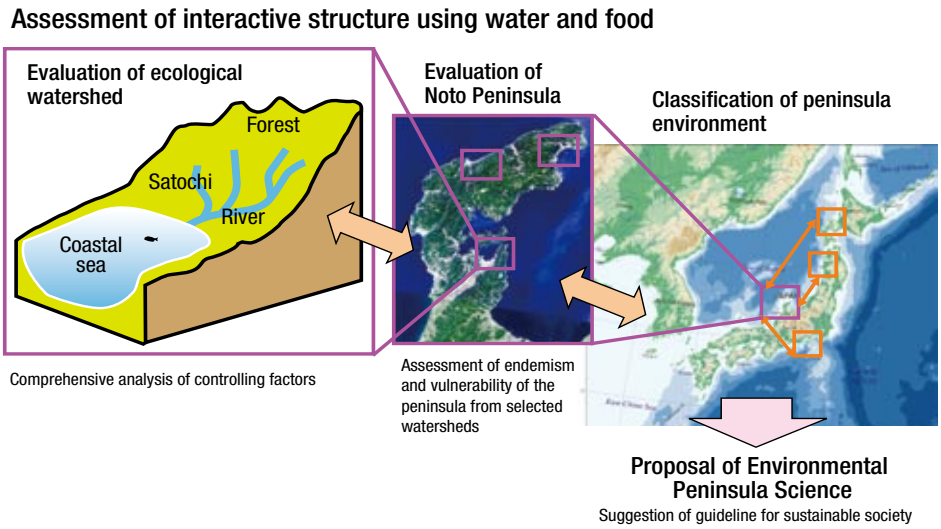


Figure **Schematics of the evaluation method for the peninsula**
An ecological watershed is the basic unit.

Historical Adaptation to Climate Change in Japan: Integrating Palaeoclimatological Data and Archaeological Evidence

How will climate change affect regional precipitation patterns? How ought human societies react to current changes of climate? This project takes a historical approach to such questions. Using high-resolution palaeoclimatological records, such as tree-ring oxygen isotope data, project researchers examine a number of regional signatures of climate variability during the past two millennia. Integrating such data with the extensive existing historical and archaeological evidence in and around the Japanese Archipelago will provide new insights into how past societies reacted to climate variability, and give clues as to how present and future societies can become tolerant of dynamic climate systems.

Principal Investigatort

NAKATSUKA Takeshi
Graduate School of Environmental Studies, Nagoya University

Core Members

MITSUTANI Takumi	Nara National Research Institute for Cultural Properties
YASUNARI Tetsuzo	Hydrospheric and Atmospheric Research Center, Nagoya University
ABE Osamu	Graduate School of Environmental Studies, Nagoya University
YASUE Koh	Faculty of Agriculture, Shinshu University
OHYAMA Motonari	Graduate School of Life Sciences, Tohoku University
SAKAMOTO Minoru	National Museum of Japanese History
KAGAWA Akira	Forestry and Forest Product Research Institute
AKATSUKA Jiro	Center for Archeological Operation, Aichi Prefecture

Research purpose

Society-climate relationships have been poorly understood, largely due to the lack of detailed palaeoclimate data. This project will therefore precisely reconstruct climate variability in several regions and historical periods in Japan. Historical and archaeological investigations will allow better understanding of the nature and characteristics of societies that are tolerant (or vulnerable) to climate changes. In integrating palaeoclimataological and historical data and synthesizing findings from several case studies, the objective of this project is to describe general social characteristics or modes associated with tolerance to environmental change.

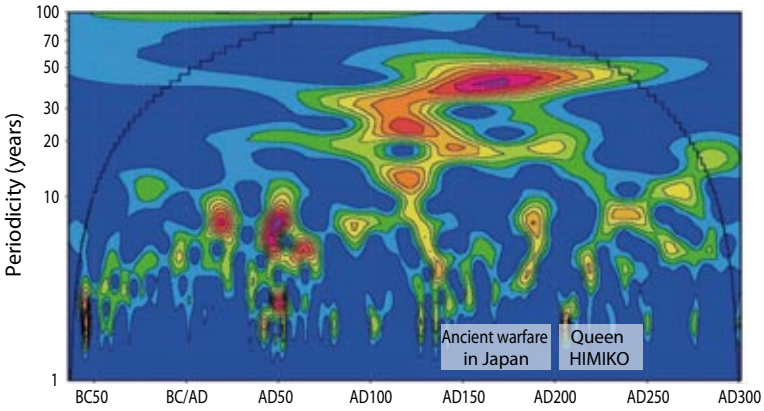
Strength of the research method

High spatiotemporal resolution palaeoclimate data of tree-ring cellulose oxygen isotopic ratios plays the key role in this project. Recent technical developments allow accurate reconstruction of past climate variability in yearly or monthly timescales. Such high resolution datasets bring remarkable advantages. They allow correlation of specific palaeographic evidence with concrete climate events such as drought and flood. Specific climate events and cycles can also be accurately linked to human historical data in order to deepen understanding of past social vulnerabilities and changes.

Expected outcomes

Palaeoclimatalogical data obtained in this project will substantially improve understanding of Japanese history; it also will improve the validity of climate prediction models. Though there are different causes of past and current climate change, there may be similarities in how societies react to such change and an association between societies that are tolerant, or vulnerable, to local environmental changes and those that are tolerant or vulnerable to climate change. In this light, our analysis of climate-society relationships is expected to deepen our understanding of the capabilities of a human society to react to global environmental changes.

Photo Taking tree-ring samples from a live tree



Figure

This figure describes past cycles ('periodicity') of summer rainfall variability in central Japan, which is derived from a tree-ring isotope data gained from an ancient buried tree sample. Periodicity (in years) is shown on the vertical axis. Colours indicate intensity of periodicity (long wavelenth colour = dominant periodicity). The figure therefore indicates that the dominant periodicity of summer rainfall variability changed significantly with time between 100 BC - 300 AD. The data allows us to hypothesize that multi-decadal variability affected historical events such as the period of ancient warfare in Wa (mid-late 2nd century AD) and subsequent appearance of the shaman Queen Himiko (late 2nd - mid 3rd century BC) of Yamataikoku, who was known for her rain-making rituals, and predictions of floods (cf. Records of Wei).

