



# Resources Program

Program Director ● **WATANABE Tsugihiro**

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

Formerly, most food was produced and consumed locally; gradually transportation technologies have enabled long-distance trade. At the same time, energy consumption has increased along with "food miles," and imposed serious environmental loads through the emission of CO<sub>2</sub>.

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

Completed Research	Leader	Title
<b>R-02</b>	<b>AKIMICHI Tomoya</b>	A Trans-Disciplinary Study on Regional Eco-History in Tropical Monsoon Asia: 1945-2005
Full Research	Leader	Title
<b>R-03</b>	<b>KUBOTA Jumpei</b>	Historical Interactions between Multi-Cultural Societies and the Natural Environment in a Semi-Arid Region in Central Eurasia
<b>R-04</b>	<b>MOJI Kazuhiko</b>	Environmental Changes and Infectious Disease in Tropical Asia
<b>R-05</b>	<b>NAWATA Hiroshi</b>	A Study of Human Subsistence Ecosystems in Arab Societies

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

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

Project Leader: AKIMICHI Tomoya RIHN

## Major Research Findings

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

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

Rapid modernization and globalization has impacted local environment, modes of life and human health; there is increasing cultivation of cash crops and cash-driven land use, frequent migration, and increased con-

sumption of sugar and fat. Yet, despite these changes, essential elements of the traditional food culture, including consumption of glutinous rice, raw animal meat, and particularly of freshwater fish, remain. In some cases, the incidence of some diseases, such as paragonimiasis and liver fluke, that are associated with traditional diets, remains high.

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

## Outcomes and Database

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

## Rural landscape in southern Laos



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

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

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



Project Leader  
**KUBOTA Jumpei**  
RIHN

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

Core Members  
**UYAMA Tomohiko**  
**MATSUYAMA Hiroshi**

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Graduate School of Science, Chiba Univ.  
Graduate School of Environmental Studies, Nagoya Univ.  
Graduate School of Letters, Kyoto Univ.  
Graduate school of Agriculture, Kyoto Univ.  
Faculty of Letters, Nara Women's Univ.  
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## 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 13<sup>th</sup> and 14<sup>th</sup> centuries. In 18<sup>th</sup> century, however, a national border defined the region between Russia and Qing China. In the next decades, the inhabitants of the area experienced a great change of lifestyle, as national borders and settlement policies forced nomadic peoples out of their traditional patterns of livelihood.

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

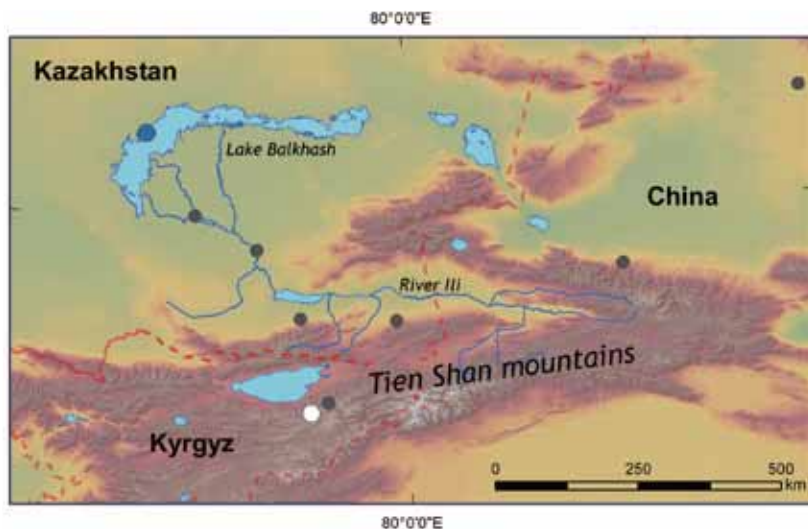
## Research area and groups

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

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

## Progress to date

Initial analysis of data from Lake Balkhash indicates that the lake level began to decrease in the 10<sup>th</sup> century, and at the turn of the 13<sup>th</sup> century reached its lowest level in the past 2000 years. After this regression, the lake level showed rapid recovery, and remained relatively high

