Project Homepage● http://www.chikyu.ac.jp/USE/

Human Impacts on Urban Subsurface Environments

This project will assess the effects of human activities on the urban subsurface environment, an important aspect of human life in the present and future but not yet evaluated. This is especially true in Asian coastal cities where population numbers and density have expanded rapidly and uses of the subsurface environment have increased. The primary goal of this project is to evaluate the relationships between the development stage of cities and various subsurface environmental problems, including extreme subsidence, groundwater contamination, and subsurface thermal anomalies. We will address the sustainable use of groundwater and subsurface environments to provide for better future development and human well-being.

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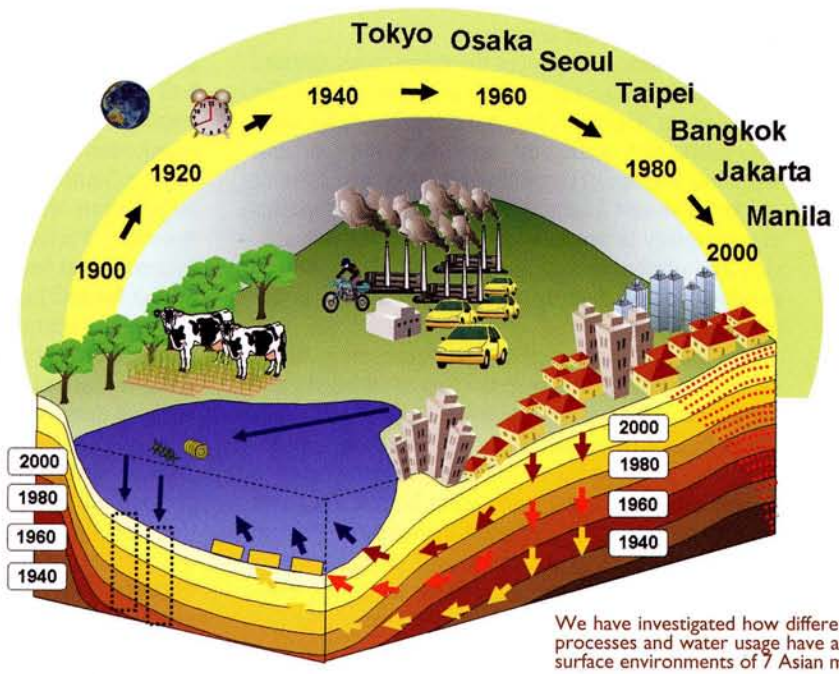
Objectives of this Project

Most global environmental studies have long been focused on the environmental issues above ground such as air pollution, global warming, seawater pollution, and decrease in biodiversity. Subsurface environmental issues are also important for human life in the present and future, but have been largely ignored because of the invisibility of the phenomena and difficulty of the evaluations. Subsurface environmental problems such as subsidence due to excessive pumping and groundwater contamination, have occurred repeatedly in Asian major cities with a time lag depending on the development stage of urbanization. Therefore, we may be able to assess future scenarios if we can evaluate the relationships between subsurface environmental problems and the development stage of the city.

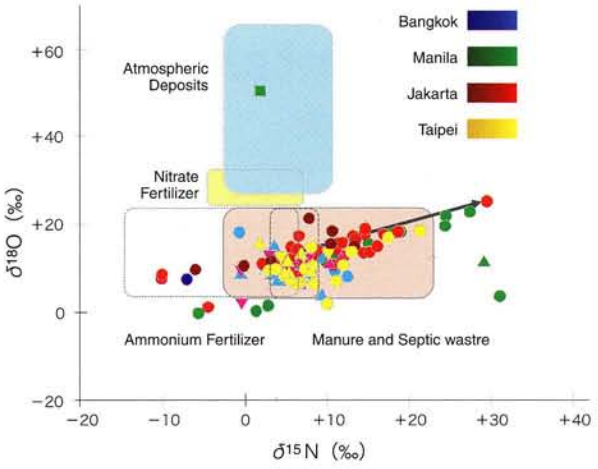
This project deals with: (1) Relationships between the development stages of cities and subsurface environmental problems which will be assessed by socio-economic analyses and reconstructions of urban areas using historical records; (2) Serious problems in subsurface environment and changes in reliable water resources which will be studied after evaluation of groundwater flow

Figure 1 Schematic Model of this Project



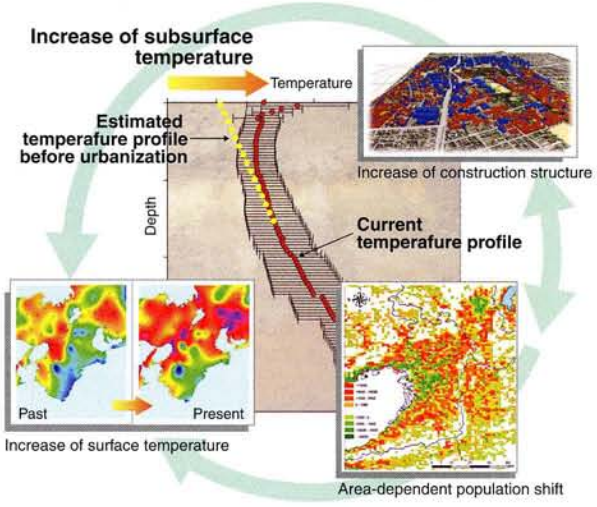
We have investigated how different development processes and water usage have affected the subsurface environments of 7 Asian megacities.

Figure 2 Distribution of Nitrate N and O Isotopes in Groundwater at Each Asian Megacity



The sources of nitrate pollution and their pathways have been investigated using stable isotope signatures and various statistical data.

Figure 3 Model of Collaboration Studies



Increases of construction and energy consumption associated with population increase brought surface temperature increases. The historical change of surface temperature is recorded as a profile of subsurface temperature.

Photo 1 Children Drawing well Water in Manila

Why don't we save valuable water resources for children in the future?

water flow systems and changes in groundwater storage using hydrogeochemical data and in-situ/satellite-GRACE gravity data; (3) Evaluation of accumulation of materials (contaminants) in the subsurface and their transport from land to ocean, including groundwater pathways using chemical analyses of subsurface water, sediments and tracers; and (4) Evaluation of subsurface thermal contamination due to the "heat island" effect in urban areas by reconstruction of surface temperature history and urban meteorological analyses.

Progress of the Project

- Field surveys on the subsurface environment in targeted cities have been made (6 times in 2005 and 9 times in 2006), and monitoring of subsurface environments has started.
- Assessments of natural and social data in each city have been made, and the structure of the project database based on GIS has been made for future work.
- Preliminary models such as GRACE, groundwater flow, and DPSIR have been established in each sub theme.
- In order to evaluate the origin and process of material loads to the subsurface, isotopes and chemical analyses of water samples have been made, and new tracers (CFC, Kr etc.) techniques have been introduced.
- Subsurface thermal signals can be used to reconstruct the history of urbanization.
- The International Symposium on "Human Impacts on Urban Subsurface Environment" was held, and the proceedings were published. Co-operation with international research agencies (UNESCO- GRAPHIC, GWSP-Asia etc.) has begun.