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

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

Principal Investigator
OKUDA Toshinori
Graduate School of Integrated Arts and Sciences, Hiroshima University

Core Members

INOUE Makoto	Graduate School of Agriculture and Life Sciences, The University of Tokyo
YAMADA Toshihiro	Graduate School of Integrated Arts and Sciences, Hiroshima University
HOSAKA Tatsuro	Graduate School of Integrated Arts and Sciences, Hiroshima University
SUBRAMANIAN Suneetha Mazhenchery	United Nations University-Institute of Advanced Studies
ISOZAKI Hiroshi	Graduate School of Global Environmental Sciences, Sophia University
ICHIE Tomoaki	Faculty of Agriculture, Kochi University
ITIOKA Takao	Graduate School of Global Environmental Studies, Kyoto University
SAKAI Shoko	RIHN

Objectives of the study

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

Methodology and approach

Field monitoring study takes place in Peninsular Malaysia, and East Malaysia (Sabah or Sarawak), all of which have experienced significant deforestation and are now targeted for reforestation. The key research areas are summarized as below:

1) Predictions of spatio-temporal changes in forest degradation and deforestation, and their associated environmental risk:
- Analysis of landcover changes in the field sites.
- Prediction and risk analysis of the socio-economic backgrounds of deforestation and land degradation processes.
- Simulations focusing on future possible changes in, and optimization of, ecosystem services in the target areas.

2) Studies on the responses of local people to the soft-landing approach and introduction of an incentive mechanism:
- Survey on the reaction and response of local people to forest degradation.
- Survey on how local and global incentive mechanisms would be accepted and used by local people.
- Development of region-custom plans for sustainable use of natural resources.
- Analysis of the compliance of incentive mechanisms to domestic and international laws.

Significance

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

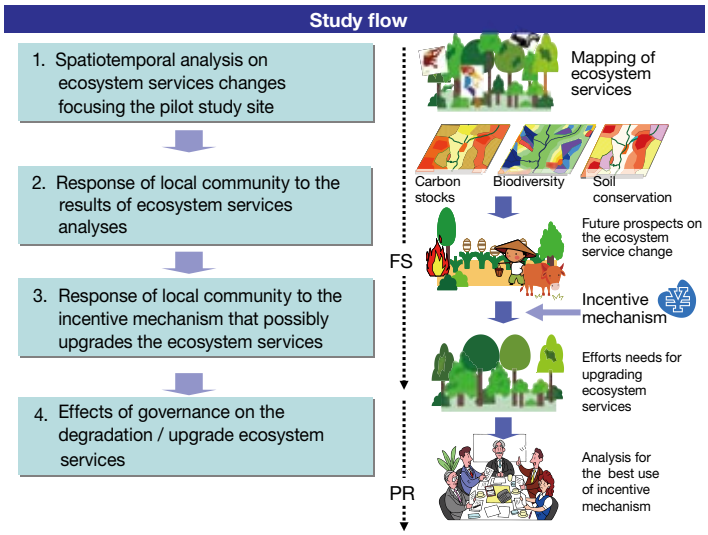


Figure 1 **Flow of the study (FS: Feasibility Study; PR: Pre-Research)**

Desertification and Livelihood in Semi-Arid Afro-Eurasia

Semi-arid Afro-Eurasia is one of the front-lines of desertification. Numerous nomadic and agricultural peoples inhabit the area, employing various husbandry practices and livelihood strategies. Difficulties in preventing desertification stem from poverty of the local communities that live on limited natural resources in the area, hence countermeasures to this environmental problem could be elicited from people's livelihood and be designed through glocal and human-scale actions therein. We will elucidate the interrelations between people's livelihood and desertification, and livelihood strategies for socio-ecological adaptation to desertification and suggest practical and feasible approaches to cope with the problem.

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

Core Members
SHINJO Hitoshi Graduate School of Agriculture, Kyoto University
KOBAYASHI Hirohide Graduate School of Global Environmental Studies, Kyoto University
NAKAMURA Hiroshi Global Environmental Forum
MIURA Rei-ichi Graduate School of Agriculture, Kyoto University

Research backgrounds and objectives

Semi-arid Afro-Eurasia has been exposed to climatic, ecological and socio-economic changes with significant uncertainties. The area, one of the front-lines of desertification, appears to suffer from a vicious cycle of poverty and land degradation. The difficulty in sucessfully addressing complex socio-economic and environmental problems since ratification of the United Nations Convention to Combat Desertification (UNCCD) imply the need to re-examine approaches employed to date. The objectives of our project are therefore to: 1) deepen our understanding of human-environment interrelations and livelihood strategies relevant for socio-ecological adaptation to desertification; 2) re-examine current practices for desertification prevention and development assistance; and 3) suggest practical and feasible approaches to cope with desertification.

Research methods

Our study areas encompass the Sahel region of West Africa (Burkina Faso and Niger), southern Africa (Namibia), and semi-arid India. Each of these areas has distinct socio-economic and ecological contexts that modulate livelihood activities, threats to livelihood, and potential adaptation strategies. Inter-area comparison studies play an integral role in identifying the common and region-specific features of the zone under study.

Socio-economic and ecological analyses will permit re-examination of current techniques used to prevent desertification and to promote development. Analysis of indigenous practices that have supported livelihoods and minimized desertification through time will allow project researchers to develop complementary countermeasures. Our recent innovation and development of a "fallow band system" in Niger has been proven useful in controlling wind erosion and concurrently promoting yield increase by 30 – 50% without the inputs of additional labour and materials (Fig. 1). We will use this system as an innovation tracer and/or pilot program in order to identify some channels of information and technique dissemination and to evaluate local adaptation and innovation.

We will also conduct action research in the field of indigenous technology- and technique-transfer, especially in the Sahel (Fig. 2). Noting that "indigenous" techniques are location-specific, we expect to observe hybridizations as specific techniques are adapted for local systems. Analysis of this process of hybridization should reveal some deeper aspects of livelihood dynamics.