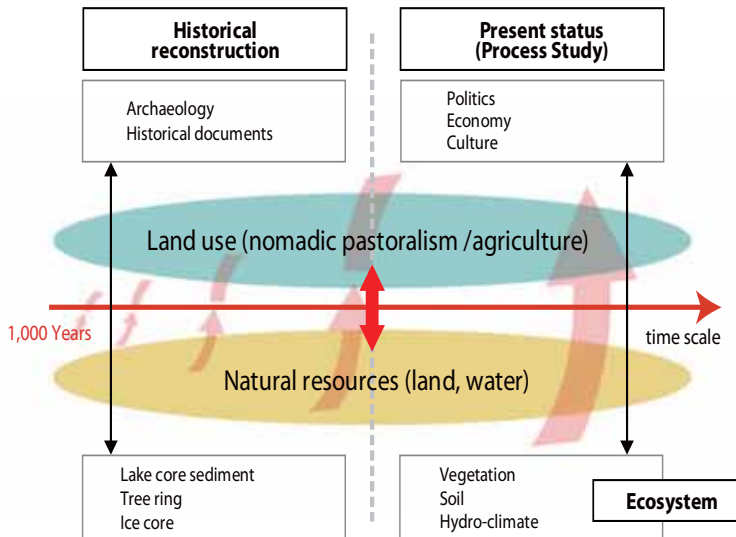


**Figure 1**  
**The Tian Shan Mountains and Ili River**

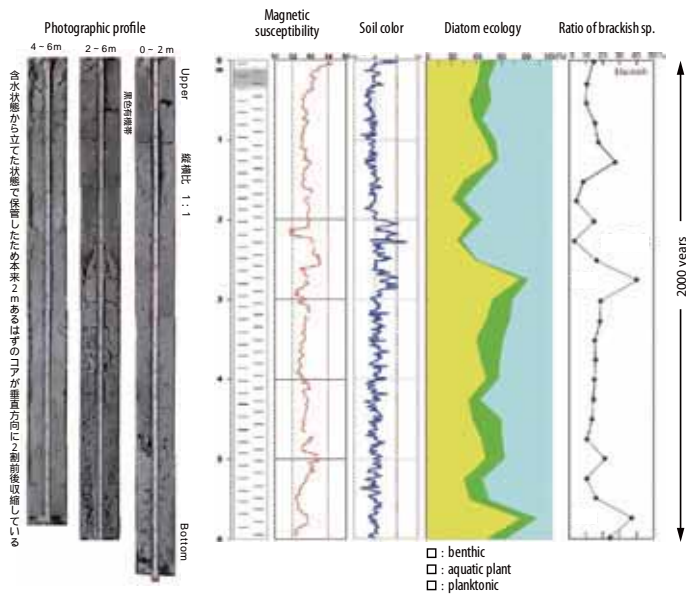
Lake sediment core  
Ice core  
Other study sites



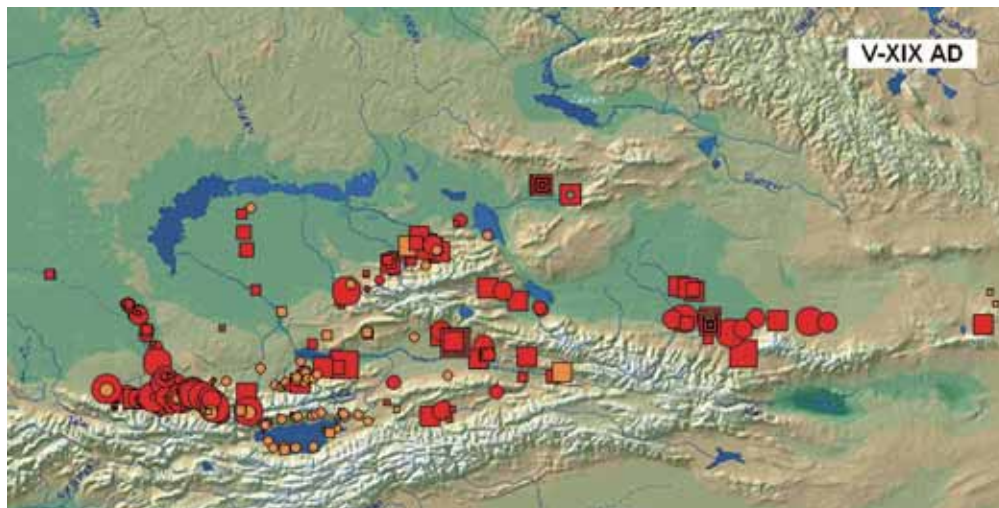
**Figure 2 Outline of the project**



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



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



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

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

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

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

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

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

# Environmental Change and Infectious Disease in Tropical Asia

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



Project Leader  
**MOJI Kazuhiko**  
RIHN

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

Core Members

- |                                 |                                              |
|---------------------------------|----------------------------------------------|
| <b>MASCI-TAYLOR Nicholas CG</b> | Cambridge University, UK                     |
| <b>KOBAYASHI Shigeo</b>         | Kyoto University                             |
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| <b>PONGVONGSA, Tiengkham</b>    | Savannakhet Malaria Centre, Lao PDR          |
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| <b>HUNTER, Paul</b>             | University of East Anglia, UK                |
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## Background

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

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

changes have dramatically affected the ecological conditions of region, and so the relations between human beings, pathogens and vectors.

## Research Methods and Organization

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

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

The project concluded MOUs in 2008-2009 with the



**Photo 1**

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



**Photo 2**

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





**Photo 3**

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

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

**Results to date**

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



**Figure 1 The Great Mekong Region**

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

- level assessments of the current state and change in local environment, life style, and health.
- 7) The health education study team developed an ecohealth questionnaire to be administered in communities and schools to collect information on environmental changes and lifestyle changes.