Future Work and Challenges

- The 2nd international workshop will be held in Indonesia in December 2007 to evaluate the interim results and find additional themes and problems in the project.
- In order to present the interim results of the project, a special issue of STOTEN (Science of Total Environment, Elsevier) will be prepared.
- New approaches to the relationship between groundwater and religion will be launched.
- A new observation system using CFC, Kr and absolute gravity measurement will be tested, and cross-comparison with different observation methods will be undertaken.

Project Homepage ● http://www.chikyu.ac.jp/sato-project./

Agriculture and Environment Interactions in Eurasia: Past, Present and Future
——The Ten-thousand-year History

Our project aims to understand the history of interaction between agriculture and environment in three major types of agricultural environment in Eurasia, namely the "*mugi*", "monsoon" and "tuber crop" zones, from an interdisciplinary perspective. Through this, we will attempt to make recommendations about some future directions for agriculture. As a means to reach this goal, we seek to reconstruct the history of the ten-thousand-year relationship between agriculture and environment, with "the loss of genetic diversity" as a guiding concept.

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The Project Goal

Agriculture has largely modified and destroyed or damaged the ecosystems in which it is practiced, and it has been said that the beginning of agriculture entailed the beginning of environmental destruction. In present day Eurasia there are large differences in both agricultural productivity and the extent of environmental deterioration between the Central Asian desert, where it is now almost impossible to conduct any agricultural activity, and the Monsoon region where vegetation and water are still plentiful. Our project focuses on different aspects of environmental deterioration associated with the ten thousand year history of agriculture. We seek to deepen our understanding of the role that "the loss of genetic diversity" has had over this long time span of interaction between agriculture and environment.

Research Aim and Methods

There are three major different types of agricultural system in Eurasia defined by crop type: rice, *mugi* (winter annual crops), and tuber crops. The background ecosystems (human habitation = "*sato*") of these agricultures, and their histories, also differ greatly. We therefore divide Eurasia into three broad regions, namely the mugi, monsoon, and tuber crop zones respectively. We have research groups for each of these regions (**Fig. 1**).

Our research methods include the following:

i) DNA analysis and observation of morphological variation in organic plant remains (**Fig. 2**) excavated from archaeological sites. This allows an assessment of genetic diversity using statistical genetic methods (Shannon's formula etc.).

ii) Carbon dating of macro botanical remains.

Figure 1 Regions Included in our Research Project

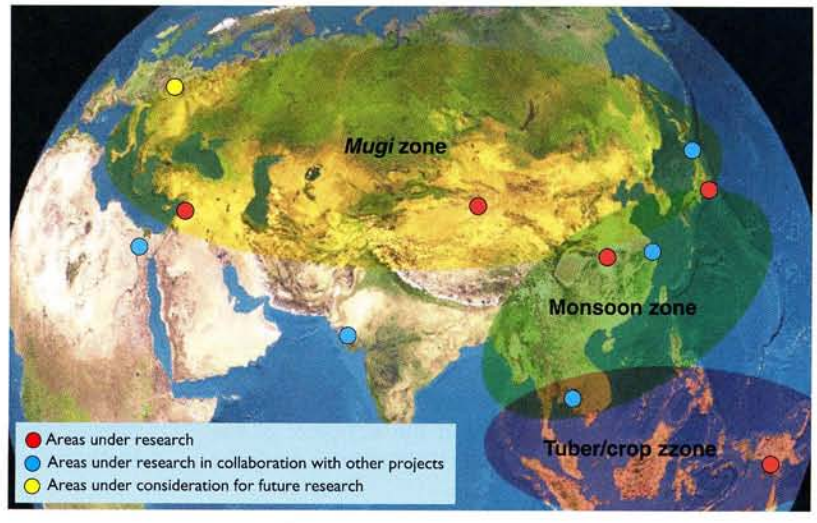


Figure 2 Diversity of Rice Cultivars from Ancient to Modern Times

Example of genetic diversity among samples found in a current rice field in Laos

Diversity of the size of carbonized rice grains from Sasai site, Fukuoka, Japan

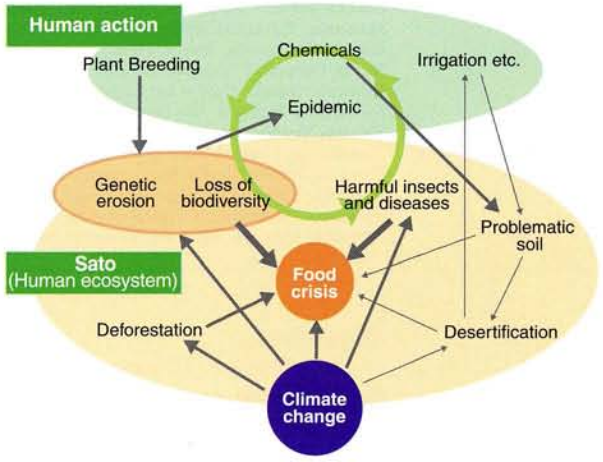
Figure 3 Archaeological Excavation in the *Mugi* Zone

Sasai Cami Yanı Site, Turkey, directed by Miyake, Univ. of Tsukuba

Figure 4 Salt Accumulations in the Desert (Xinjiang Uygur Province, China)

The white material covering the land now is salt. Three thousand years ago, this region appears to have been agriculturally fertile.

Figure 5 Model of the History of Relationships between Agriculture and Environment



iii) Characterization of plant seeds and animal tissues by stable isotope analysis.
iv) Analysis of pollen, phytolith, diatom and wooden pieces extracted from soil samples. This provides an understanding of environmental history (especially that of the local ecosystems).
v) Ecological assessment of "*sato*" (human habitation) using historical documents, ethnographical and ethnological materials.
vi) Research on the history of agricultural technology, including the hydrological balance and fertilizer use, employing both ethnobotany and economic research (on issues such as the circulation of agricultural products, etc.).

Present Results and Future Research

1) We have obtained the following results to date.
i. The analysis of botanical and faunal remains excavated at the Xiaohe site in the Xinjiang Uygur Region of China show that, in that period, agriculture and pastoralism were practiced.
ii. Contrary to previous views, the domestication of wheat required a longer time frame than previously believed (Tanno & Willcox 2006, Science 311).
iii. We have confirmed that rice paddy cultivation in Japan was often affected by accidental flooding, triggering a loss of biodiversity and the destruction of sato.
iv. We have established the importance of indigenous knowledge in maintaining the environment of slash-and-burn agriculture and other traditional activities.

2) We plan to continue our research on the following topics.

In the *mugi* zone, we are studying the soil salinity problem (**Fig. 4**), in relation to declining agricultural production.

In the monsoon zone, we intend to extend our understanding of the history of agricultural systems and their surrounding ecosystems.

Our previous research underlines the significance and complexity of the interrelationships between agriculture and environmental deterioration. The details vary according to climate and historical period. **Fig. 5** shows an outline theoretical model of contemporary agriculture, and we would like to modify and refine this model during the remaining four years of the research period.