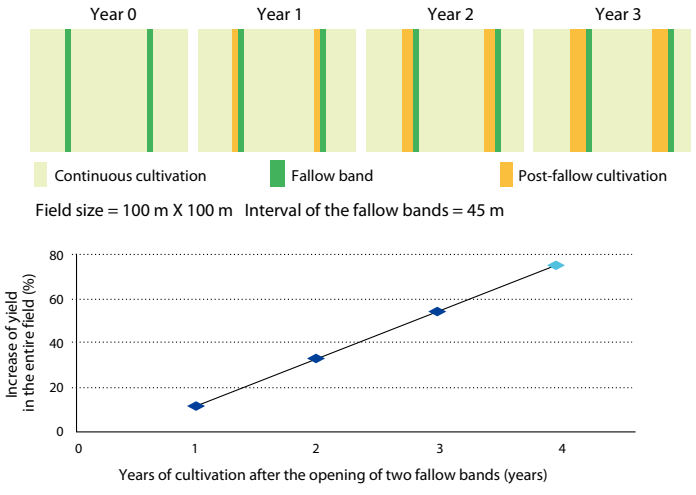


Figure 1 **Fallow band system and yield increase**

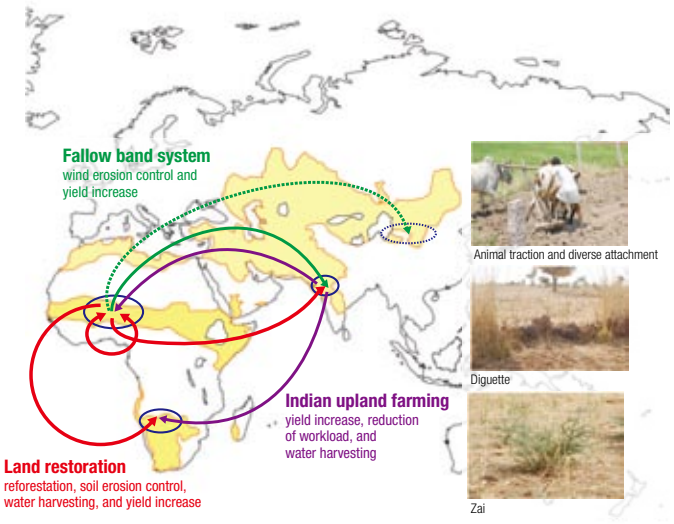


Figure 2 **Action research for technology transfer**

Environmental Change and Immunological Adaptation in the Mekong River Region

This study examines human immunological change and adaptation in relation to development and environmental change. The emerging field of environmental immunology provides the conceptual and methodological framework, as this field addresses the impact of environmental factors, such as exposure to pollution, nutritional stress, and infectious disease pathogens, on the human immune system. Field work will take place at selected sites in Vietnam, Cambodia, and Southern Laos, where people are often dependent on agricultural and aquatic resources and particularly susceptible to impacts of current environmental change.

Principal Investigator

WATANABE Hisami
Tropical Biosphere Research Center,
University of the Ryukyus

Core Members

MOJI Kazuhiko	RIHN
OKU Hirosuke	Tropical Biosphere Research Center, University of the Ryukyus
BABA Shigeyuki	Tropical Biosphere Research Center, University of the Ryukyus
YAMAHIRA Kazunori	Tropical Biosphere Research Center, University of the Ryukyus
SAKAI Kazuhiko	Tropical Biosphere Research Center, University of the Ryukyus
TSUKAWAKI Shinji	Nature and Environmental Technology, Kanazawa University
ASANUMA Ichio	Faculty of Informatics, Tokyo University of Information Sciences
WATANABE Chiho	School of International Health, Graduate School of Medicine, The University of Tokyo
KOBAYASHI Jun	Graduate School of International Health Development, Nagasaki University
ASANO Tetsumi	NGO: Action for Mangrove Reforestation

Project overview

The immune system is the human body's basic adaptive mechanism to changing environmental conditions, but recent environmental change occurs at a pace far beyond the body's capacity to adapt. This FS focuses on peoples dependent on Mekong River agricultural and aquatic resources, as their livelihoods are often directly affected by development in the region. Rich in natural and human resources, the Mekong region has attracted considerable investment and achieved remarkable economic growth in recent years. Poverty is still prevalent in the region, however, and environmental degradation associated with development often negatively affects traditional agricultural- and fisheries-based livelihoods. Japan's 2009 Official Development Assistance (ODA) program, "A Decade for a Green Mekong", highlights the need for environmentally-sound "green development" in the region, especially in relation to biodiversity and preservation of forests. Innovative approaches are needed.

Field research will describe food-nutritional status, which is undergoing rapid change, in relation to human resistance ("host defense") to disease. Environmental immunology provides the conceptual and methodological framework, as it links human physiological condition and health status to development and environmental change in the Mekong River region; this study will therefore advance description of "sustainable development", especially in relation to human wellbeing.

Research structure

The central objective of the research is to document human immune response to recent development in the Mekong Delta of Vietnam, the Tonle Sap Lake area of Cambodia, and southern Laos. Water environments and dynamics are privileged, as hydrologic dynamics and water availability, access and quality are determinant in the region. Multi-dimensional field studies will describe: 1) the impact of upstream environmental change on fish-, coral- and mangrove ecology, as well as on agricultural, fishery and forestry resources; 2) kinetics of water levels, especially flood, in the study sites; 3) individual and community nutritional and immunological status through anthropometric measurements, diet records, and biochemical-immunological analysis of blood and urine. The incidence of infectious disease, including dengue fever, forest-, wet-rice- and coastal-malaria, as well as Mekong schistosomiasis and paragonimosis, will be tracked, as will immunological response to chemical pollutants.