**Scheduled Research Activities in 2009 and beyond**

**Lao PDR**

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

**Bangladesh and Sri Lanka**

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

**China**

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

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

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



Project Leader  
**NAWATA Hiroshi**  
RIHN

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

Core Members

- KOBORI Iwao**
- KAWATOKO Mutsuo**
- SUGIMOTO Yukihiko**
- MIYAMOTO Chiharu**
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- LAUREANO, Pietro**
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- United Nations University
- Research Institute for Islamic Archaeology and Culture
- Graduate School of Agricultural Science, Kobe University
- Action for Mangrove Reforestation
- Faculty of Science and Engineering, Ishinomaki Senshu University
- Graduate School of Environmental Science, Okayama University
- Faculty of Environment Systems, Rakuno Gakuen University)
- Appropriate Agriculture International Co.
- Sudan University of Science and Technology
- Gezira University
- Agricultural Research Cooperation, Sudan
- Agricultural Research Cooperation, Sudan
- Traditional Knowledge, World Bank
- Centre National de Développement des Ressources Biologiques, Algeria

## Background and Objectives

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

Our project focuses on human subsistence ecosystems; the traditional life support mechanisms and self-sufficient modes of production of the region, such as hunting, gathering, fishing, herding, farming, and forestry, that involve low energy resource consumption. Our analysis of traditional livelihoods will allow us to re-examine the costs and benefits of advanced technology and economic development, and to suggest compre-

hensive measures to combat immediate environmental problems, such as desertification. Based on our research results, we will propose a scientific framework for strengthening subsistence productivity and enhancing daily life in Arab societies in the post-oil era.

### Research Areas, Approaches, and Methods

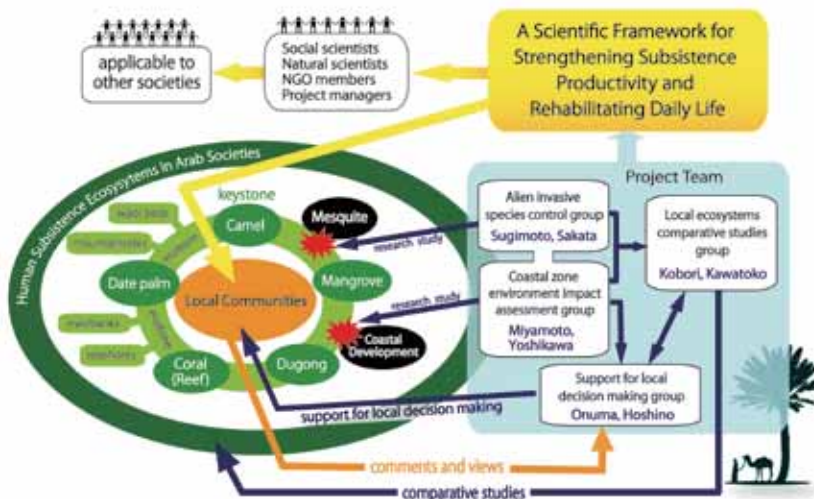
We will develop and implement our study of human subsistence ecosystems around three main areas: 1) comprehensive measures to control the alien invasive species mesquite; 2) assessment of the environmental effects of development programs in coastal zones of the arid tropics; and 3) sharing of research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

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

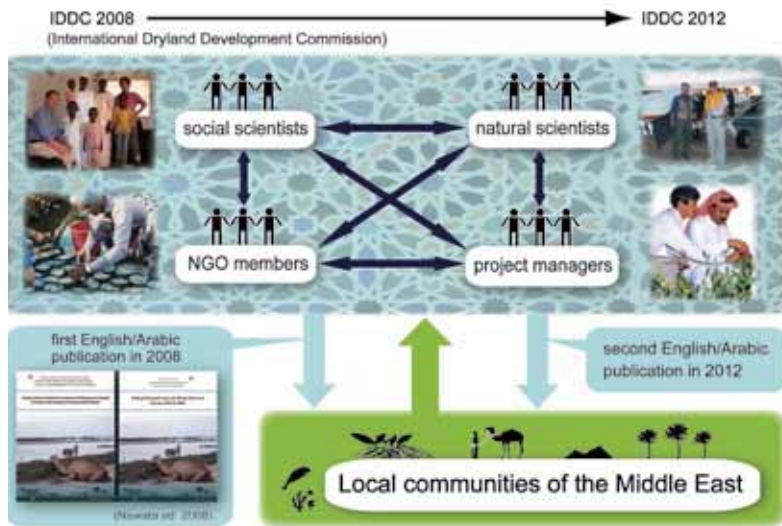


Figure 1 Area of field surveys





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



**Figure 3** Research communication and exchange

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

**Project Organization**

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

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

**Achievements**

**Field Survey in Sudan**

Sudan is the top-priority country for the field survey. Project members from RIHN and the Sudan University

of Science and Technology (SUST) met on 27 November, 2008, and agreed to a joint Memorandum of Understanding and Implementation Agreement. The main objective of this collaboration is to develop comprehensive measures for controlling the alien invasive species mesquite (*Prosopis* spp.).

**Publications in Arabic and English**

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

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

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

peoples’ opinions in our project targets and activities, and encourage continued communication between project researchers and local communities by publishing a revised version of the edited volume on the project’s completion.

**Further Issues**

In the first year of Full Research we intend:

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



# Encounters in the field



1



2



3



4



5



6



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