Project Homepage ● http://www.chikyu.ac.jp/retto/retto.htm

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

The Japanese Archipelago has been extremely densely populated since the Neolithic Age, and most of the natural environment has been strongly influenced by human activities. However, in spite of the intensive intervention by humans in the natural environment, there is still a rich biota in the Japanese Archipelago, which includes, for example, an abundance of indigenous species of angiosperm and freshwater fish. But recently, many plants and animals are close to extinction because human-nature relations in this Archipelago have changed. This project aims to reconstruct human-nature relationships as historical processes to suggest concrete measures for preventing further extinction of species in the near future.

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Objectives

The objective of the present project is to reconstruct human-nature relationships as historical processes. It will examine: first, how the natural environment has been changed since the late Paleolithic Age, when human beings are first known to have existed in the Japanese Archipelago; second, how the biota has changed during that process; and third, what kind of perceptions, knowledge and skills the humans possessed, concerning both nature in general, and specific life forms. Our aim is to present a foundation for contemplating how human-nature relations should be developed, and to suggest concrete measures for preventing further extinction of species in the near future.

Study Area and Methodology

The project will elucidate the historical process of change in human-nature relationships under the global and/or local climate changes in these six regions: Hokkaido, Tohoku, Chubu, Kinki, Kyushu

Table 1 Characteristics of the Core Site in Each District

District	Core site	Climate	Characteristics
Hokkaido	Central and Eastern	Boreal	Very little agricultural activity until recently Rapid changes occurred after Meiji Era
Tohoku	Kitakami-Shimokita	Cool temperate (less snow)	Frequent suffering due to severe famine caused by low temperatures in summer
Chubu	Akiyama-Tsumari	Cool temperate (heavy snow)	High level of adaptation to heavy snowfall, sometimes reaching to 4 m in depth
Kinki	Kyoto-Tanba	Cool ~Warm temperate	Ancient capital and high rate of economic activity until the 19th century
Kyushu	Kuju-Aso	Warm temperate	High volcanic activity and wide range of grassland maintained by burning
Amami, Okinawa	Okinawa Island and Amami-oshima Island	Sub-tropical	Economy and culture supported by trade between the islands and China and Japan

Photo 1 Archaeological Excavation (Kyushu WG, Mutaguchi Ruin)

Photo 1 Sen-cho Muta in Kuju Town, Ohita Prefecture was described as for the foundation and abandonment of paddy fields in Bungo-fudoki. Excavation was carried out to prove the description related to the evidences of volcanic activities and flood.

Photo 2 Old documents are abundant in Sakae Village, Nagano Prefecture. Among all, Osutaka-Yama (hawk-rearing mountains) has been targeted to study inter-disciplinary, with collaboration of ecology and historical sciences.

Photo 3 In 1940s, detailed aerial photography was made by US Army in Setouci Town, Kagoshima Prefecture. Changes of land use and life style were interviewed for elder people using aerial photos.

Photo 2 Finding Old Documents (Chubu WG, Sakae-mura)

Photo 3 Interview Using Arial Photos (Amami-Okinawa WG, Kakeroma-jima)

and Amami-Okinawa, with the addition of Sakhalin; using biological remains that contain pollen samples, archaeological remains, old documents and folkloric materials. In addition, we intend to examine the change of the historico-economic background and the knowledge and skills concerning nature and living organisms, with special emphasis on their relation to the disappearance, or thriving, of organisms. The main approaches are: 1) the analysis of ancient vegetation and changes in the distribution of plants and animals; 2) reconstruction of human ecology based on population estimates and diets; 3) reconstruction of human-nature relations in the past, and the analysis of the social systems behind them; and 4) theoretical modeling of human-nature relations.

Progresses, Organizing Working Groups and Targeting Core Sites in Six Districts

We have re-organized six district-based working groups targeting core sites (shown in parentheses), Hokkaido (Shiribeshi), Tohoku (Kitakami), Chubu (Akiyama), Kinki (Kyoto-Tanba), Kyushu (Kuju-Aso), Okinawa (Okinawa Island and Amami-oshima Island), with the addition of Sakhalin, each of which possesses characteristic climate, vegetation, flora and fauna, and traditional lifestyles of people (Table), and includes ca. 100 km×100 km area of agricultural and forestry villages, and mountains. Also, we organized three method-based working groups targeting paleo-ecosystems, plant-geography, and old human bones. We have not organized a working group on animal-geography because several research projects are underway in the 21st Century COE program at Kyoto University, Ryukyu University and Hokkaido University; nor human population estimates which have already been carried out by a project of the International Research Center for Japanese Studies. Each working group held several meetings to review the pre-existing information and to discuss the approaches, expected results and timeline of the project.

Publications and Symposium

1) "What does the conservation of nature mean?" (By T. Yumoto) In: *Our Earth in the Future: What to Tell Children and How to Tell Them* (Ed. T. Hidaka), Kodan-sha, published on 20 July 2006 (in Japanese).
2) "History of human-forest relationships over the past 10,000 years" (by T. Yumoto) In: *Who claims forests ownership?* (Eds. T. Hidaka and T. Akimichi), Showa-do, published on 10 March 2007 (in Japanese).
3) "Environmental history and human activities in the Kyoto basin: from several different approaches" Symposium at the Annual Meeting of The Japanese Society of Ecology, held on 22 March 2007, Matsuyama (in Japanese).

Project Homepage ● http://www.chikyu.ac.jp/indus/

Environmental Change and the Indus Civilization

Human beings have always created dwelling spaces with sustainable food supplies by modifying their surrounding natural environment. In this project, we research the impact of environmental change on the Indus civilization. That is one of the four great ancient civilizations. Indus sites spread over 100,000 sq. km. of the northwestern part of the Indian subcontinent. Indus people established cities and an urban lifestyle from 2600 BC to 1900 BC. The urban phase of this civilization lasted for a much shorter period than the other ancient civilizations. Our methodology is based on human sciences as well as scientific approaches. Our project aims to find out the reason for the decline of the Indus Civilization, shedding light on the relations between humanity and nature since ancient times.

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Objectives

Our project aims to understand the formation, development and decline of the Indus Civilization by means of an interdisciplinary approach. Especially, we attempt to evaluate the impact of environmental change on the subsistence economy and the trade network, which sustained the urban system.

Our project team is divided into four research groups, focusing respectively on the environmental changes, the material cultures, the inherited cultures, and the subsistence system.

The paleo-environment research group studies the environment surrounding the Indus Civilization. Two main research tasks are to be conducted: (i) the reconstruction of the lost course of the Sarasvati river that seems to have played an important role in the Indus Civilization through geographical analyses using satellite images and remote sensing; (ii) core-boring from lakes with the aim of reconstructing long-term environmental change.