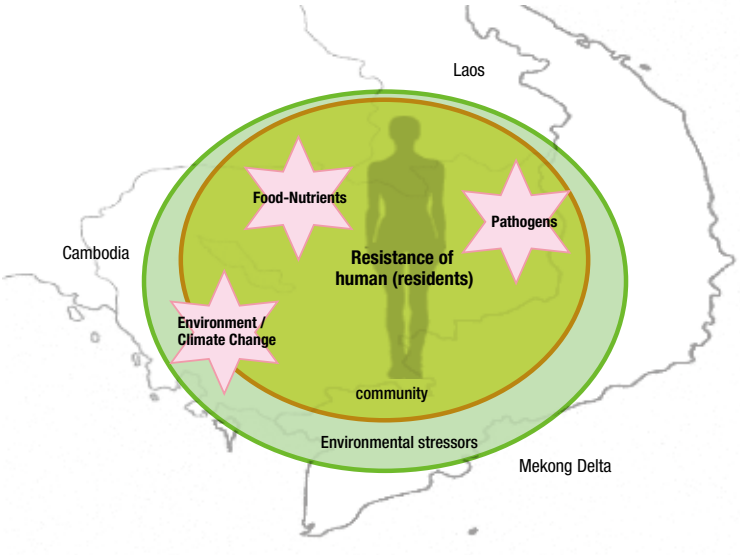


Figure 1 **Key concept of the project**

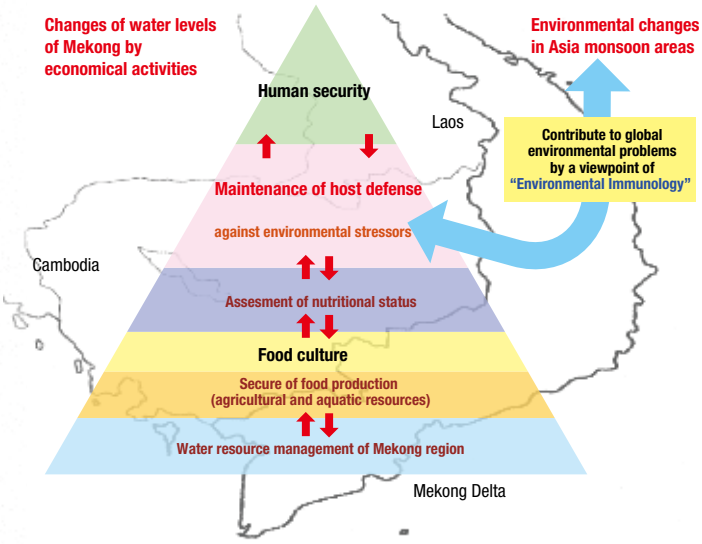


Figure 2 **Research framework**

A mangrove forest cleared to provide timber for the paper mill
Sumatra, Indonesia
ABE Ken-ichi

Color of a City
Ankara, Turkey
From above, a city is unified with the Earth's color
MATSUNAGA Kohei

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

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

The Earth Forum Kyoto invites world-renowned experts and activists to discuss the environmental and cultural bases of more responsible human societies. The Earth Hall of Fame Kyoto Award is given to those who have made exemplary contributions to the protection of the global environment. Organizers of the event are the International Institute for Advanced Studies, the Kyoto International Conference Centre, and RIHN. The 2010 recipients of the Earth Hall of Fame Kyoto Award were His Majesty Jigme Singye Wangchuck (Bhutan), Masazumi Harada (Japan) and Elinor Ostrom (USA).

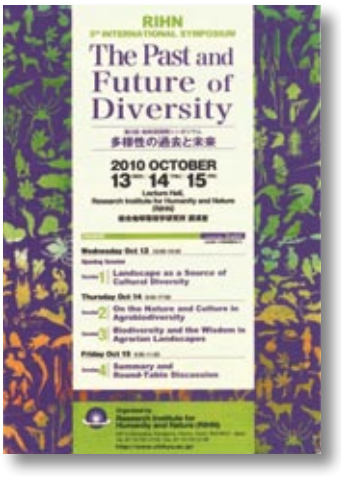
Award ceremony of the Earth Hall of Fame Kyoto

Kyoto Forum on Environmental Wisdom and Culture

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

RIHN International Symposium

A symposium organized in October of each year to discuss the findings of concluding research projects.
The Past and Future of Diversity, 13-15 October, 2010



International Symposia

International symposia are organized to allow intensive discussion of key project or domain topics. They may be organized by individual projects, RIHN research domains and in collaboration with other institutions. Recent symposia include:

Rethinking the Impacts of Climate Change in the Past
Organized by the Indus Project (H-03), Ecohistory Domain. 20-21 August, 2011
Keystone Species of Human Subsistence Ecosystems in Arab Societies
Organized by the Arab Subsistence Project (R-05), 20-21 December, 2010
Ecohistory of the Yellow Belt and Green Belt in Afro-Eurasia
The 3rd Ecohistory Program Symposium, 21 February, 2010

The 38th RIHN Public Seminar

RIHN Public Seminars

Public seminars are held almost monthly at RIHN or in the city center.

#38 Garden Cities or Metrocivilization: Kyoto, Shibuya and the Cities of the Future
NAKAGAWA Osamu, Kyoto Institute of Technology
MURAMATSU Shin, RIHN
16 April, 2010, Heart Pier Kyoto

#39 Haiku and Global Environmental Problems
TUBOUCHI Toshinori, Bukkyo University
18 June, 2010, Heart Pier Kyoto

#40 How Will You Live after Oil Resources are Gone? Part2
TAKAKI Keiko, J. F. Oberlin University; ISHIYAMA Shun, RIHN
17 September, 2010, Heart Pier Kyoto

#41 Oral History and Harmonious Coexistence with Nature: Tlingit Story-Telling by Bob Sam
Bob Sam, Alaskan Tlingit; HABU Junko, RIHN/U.C. Berkeley
30 November, 2010, Heart Pier Kyoto

#42 Learning from Minamata: from Pollution to Global Environmental Problems
HARADA Masazumi, previously at Kumamoto Gakuen University
15 February, 2011, Heart Pier Kyoto

RIHN Seminars

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

#43 Problems with Integrating Social and Ecological Processes in a Unified Modeling Framework: A Case study on the Drivers of Landscape Pattern
MCCAULEY, Stephen, Clark University/Worcester Polytechnic Institute,
7 June, 2010

#44 Food Security, Climate Variability and Land Use in Zambia: Methods for Spatial Analysis and Modeling Vulnerability and Resilience of Smallholder Systems
EVANS, Tom P., Indiana University/RIHN Visiting Research Fellow,
17 June, 2010

#45 How Can Academism Contribute to Global Environmental Issues? Agenda Setting as Commitment
YONEZAWA Shohei, Research Center for Advanced Science and Technology
29 June, 2010

#46 Environmental Governance in China
BAO, Maohong, Beijing University/ RIHN Visiting Research Fellow
8 July, 2010

#47 Sustainable Development and Advancing Environmental Governance
TOEPFER, Klaus, Executive Director, Institute for Advanced Sustainablility Studies, Potsdam, Germany
5 October, 2010

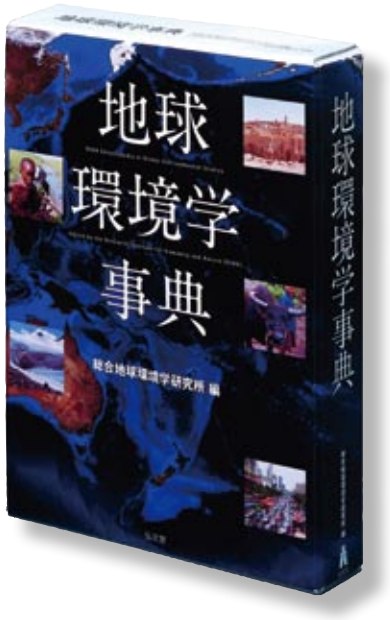
#48 New Perspectives on Sustainability: Research, Practice, and Education
REDMAN, Charles L., Founding Director, School of Sustainability, Arizona State University
27 October, 2010

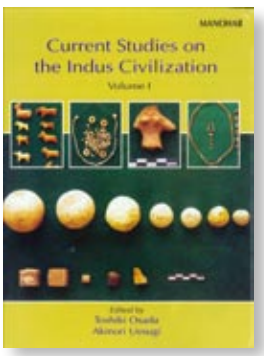
PUBLICATION

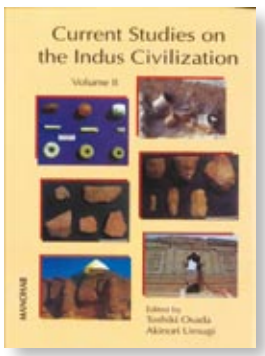
RIHN Encyclopedia of Global Environmental Studies

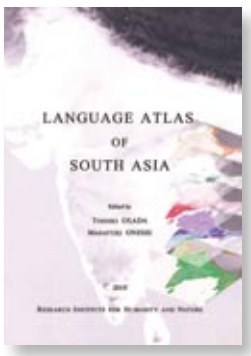
The RIHN Encyclopedia of Global Environmental Studies was published in 2010 to commemorate RIHN's 10th anniversary. In the past decade RIHN research has been disseminated through a remarkable range of academic and popular media, and yet each publication, interview, or workshop can only communicate a part of the whole. The encyclopedia was designed and written in order to address the need for a single, systematic and comprehensive reference work describing RIHN's research in the field of global environmental studies.

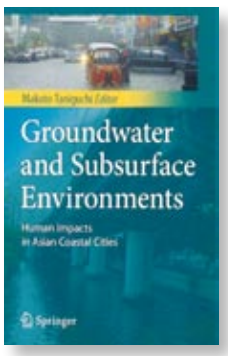
RIHN projects and researchers also publish a number of books each year in both Japanese and English.











The National Institutes for the Humanities (NIHU) 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.

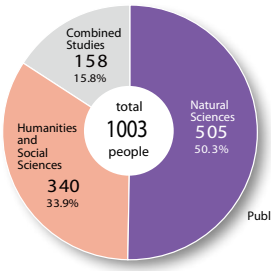
RIHN coordinates two NIHU endeavors on topics of great regional and global significance: Water in Asia, and environmental transformation in China. RIHN is the core institution in the Integrated Study of Water and People in Humid Asia research network, and published themed issues of the journal Water 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, which organizes symposia in both Japan and China. Such works have established RIHN as a central node in the network of scholars concerned with environmental transformation in China.

The international symposium on "Development and Environment, Livelihood, and Health in Southwestern China" was held at Yunnan University on November 2, 2010.

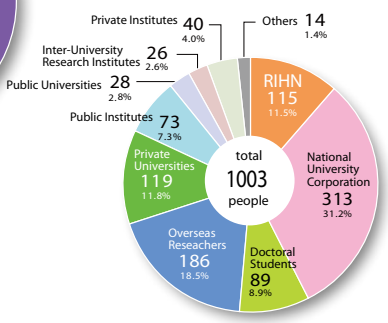
The Ten-Chi-Jin ("Heaven, Earth, People") Newsletter and a poster for a workshop on food in China.

Research Affiliations

Research Areas

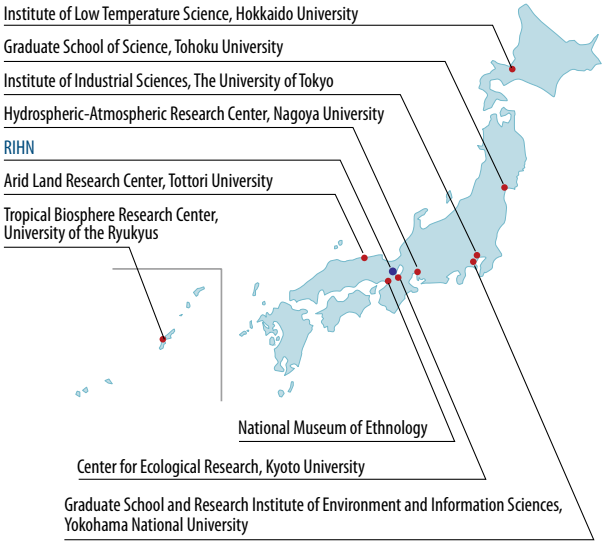


Affiliate Organizations



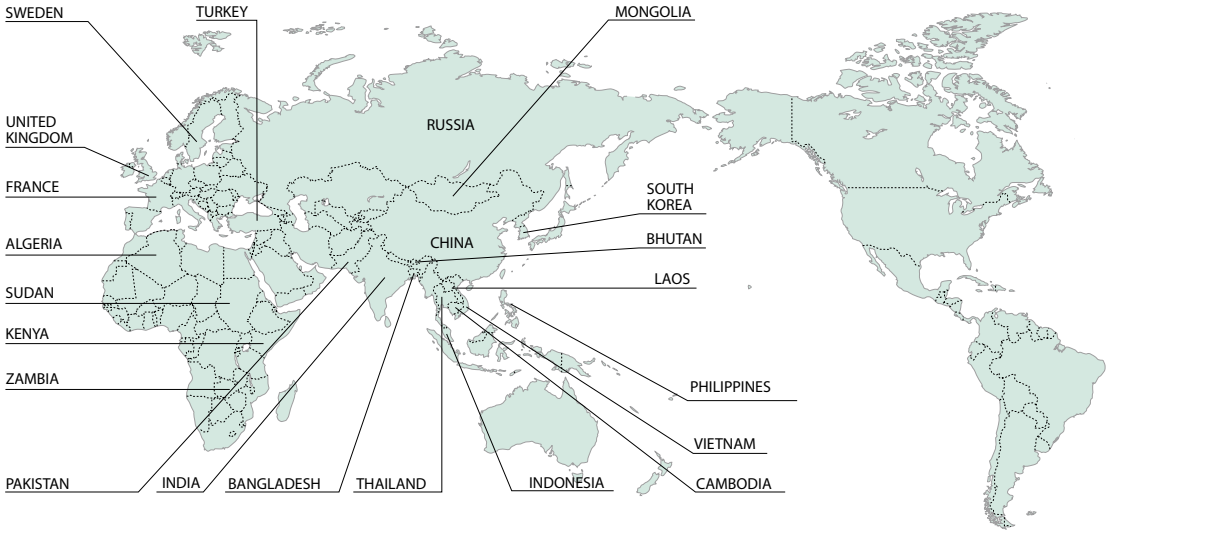
*As of May 1st, 2010

Collaboration in Japan



International Collaboration

Memoranda of Understanding and Research Cooperation Agreements (As of April 1st, 2011)