The material culture research group studies excavated materials from archaeological sites to reconstruct the society and culture in the Harappan period. We have been excavating at Kanmer, in the Rann of Kachchh, Gujarat, India in collabo-

Figure 1 Concept of the Project

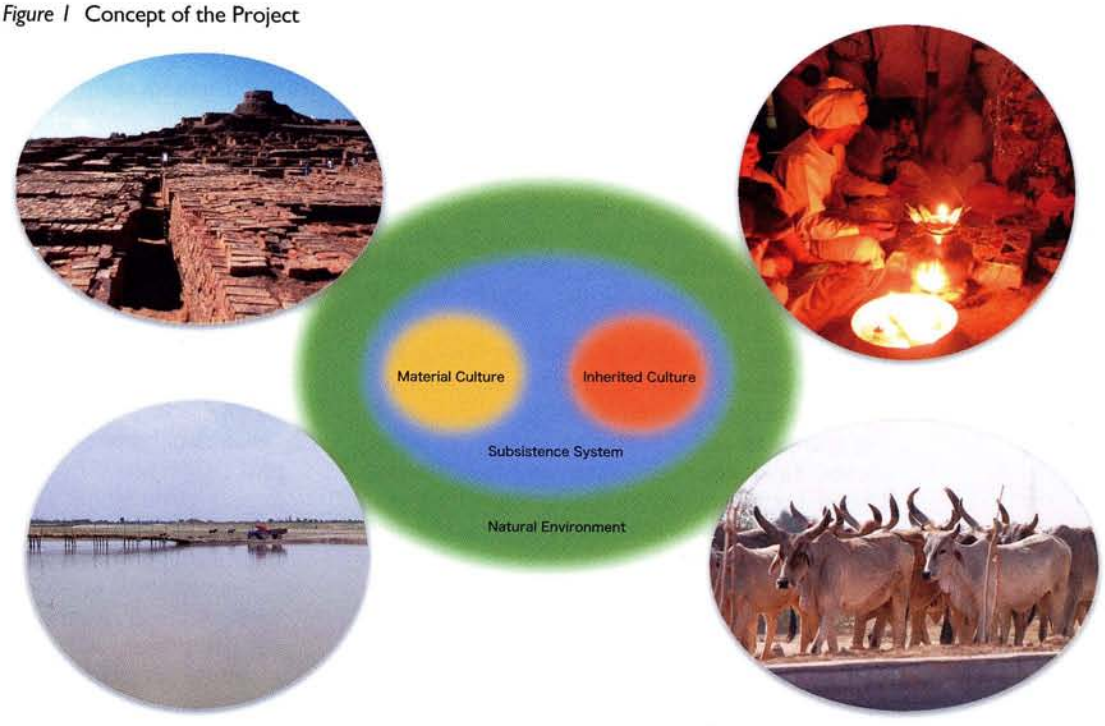

Figure 2 Distribution of Sites of the Indus Civilization

By using GIS, various data are being integrated.

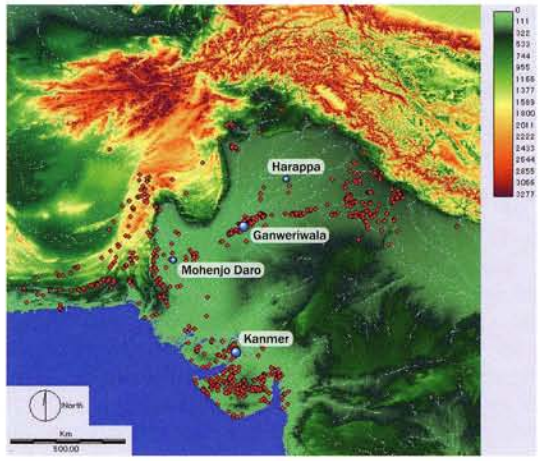

Figure 3 DEM of Kanmer, Gujarat, India

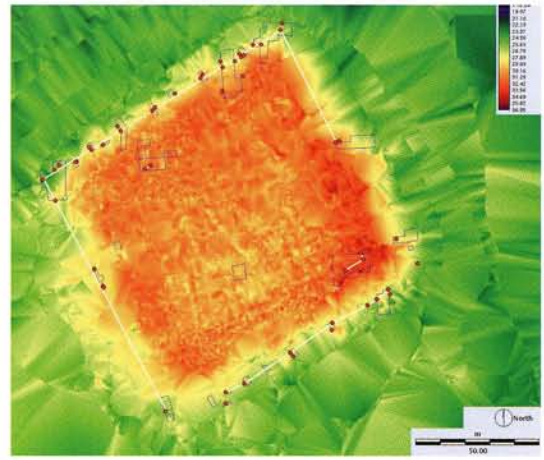

Figure 4 Scene of the Excavations at Kanmer

Interdisciplinary research is being conducted by the international team.

Figure 5 Sampling of Plant Residues at Kanmer

ration with Indian archaeologists.

The inherited culture research group studies Indian cultures for the purpose of reconstructing the historical significance of the Indus Civilization through Vedic studies by Indologists and fieldwork by cultural anthropologists.

The subsistence system research group deals with botanical and zoological evidence both from archaeological sites and from the present fauna and flora in order to reconstruct the subsistence system of the Indus Civilization.

Results and Future Task

In the last two-seasons' excavations at Kanmer, a large-scale fortification wall of stone masonry was found to enclose the central mound of the site. The discoveries of semi-precious and shell lapidary industries indicate that the site functioned as a center of production and trade in the Rann of Kachchh during the Harappan period. Furthermore, the analysis of botanical evidence such as wheat, barley and rice, and animal bones such as cattle and buffalo provides a clue to understand the relations between the natural environment and human activities around the site.

In this fiscal year, we will commence geological research on sites in the Sarasvati area and excavation at Ganweriwala, supposed to be one of major sites of the Indus Civilization, in Pakistan in collaboration with Punjab University.

Figure 6 Steatite Microbeads from Kanmer

Various artifacts of precious materials have been discovered at Kanmer. Among them is a large number of steatite microbeads that were contained in an earthen pot.

Project Homepage ● http://www.chikyu.ac.jp/resilience/

Vulnerability and Resilience of Social-Ecological Systems

A vicious cycle of poverty and environmental degradation such as forest degradation and desertification is a major cause of global environmental problems. Especially in semi-arid tropics (SAT) including Sub-Saharan Africa and South Asia where the majority of the poor is concentrated, poverty and environmental degradation is widely prevalent. People in this area largely depend on rain-fed agricultural production systems and their livelihoods are vulnerable to environmental variability. Environmental resources such as vegetation and soil are also vulnerable to human activities. In order to solve these "global environmental issues", a key factor is a quick recovery from, or a resilience of human society and ecosystems to, the impacts of environmental variability. This project aims at identifying the factors affecting resilience and the ways to enhance the resilience of rural people in developing countries to environmental variability.

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Purpose of the Research Project

In the past, no serious attention has been paid to the vulnerability and resilience of people whose livelihoods and production systems heavily depend on environmental resources. Thus projects for disaster relief and environmental conservation in drought-affected areas did not sufficiently take into account the resilience of local people. In developing countries, loss of resilience of social-ecological systems due to an increase of population and the collapse of rural communities is of critical importance especially for farmers and nomads whose livelihoods rely heavily on environmental resources. This project tries to consider human activity against environmental change in view of social-ecological resilience and thus to clarify the effects of local environmental change on social-ecological systems as well as the mechanism through which the systems recover from such shocks. Also, from various case studies, our research tries to identify factors that determine adaptive capacity of households and communities to environmental shocks, and the role of institutions on strengthening social-ecological resilience. By analyzing the factors influencing social-ecological resilience, it is possible to introduce policy interventions for enhancing human security in developing countries.