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

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

BHUTAN
Department of Medical Service, Ministry of Health, The Kingdom of Bhutan* (D-03)

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

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

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

INDIA
Institute of Rajasthan Studies, JRN Rajasthan Vidyapeeth (H-03)
Maharaja Sayajirao University of Baroda (H-03)
Maharshi Dayanand University (H-03)
Rajiv Gandhi University (D-03)

INDONESIA
Faculty of Agriculture, Hasanuddin University (H-02)
Universitas Indonesia* (C-08)
Indonesian Institute of Sciences (LIPI)* (C-08)

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

KENYA
National Museums of Kenya* (C-06)

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

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

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

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

RUSSIA
Far Eastern National University (H-04)
Institute for Biological Problems of Cryolithozone (C-07)
Institute of Humanitarian Research and the Problems of the Northern Minority Peoples (C-07)
The Melnikov Permafrost Institute of Siberian Branch of the Russian Academy of Sciences* (C-07)

SOUTH KOREA
Institute of Islands Culture (D-02)

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

SWEDEN
The Sven Hedin Foundation (H-02)

THAILAND
Rice Department, Ministry of Agriculture and Cooperatives (H-02)
Maejo University* (C-06)
The Southeast Asian Fisheries Development Center* (ISHIKAWA FS)

TURKEY
Çukurova University (H-02)

UNITED KINGDOM
Sainsbury Institute for the Study of Japanese Arts and Cultures (H-04)
London School of Hygiene and Tropical Medicine* (R-04)

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

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

*MOU signed in 2010

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

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

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

Laboratories

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

Instruments

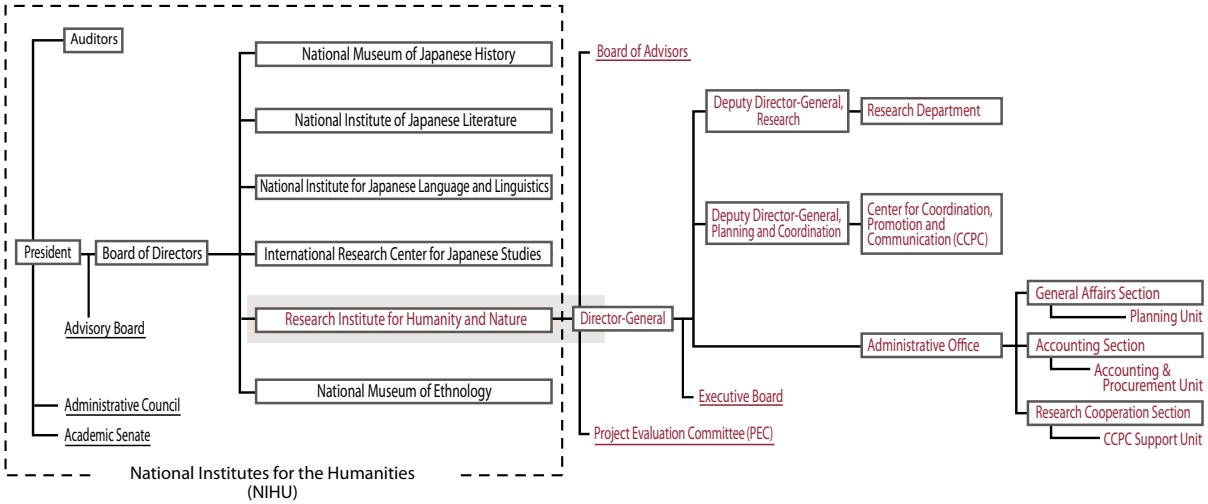
While individual projects make extensive use of specialized instruments, RIHN provides common access to the advanced instruments essential to contemporary environmental studies. In order to assure the proper use and care for this equipment, and to support its accessibility to the joint research of an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

Management

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

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

Organization



Financial Information

■ Segmental Financial Information (Fiscal Year 2009)

Operating Expenses

Category	Amount (Yen in thousands)
Operating Expenses	2,161,952
Inter-University/Joint Research	1,131,399
Outsourced Studies	56,351
Outsourced Operations	61,218
Personnel	912,982
General Management	187,405
Financial Expenses	63,899
Total Expenses	2,413,258

Operating Income

Category	Amount (Yen in thousands)
Subsidy for Operation	2,160,702
Contract Operations, etc.	75,469
Donations	6,925
Others	188,607
Total Earnings	2,431,705

Operational Balance 18,447

■ External Sources of Funding

(Fiscal Year 2009)

Category	Amount (Yen in thousands)
Fund for Promotion of Academic and Industrial Collaboration	78,299
Grants-in-Aids for Scientific Research	78,580
Donations for Research	10,375

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

Board and Committees

*As of April, 2011

Board of Advisors

Oversees personnel, planning, administration and operation of the institute

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

Project Evaluation Committee (PEC)

External review of research project proposals

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

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

Executive Board

Oversees administrative operation of the institute

TACHIMOTO Narifumi
Director-General
SATO Yo-Ichiro
Deputy Director-General
Director, CCPC
WATANABE Tsugihiro
Deputy Director-General
KAWABATA Zen'ichiro
Program Director
MOJI Kazuhiko
Program Director
NAKANO Takanori
Program Director
TANIGUCHI Makoto
Program Director
YUMOTO Takakazu
Program Director
IBUKA Junji
Director, Administrative Office

Emeritus Professor

NAKANISHI Masami
WADA Eitaro
NAKAWO Masayoshi
FUKUSHIMA Yoshihiro

Guest Professor

KINOSHITA Tetsuya

In Memoriam

Professor HIDAKA Toshitaka
First Director-General of RIHN

RIHN Staff

DIRECTOR-GENERAL TACHIMOTO Narifumi
DEPUTY DIRECTOR-GENERAL, Planning and Coordination SATO Yo-Ichiro
DEPUTY DIRECTOR-GENERAL, Research WATANABE Tsugihiro