Research Methods and Target Areas

The method for comprehensive assessment of resilience is organized in four research themes as highlighted in **Figure 1**. Theme I focuses on soil and forest resources for analyzing ecological resilience. In theme II, we will conduct intensive interviews of farm households/communities and identify the factors affecting social resilience. Theme III considers historical changes in land tenure systems made by government policies and their effects on natural environment as well as social political factors of increasing vulnerability and the process of collapse and recovery of resilience in different communities. Theme IV cov-

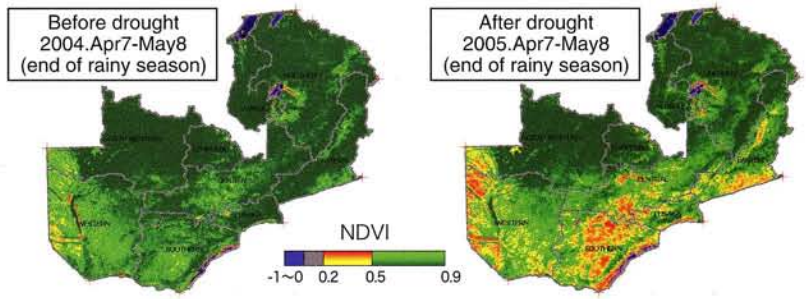
Figure 1 Close Relationship of Social and Ecological Resilience

Figure 2 Zamiba, the Main Field Site

Taken from URL http://www.mapquest.com.

Figure 3 Meeting with Villagers in Petauke District, Eastern Province, Zambia

Figure 4 Comparison of NDVI Distribution Before and After Drought



Vegetation area extends to the whole Zambia before drought.

Warm colors indicates the dryness and the low values of NDVI (warm colors area) are widely shown in Southern and Eastern Provinces after drought.

Figure 5 Emergency Food as Ex-Post Coping Measures to Drought

ers larger areas utilizing statistics, remote sensing imageries and aerial photographs to help trace long-term changes in land cover in addition to the analysis of data on rainfall and temperature. By utilizing the information provided by themes I, II and III, we will develop comprehensive and integrative methods for assessing social-ecological resilience.

The main field site is located in the semi-arid tropics (SAT) including Zambia (**Figure 2**) and other areas in sub-Saharan Africa and South Asia where the resource base is critical for livelihood. People in these areas largely depend on vulnerable rain-fed agricultural production systems. Increasing food security, resilience of livelihood and reducing poverty are acute issues in these areas. This project thus aims at identifying the ways in which subsistence farm households can become resilient to environmental variability by developing a method to assess resilience of social-ecological systems.

Research Outcomes to Date and Expected Results

During the field trip to Zambia in 2006, we identified the field experiment site near Petauke in Eastern Province and obtained permission for the use of fallow land from the District Commissioner as well as the villagers (**Figure 3**). Also, a preliminary soil analysis was conducted in order to map spatial distributions of soil characteristics. Since August 2006, two project members have been residing in two different villages in Southern Province for their interview surveys on labor migration, drought response and others. They will continue to stay in the respective villages until the end of the cropping season in June 2007. In order to understand typical patterns of land use changes in past years, we analyzed multi-temporal satellite imageries as our preliminary analysis. Using Normalized Difference Vegetation Index (NDVI), which was generated by the combination of visible and near infrared bands, we extracted information on areas of typical land cover changes caused by drought (**Figure 4**). We then conducted a ground survey to verify the results of satellite imagery readings with actual ground conditions. Furthermore, we used rainfall data from national meteorological stations in Zambia to identify the specific rainfall patterns during drought years. We also visited a local hospital, and health center. Reportedly, the rate of underweight newborn infants below 2.5 kg significantly increased during the drought year. The effects of drought on humans are captured especially in the status of infant health and nutrition. Information related to the weight, height and arm circumference of children under five will be used to assess short- and long-term impacts of droughts on human capital and labor productivity. For the human dimensions of human security, we surveyed global food security issues as well as institutions for food aid and early warning systems. After we start the extensive and intensive agricultural household interview surveys, we will obtain further information on the resilience of farm households based on the analysis of detailed data. We continue to organize the Resilience Seminars at RIHN in order to disseminate the latest findings in this field.

Project Homepage ● http://www.chikyu.ac.jp/neo-map

Neolithisation and Modernisation:
Landscape History on East Asian Inland Seas

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

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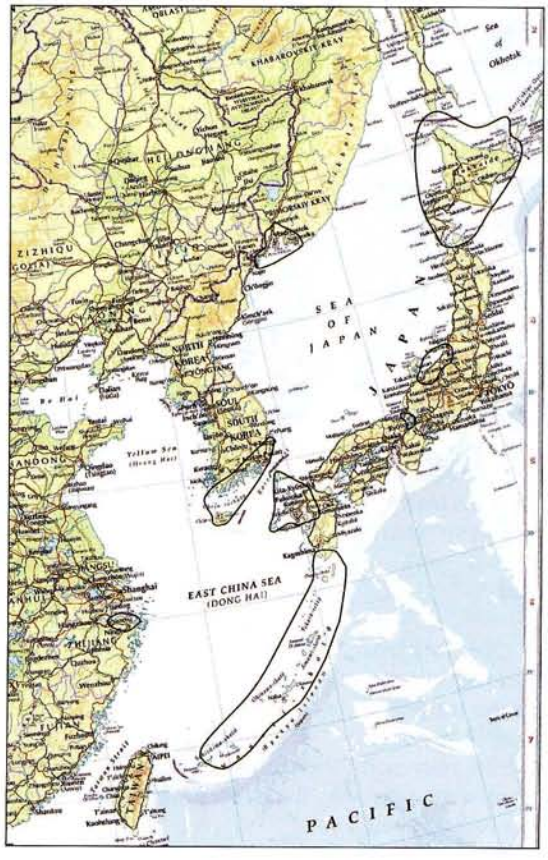
Nishitani, Masaru National Museum of Japanese History
Okada, Hiroki Kobe University
Popov, Alexander Far-East National University
Yasumuro, Satoru National Museum of Japanese History

Background and Aims

Recent years have seen the concept of "cultural landscape" become increasingly important in landscape protection policies, not only in Japan but also on an international scale. Accordingly, it has become especially important to understand the cultural processes and mechanisms of landscape formation, change and evaluation. Landscape research that focuses on cultural aspects in the same measure with the physical geographical ones, is still rare in East Asia.

Figure 1 East Asian Inland Seas and Eight NEOMAP Research Areas



Landscape

Landscape is a holistic phenomenon, combining the elements of the natural environment as well as human actions, mental landscape images and traces of cultural processes. An image of landscape held by a society influences largely their way of working on the physical landscape. The newly born landscape in its turn creates a new image, which is then again applied on physical reality, creating thus an ever-continuing spiral of change. As such, the concept of landscape allows us to interpret not only the biological or physical processes behind the modern environmental problems, but also the mental and cultural processes behind the humans' destructive behaviour towards their natural environment.

Inland Seas

Throughout history, the inland sea regions have been densely populated and have acted as centres of extensive trading networks. Located on the borders of diverse cultural and natural environments, the inland seas can be considered a cultural system that has managed to maintain both intense cultural and economical contacts and remarkable cultural diversity. The research results of the NEOMAP project would be compared to those from North European Inland Seas (the Baltic Sea and the North Sea).

Neolithisation and Modernisation

Present-day landscape elements can be traced back to different historical layers. The NEOMAP

Figure 2 Concept of Landscape

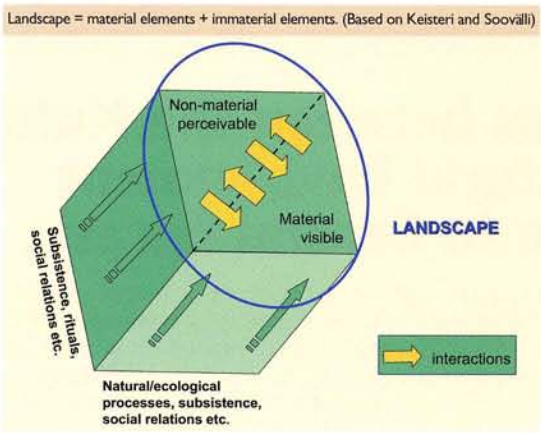


Figure 3 Project Members Looking at Ancient port Remains at the Early Neolithic Tienluoshan site in China

Figure 4 Shirakawa Village, Japan

Landscape once created on the crossroads of mountain products' trade, has itself become an object of consumption.

project defines *Neolithisation and Modernisation* as two key layers in historical landscape change. Neolithisation refers to a period of emerging permanent settlements and agriculture, the expansion of trading networks, and the birth of many novel technologies. Similarly, Modernisation is a time of urbanisation and industrialisation, the globalisation of trading activities and the invention of new revolutionary technologies. Showing considerable similarities in overall tendencies, these two periods have been crucial to the formation of present-day landscapes.

Results up to Now

The project is divided into eight research groups according to the eight research areas defined on the collision points of cultures and natural environments. Up to now, each workgroup has defined its major topics and areas of interests and carried out preliminary fieldwork to determine the feasibility of the project research.

To guarantee maximum integration, each project member has to belong to at least two workgroups. The interregional and historical comparison is further facilitated by the creation of GIS database uniting basic historical, archaeological and environmental data from each research area.

To promote international collaboration with Europe and pave the way for the comparison with North Sea and Baltic Sea, discussions have been held with scholars from Estonia, Belgium, Holland, England, Germany and elsewhere.

For a deeper understanding of landscape research inside the institute, the project has opened two seminar series, "Landscape Research" and "Wild Boar and Landscape". Project has participated in, organised and co-organised several workshops and seminars in Japan (at Suita City Museum, Society of Biosophia Studies, Lake Biwa Museum etc) and abroad (SISJAC, PECSRL).

Plans for 2007

On the basis of the main research themes agreed on in each workgroup and individual research plans, and making maximal use of the project organisation that allows for considerable interaction between specialists on different areas, fields and periods, we hope to start full-scale research from April 2007.

The topics that will be addressed by the individual researchers in all the eight research groups can be divided into four major common themes. First, the birth and expansion of the archetypal East Asian landscape, which includes research on rice paddy system, migratory waterfowl hunting, raised floor stock houses on one hand and on archetypal urban planning and Feng Shui on the other. Second, we will be investigating waterfronts, i.e. the system of the inner/outer sea, rivers and lakes as a source of living and an object of worship, but also the function of waterways as a passage for trade of local produce. Third major theme is migration and colonisation as a major force of landscape change, including the change of settlement patterns inside one culture, as well as colonisation and immigration as a forced landscape shift from indigenous/traditional landscape systems to introduced ones. Lastly we will be addressing the issue of travelling and creation of mental landscape images with topics like Eight Ômi Landscapes, the landscape imports in colonisation (ghosts and spirits transferred to new areas) and the role of temples as a landscape axis.

Project Homepage ● http://www.chikyu.ac.jp/rihn/pro/2004_4-5.html

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

The project highlights man-made trans-boundary problems between countries or ethnic groups, religions, agriculture and nomadism, or between cities and the surrounding areas. People in the semi-arid region of Central Eurasia, once lived a nomadic lifestyle. After the long transition of the rise and fall of various ethnic groups and countries, a tight and well-defined border divided the region between Russia and Qing. Both sides of the border used to be the same but have developed differently. This project aims to study and clarify the historical interaction of human activities and natural systems in the semi-arid region of Central Eurasia, with particular emphasis on the meaning of boundaries in the context of environmental issues. This project should provide important keys not only for evaluating the effects of projected human activities on ecosystems in semi-arid regions, but also for elucidating fundamental perspectives to examine a desirable mode of living in multi-cultural regions.

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Konagaya, Yuki National Museum of Ethnology
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Nakawo, Masayoshi RIHN
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Sugiyama, Masaaki Graduate School of Letters, Kyoto University
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Uyama, Tomohiko Slavic Research Center, Hokkaido University
Yoshida, Setsuko Department of Applied Sociology, Shikoku Gakuin University
Yoshikawa, Ken Graduate School of Environmental Science, Okayama University

Background and Objectives

With the exception of those people who lived in oasis areas, people of the semi-arid region that extends across Central Eurasia once lived a predominately nomadic lifestyle. After the long transition marked by the rise and fall of various ethnic groups and countries, the Yuan Dynasty governed the whole of Eurasia as a loosely controlled unity during the 13th and 14th centuries. In the 18th century, however, a tight and well-defined border divided the region between Russia and Qing. At the same time, the people of this area experienced a great change in their lifestyle, caused by the migration of farmers, settlement of nomads and development of agriculture in association with the expansion of Russia and Qing. For nomadic peoples living in semi-arid regions, relocation was one of the major means for adapting to environmental changes, demographic expansion and political conflicts between groups. Settlement policies and borders prevented these people from following their way of adaptation. Finally, with the weakening of the Soviet Union, the Russian side was divided into many republics. Man-made trans-boundary issues, between countries or ethnic groups, religions, agriculture and nomadism, or between cities and the surrounding areas, commonly lie behind the various environmental problems in the world. This project aims to study and clarify the historical interaction of human activities

Photo 1 The Yuldus steppe in the Tian Shan Mountains

Photo 2 The Kazakh Steppe on the north of the Balkhash Lake, Kazakhstan

A semi-arid region, to the north of the Tian Shan Mountains, has been used for both agriculture and nomadic pastoralism. How did the people in this region adapt their life style to changes of the natural system? What is a desirable mode of living in future? The project will tackle these questions.