ADMINISTRATIVE OFFICE

ADMINISTRATIVE DIRECTOR IBUKA Junji

GENERAL AFFAIRS SECTION

Head IWASAKA Yutaka
Deputy Head YAGI Kiyotaka
General Affais Subsection
Head MATSUO Takashi
Chief HARA Akiko
Personnel Subsection
Head TANIKAWA Yoshitaka
Clerk OKAUCHI Naoko
Clerk KIDA Yoshimi
Planning Unit
Head YAGI Kiyotaka
Planning & Assessment Subsection
Head NISHIMURA Takatoshi
Clerk NAKAOHJI Yu
Information Subsection
Head NISHIMURA Takatoshi
Clerk NAKAOHJI Yu

ACCOUNTING SECTION

Head MINAMI Kenichi
Deputy Head FUJIWARA Koichi
Financial Planning Subsection
Head YAMAGATA Satoshi
Clerk HONDA Takayuki
Facility Management Subsection
Head NISHIKAWA Tomonobu
Accounting & Procurement Unit
Head FUJIWARA Koichi
Accounting & Procurement Subunit
Head YAGI Tsukasa
Chief MURASE Mamiko

RESEARCH COOPERATION SECTION

Head SARA Toshihisa
Deputy Head MAENO Yoshiaki
Research Cooperation Subsection
Head SHINNO Masato
Clerk TAKATORI Yoko
International Affairs Subsection
Head TOKUDA Miki
CCPC Support Unit
Head MAENO Yoshiaki
CCPC Support Subunit
Head MIHARA Kazuaki
Clerk TSUJI Hanako

RESEARCH DEPARTMENT

Program Directors

KAWABATA Zen'ichiro
MOJI Kazuhiko
NAKANO Takanori
TANIGUCHI Makoto
YUMOTO Takakazu

<Program Assistant Directors>

HIYAMA Tetsuya
KUBOTA Jumpei
SAKAI Shoko
UCHIYAMA Junzo
UMETSU Chieko

Professors

KADA Ryohei	Agricultural Policy, Environmental Economics
KAWABATA Zen'ichiro	Microbial Ecology
MOJI Kazuhiko	Human Ecology
MURAMATSU Shin	Architectural History, Urban History
OSADA Toshiki	Linguistics
SATO Yo-Ichiro	Plant Genetics
TANIGUCHI Makoto	Hydorology
WATANABE Tsugihiro	Irrigation Engineering
YAMAMURA Norio	Mathematical Ecology
YUMOTO Takakazu	Plant Ecology

Associate Professors

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

Visiting Professors

GOTO Tamon	Chinese History, Film Making
HIMIYAMA Yukio	Geography
IEDA Osamu	East European Area Studies, East European Economic History
KATO Tsuyoshi	Comparative Sociology
KAWASAKI Masahiro	Atmospheric Chemistry
KOYAMA Shuzo	Archaeology
MATOH Toru	Plant Inorganic Biochemistry
NAGAO Seiya	Environmental Monitoring Radionuclides
NAKAJIMA Tsuneo	Ichthyology
OKUDA Toshinori	Ecology
SHIBAYAMA Mamoru	Area Informatics
UCHIBORI Motomitsu	Cultural Anthropology

Visiting Associate Professors

FUJITA Noboru	Grassland Ecology
ISHIKAWA Satoshi	Conservation Ecology, Global Fisheries Science
SHIRAIWA Takayuki	Glaciology
TANAKA Ueru	Terrestrial Ecosystem Management

Visiting Reseach Fellows

HONG, SUNG Heup	Cultural Anthropology, Japanese Culture
TKACHEV, Sergey Viktorovich	Oceanology, Political Science
YAHYA, Andi Saputra	History of Betawi, Indonesia
ZAMBA, Batjargal	Meteorology, Hydrology

Senior Project Researchers

C-06	MINAMOTO Toshifumi	Molecular Ecology
C-07	FUJIWARA Junko	Cultural Anthropology
C-07	SAKAI Toru	Satellite Ecology
R-03	CHENGZHI	Central Eurasian History
R-06	MASUDA Tadayoshi	Natural Resource Economics
R-06	RAZAFINDRABE, Bam Haja Nirina	Disaster Risk Management
H-03	MORI Wakaha	Linguistics, Sumerology
H-03	ONISHI Masayuki	Linguistic Typology
H-04	MAKIBAYASHI Keisuke	Archaeology
H-04	ZEBALLOS VELARDE, Carlos Renzo	Urban Environmental Planning
E-04	LEKPRICHAKUL, Thamana	Environmental & Health Economics

Project Researchers

C-06	ABE Akira	Sociology, Ethics
C-06	HONJO Mie	Environmental microbial ecology
C-06	TAKAHARA Teruhiko	Chemical Ecology
C-07	KOBAYASHI Nakako	Forest Meteorology
C-07	OSHIMA Kazuhiro	Climatology
C-08	GUSEVA, Anna	Southeast Asian Architectural History, Urban History
C-08	HAYASHI Kengo	Southeast Aian Architectural History, Urban History
C-08	MATSUDA Hiroko	Southeast Aian Architectural History, Urban History
C-08	MEUTIA, Ami Aminah	Hydorology
D-03	KOSAKA Yasuyuki	Ethnobotany
D-03	SAKAMOTO Ryota	Public Health
D-03	NOSE Mitsuhiro	Forest Resource Management
D-04	KATO Satoshi	Ecology
D-04	TAKANO Kohei	Insect ecology
R-03	NARAMA Chiyuki	Physical Geography
R-03	WATANABE Mitsuko	Geography
R-04	CAI, Guoxi	International Health & Public Health
R-04	FUKUSHI Yuki	Modern Chinese History
R-04	JIANG, Hongwei	Human Ecology
R-04	NISHIMOTO Futoshi	Social Anthropology
R-04	TOJO Bunpei	Area Studies
R-05	ICHIKAWA Kotaro	Bioacoustics
R-05	ISHIYAMA Shun	Cultural Anthropology
R-05	NAKAMURA Ryo	Cultural Anthropology
R-06	SAITO Satoshi	Isotope Geochemistry
R-06	YAOTA Kiyoyuki	Spatial Econometrics
H-03	ENDO Hitoshi	Archaeology
H-04	NAKAMURA Oki	Archaeology
H-04	HOSOYA Leo Aoi	Archaeobotany, Ethnoarchaeology
E-04	ISHIMOTO Yudai	Ecological Anthropology
E-04	MIYAZAKI Hidetoshi	Soil Science