Figure 1 Study Areas

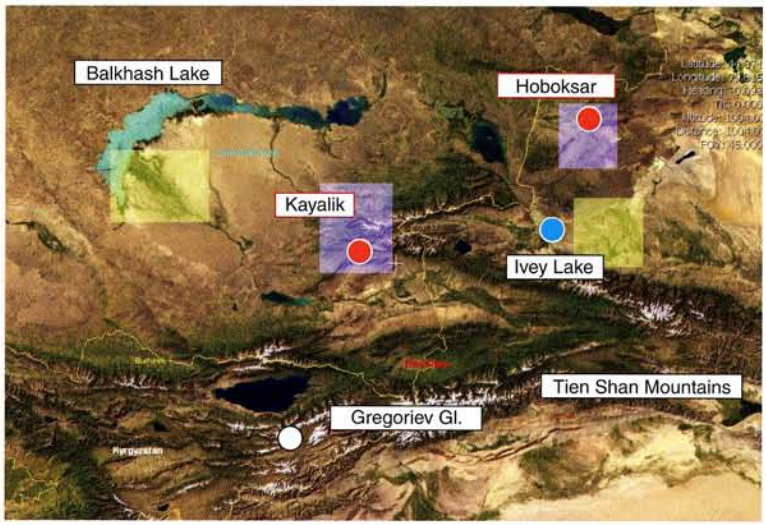
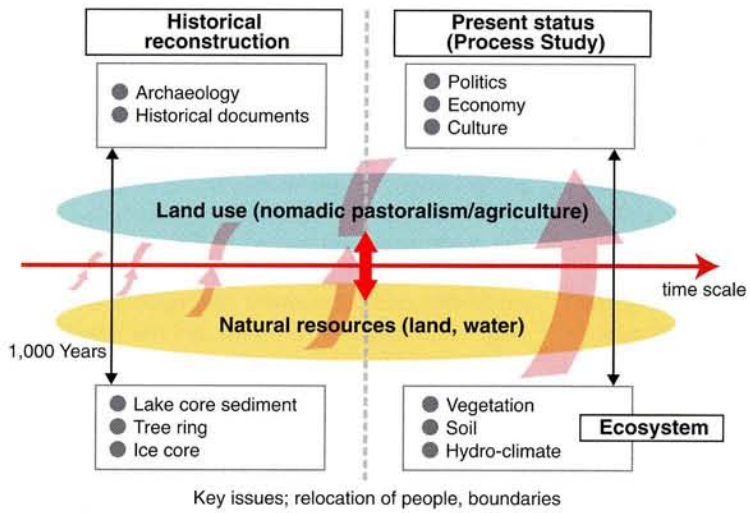


Figure 2 Outline of the Project



and natural systems in the semi-arid region of Central Eurasia, with particular emphasis on the meaning of boundaries in the context of environmental issues. This project should provide important keys not only for evaluating the effects of projected human activities on ecosystems in semi-arid regions, but also for elucidating fundamental perspectives to examine a desirable mode of living in multi-cultural regions

Contents and Methods

1) Research area

The area of study is the Ili River watershed, which flows from China to Kazakhstan, terminating at Lake Balkhash, as well as the surrounding areas, including Kyrgyz and Uzbekistan. Geographically, the Ili River watershed is recognized as a fertile area with relatively high precipitation, lying to the north of the Tian Shan Mountains. Within an historical context, the Ili River watershed and the surrounding areas have been a key area of East-West interaction in which many ethnic groups and countries have risen and fallen. Also, the region has areas with current environmental problems due to modern development under socialism.

2) Research groups

The project consists of two research groups: one will set out to clarify historical changes in both human activities and natural systems through the analysis of historical documents as well as a variety of natural proxies, and the other group is to investigate the current processes of human activities and natural systems for the purpose of interpreting the historical information.

3) Contents

A) To clarify historical changes, the rise and fall of nomadic groups and countries, their removal, changes in subsistence, the use of natural resources, and climate change through the analysis of historical documents and archaeological investigations as well as various natural proxies such as ice cores, lake sediment samples, tree rings and wind-blown deposits.

B) To investigate the present status of the area and the effects of human activities on the natural environment, with particular emphasis on their social, religious and cultural background.

C) To compare both sides of the border within the context of historical changes and their current status, examining areas that were previously similar but that have subsequently developed differently, to understand the meaning of boundaries in the context of environmental issues.

Present Status of the Project

Preliminary field trips have been made in 2006. In July to August, the present status analysis group made a preliminary field trip to Kazakhstan and China for general surveying. They found several field sites potentially suitable for the evaluation of the impact of human activities on local ecosystems. A large amount of basic information concerning vegetation, soil, meteorological and hydrological conditions was gathered during the field trip with regard to the present status of the study area. The ice-core research group made a field trip to the Gregoriev Glacier in the Tian Shan Mountains in Kyrgyz in August. They surveyed the area and decided on drilling sites. They confirmed the availability and accessibility of the sites. The historical research group traveled from Uzbekistan, Kazakhstan and China for a general survey of the historical remains in the area. The lake sediment coring group visited Lake Ivey in China during winter, in the hope of drilling from its ice-bound surface.

Also agreements for conducting joint research with universities and research institutes in China and Kazakhstan have been prepared.

Based on these preliminary field trips and preparations for cooperative studies in 2006, we will accelerate our research activities in 2007. This project should provide important keys not only for evaluating the effects of projected human activities on fragile ecosystems in semi-arid regions, but also for proposing fundamental perspectives to examine a desirable mode of living in multicultural regions.

Project Homepage ● http://www.chikyu.ac.jp/z

Effects of Environmental Change on the Interactions between Pathogens and Humans

The rapid spread of emerging infectious diseases is threatening human lives. Our project team aims to reveal the interactions between environmental alterations by human activities, outbreaks of pathogens, and changes in human lifestyle. We will suggest ways to prevent the outbreak and spread of infectious diseases and explain how to facilitate the safe coexistence of humans and pathogens.

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Research Aims

The spread of emerging infectious diseases is becoming a serious global environmental problem. To predict outbreaks of infectious diseases and to prevent epidemics, it is essential not only to conduct pathological studies but also to understand the interactions between humans and environments that generate infectious diseases.

The objectives of this study are to clarify the relationships between anthropogenic environmental changes, pathogens that emerge under these environmental changes, and the effects on humans of diseases caused by those pathogens. Our project is based on the hypothesis that anthropogenic environmental changes mediate the spread of disease. Outbreaks of mass mortality in carp, which have long been part of human food resource and culture, caused by the koi herpes virus (KHV) disease have occurred worldwide since 1998. Specifically, we will focus on the relationships between environmental changes in a freshwater ecosystem, KHV, common carp (*Cyprinus carpio carpio*), KHV disease and humans. We regard this system as a model of interactions between pathogens and humans (**Fig. 1**), because parameters common to other diseases are involved in the system and also this system allows us to conduct experiments to verify the interactions. We will then establish a general model for the emergence and spread of diseases (**Fig. 2**).

This study could help deal with emerging infectious diseases proactively, before they become a major health threat, through an understanding of the nature of disease, and contribute to the safe coexistence of humans with pathogens to realize long-term societal security.

Research Organization and Methods

Fields surveys are conducted at Lake Biwa, Japan, and Lake Chau-hu, China.

Our project is organized into five research groups, an executive group, and an advisory group. The role of each group is as follows:

Environmental alteration by humans (Group 1): revealing the effects of anthropogenic environmental alteration on the emergence and spread of a pathogen (KHV) and on the behavior of its host (common carp, *Cyprinus carpio carpio*).

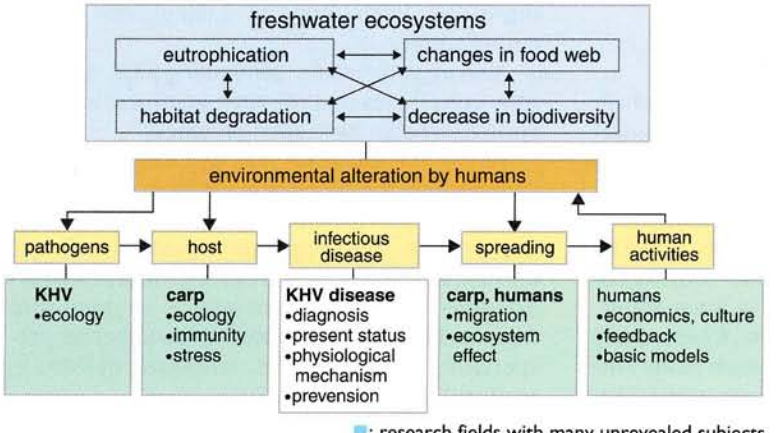
Ecology of pathogens and their hosts (Group 2): clarifying the dynamics of a pathogen (KHV) and its host (common carp) in relation to environmental factors, thereby defining the environmental factors involved in KHV infection.

Infection process and ecosystem effects (Group 3): revealing the infection process and the effects of KHV disease on ecosystem functions such as material cycling.

Economics and culture (Group 4): clarifying losses in terms of ecosystem services, economics and culture as a result of environmentally increased diseases, and the compensation process for those losses.

Feedback (Group 5): clarifying the effects of those losses on subsequent environmental alter-

Figure 1 Interactions between KHV Disease and Humans



■: research fields with many unrevealed subjects

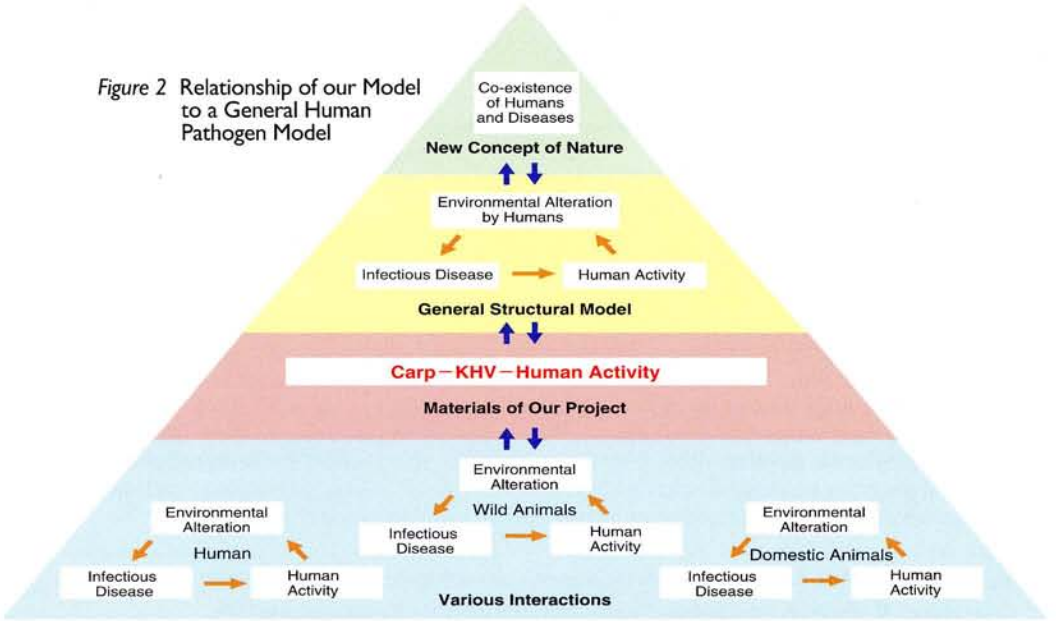
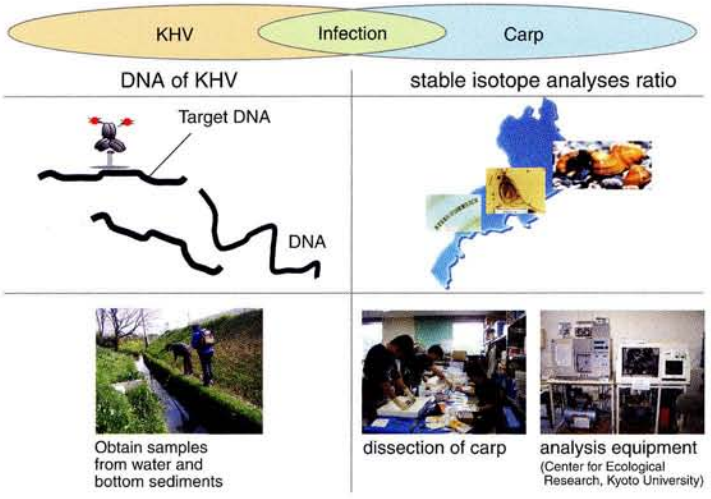


Figure 2 Relationship of our Model to a General Human Pathogen Model

Figure 3 Survey of Distribution of KHV and behavioral Range of Carp to Predict the Outbreak of Infectious Diseases



ation by humans.

Executive: coordinating the activities of each group to connect the research subjects to attain our objective. Applying our model to other infectious diseases.

Advisory: giving us suggestions to improve our project from the viewpoint of international experts.

Results in 2006

1) We surveyed the topology, bottom quality, and water quality of four satellite lakes of Lake Biwa that seemed to be important habitat for common carp. We found heterogeneous environments in this lake. These environments may affect the behavior of common carp. A mathematical model, based on the hypothesis that common carp migrate between the satellite lakes seeking better habitats, predicted that lower connectivity among satellite lakes increases the stress carp experience and enhances the spread of KHV.
2) A pre-survey was conducted in Lake Chau-hu, China, with a Chinese collaborator.
3) We developed a method to detect KHV in lake water and bottom sediments. We collected carp from seven sites in Lake Biwa to obtain materials for stable isotope analyses to identify their behavioral range (**Fig. 3**). We studied a method to measure cortisol as a stress -induced hormone. We installed breeding tanks for common carp with a controlled water temperature for the stress experiment.
4) We collected blood samples from common carp, to measure antibodies against KHV.
5) We began our study of the effect of common carp extinction on humans.
6) We exchanged information about some infectious diseases with other research groups to find common parameters involved in infectious disease outbreaks.
7) We have established the research topics for each group and have integrated them into the basic structure of the interactions between pathogens and humans.

Scheduled Research Activities in 2007

1) Clarify the behavior of the *C. carpio* (common carp) according to the presence of a KHV antibody that reveals the history of KHV infection, and shows the places where the infection is likely to occur.
2) Reveal the distribution of KHV in Lake Biwa.
3) Clarify the environmental characteristics of places where KHV and the carp are both present.
4) Reveal the relationship between environmental factors and stress through experiments.
5) Try to assess the economic impact of the disappearance of the carp.
6) Create an outline model of the effect of environmental change on the interactions between KHV and humans.
7) Analyze cases of other infectious diseases from the viewpoint of their interaction with humans.
8) Provide multidimensional assessment of environmental change on the interactions between pathogens and humans from the perspective of the local residents.
9) Collaborate with an international program of biodiversity science (DIVERSITAS).