Project Research Associates

C-06	IBUKI Naomi
C-06	MASUDA Yoshie
C-07	SHIMIZU Hiromi
D-04	KITAMURA Naoko
R-03	YODEN Makoto
R-05	HAFIZ KOURA, Hafiz Mohamed Fathy
R-05	ISHII Yume
R-05	MIZUMA Sakiko
R-05	Wang, Na
H-04	KAMURA Nozomi
H-04	OTANI Megumi
H-04	UCHIKADO Megumi
E-04	ITO Chihiro
E-04	WEYGANDT, Mayumi Kanzaki

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

MATSUNAGA Kohei	Geography

Center for Coordination Promotion and Communication (CCPC)

DIRECTOR SATO Yo-Ichiro

Heads of Divisions

Division of Coordination	TANIGUCHI Makoto
Division of Promotion	SEKINO Tatsuki
Division of Communication	ABE Ken-ichi

Head, Core Research Hub

YUMOTO Takakazu

Professors

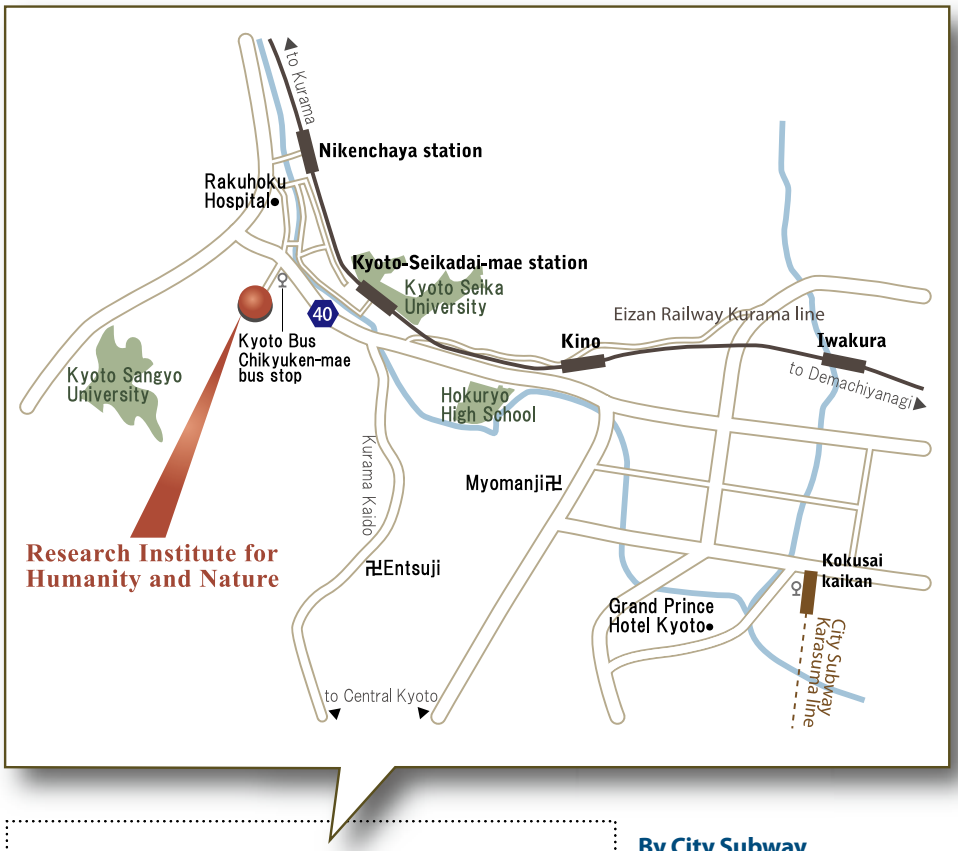
ABE Ken-ichi	Ecological Anthropology
AKIMICHI Tomoya	Integrated Area Study
NAKANO Takanori	Isotope Environmental Studies
SATO Yo-Ichiro	Plant Genetics
TANIGUCHI Makoto	Hydrology
YUMOTO Takakazu	Plant Ecology

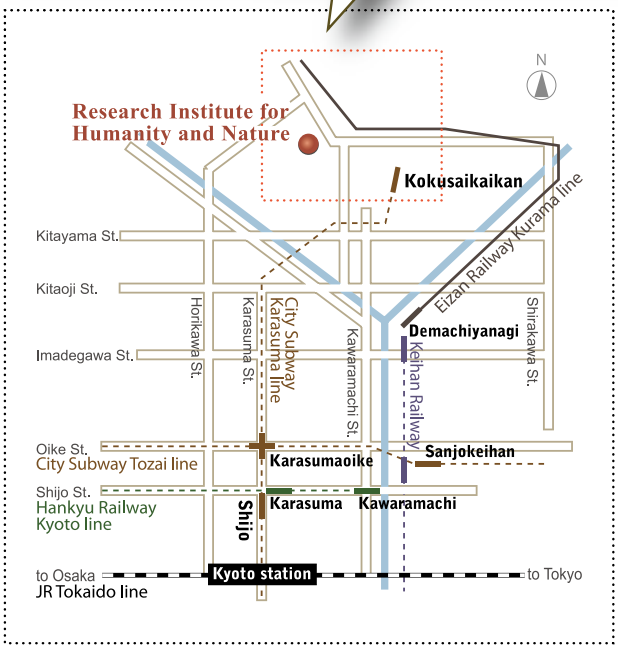
Associate Professors

HANDOH Itsuki C.	Earth Systems Science, Mathematical Modeling
KUME Takashi	Isotopic Soil Hydrology
KURATA Takashi	Philosophy
SEKINO Tatsuki	Information Science

Assistant Professors

KOHMATSU Yukihiro	Ecology Geography
NILES, Daniel	Geography
UYAR, Aysun	International Relations, International Political Economy
YASUTOMI Natsuko	Meteorology, Climatology





By City Subway

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

By Kyoto Bus

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

By Eizan Railway

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

Cover photo

Skilled riders wearing traditional headwear and ceremonial sabers wait on their prize camels for a race, part of a festival for ancestors in In Belbel, Algeria. Inhabitants of the oases located throughout the central Sahara may travel hundreds of kilometers to gather on important occasions and maintain community relationships. (Photo by ISHIYAMA Shun, June 2010)

RIHN 2011-2012 Prospectus overseen by ABE Ken-ichi and edited by NILES, Daniel and HANDOH Itsuki C.

RESEARCH INSTITUTE FOR HUMANITY AND NATURE

457-4 Motoyama, Kamigamo, Kita-ku, Kyoto
603-8047, JAPAN

Tel. +81-75-707-2100
Fax.+81-75-707-2106

http://www.chikyu.ac.jp
e-mail: kokusai@chikyu.ac.jp

ISSN 2185-8055
April 2011