H Ecohistory

Program Director ■ **SATO Yo-Ichiro** RIHN

"Ecohistory" investigates "Circulation," "Diversity," and "Resources," which are among the principle concerns of global environmental study, in terms of historical time. Behind every problem (or phenomenon) there lies, in some measure, the issue of historical causality, and this underscores the need for the intellectual stance of comprehending the present through investigation of the past (*Onko chishin*). As its specific goal, this program seeks to design a framework of "futurability" in accordance with RIHN's mission: elucidating global environmental issues and proposing solutions.

The program comprises four projects, one completed to date (CR), three in progress (FR), and one feasibility study (FS): "Historical Evolution of the Adaptability in an Oasis Region to Water Resource Changes (CR; Project leader, NAKAWO Masayoshi); "Agriculture and Environment Interactions in Eurasia: Past, Present and Future—A Ten-Thousand-Year History" (FR; Project leader, SATO Yo-Ichiro); "Environmental Change and the Indus Civilization" (FR; Project leader, OSADA Toshiki); and "Neolithisation and Modernization: Landscape History of East Asian Inland Seas" (FR; Project leader, UCHIYAMA Junzo); and, "Interactions between man and the environment in Mesopotamia" (FS; Project leader, WATANABE Chikako).

Focusing on different regions and a range of historical moments, these projects address the environmental histories of two main and contrastive areas, what might be called the "Asian Green Belt" and "Yellow Belt" in Eurasia. In the former, generally speaking, communities managed to maintain sustainable development for a period of approximately 10,000 years, while in the latter, many civilizations had collapsed within this time frame. But is this correct? What distinguishes the conditions of productivity and sustainability between these two regions? This question is, ultimately, at the core of this project and whose answer is surely indispensable to human futurability.

Completed Research	Leader	Theme
H-01 (CR2)	NAKAWO Masayoshi	Historical Evolution of the Adaptability in an Oasis Region to Water Resource Changes
Full Research	**Leader**	**Theme**
H-02 (FR3)	SATO Yo-Ichiro	Agriculture and Environment Interactions in Eurasia: Past, Present and Future —A ten-thousand-year history
H-03 (FR2)	OSADA Toshiki	Environmental Change and the Indus Civilization
H-04 (FR2)	UCHIYAMA Junzo	Neolithisation and Modernisation: Landscape History on East Asian Inland Seas
Feasibility Study	**Principal Investigator**	**Theme**
H-FS	WATANABE Chikako E.	Interactions between man and the environment in Mesopotamia

Ecohistory

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

Historical Evolution of the Adaptability in an Oasis Region to Water Resource Changes

The Oasis Project is a research project aiming at reconstructing the history of the interaction between people and nature for the last 2000 years in a Chinese arid region. The project adopts a trans-disciplinary approach, integrating the studies of history, archeology, ethnology, economics, hydrology, meteorology, climatology, glaciology, biology, and agriculture. The major research field has been in and around the Heihe region in central Eurasia, where outstanding human cultures have developed for the last 2000 years.

Project Leader ■ **NAKAWO Masayoshi** (RIHN until March 2008)

Research Content

The history of the region has been reconstructed by examining historical documents, and a variety of proxies such as ice cores from glaciers, tree-ring samples, and lake sediment cores. The water circulation system in the basin, water resources and demands placed on them has been also studied.

The Outline of the Research Results

The Heihe Basin is a region where farming was developed by numerous colonial soldiers sent there to confront the Huns during the Han Dynasty 2000 years ago. At that time, the area of the Juyanze Lake was as large as 1600 km^2. The lake area started decreasing thereafter, and this is considered to be due to the development of irrigated farmland. Thereafter, the region's population fell temporarily, but increased during each of the following dynasties: Tang, Xixia and Yuan.

Three-dimensional views helped identify the geographical extent of the agricultural lands around Kara Khoto during the Xixia and Yuan Dynasties in the period when Kara Khoto flourished. It was approximately twice the size of the modern Ejina Oasis.

Ice core analysis showed that the air temperature from the end of the Yuan through the early Ming dynasties gradually fell. In other words, the volume of river flow per annum became less than the total annual precipitation concomitant with the growth of the glaciers due to the cooling effect.

Also, it became clear that many large-scale water routes were constructed during the Yuan Dynasty, and were used to develop vast tracts of agricultural land. This development of farmland definitely increased the volume of water drawn from the river around the oases, and consequently the downstream region of Kara Khoto was visited with water shortages.

The river bed on the Heihe in 2002, where no water is flowing at all.

At present, water shortages are again evident. Nearby vegetation is on the verge of crisis. Juyanze is also a shadow of its former self. The cause, basically, is the increase in the volume of water drawn from the river for irrigation farming at the oases, since water supply from the mountains has increased lately.

Two countermeasures to this problem have been established: forestation, and limits to the water drawn from the river in the mid-flow basins. Accordingly oasis farmers, for whom the volume of water they can take has been reduced, have come to dig wells to use the subterranean aquifers to augment their shortages in order to maintain their arable land. For forestation, a policy of "Ecological Relocation", in which herdsmen from the foothills of the mountains are moved to the area around the oasis, has been adopted. The displaced herdsmen, however, have to develop fresh arable land to graze their animals. Although only natural, their new farming regions need water. Hence, the oases need more water now than ever, and shallow wells in the downstream area and even around the midstream region of Zhangye have started to dry up. To supplement this, an abundance of deep wells are now being dug. The water, however, has started to be used in abundance. This is considered the major problem at the moment.

In the Heihe Basin, people have solved the problem of water shortages caused in the region (system) where they live, by expanding the area of the system. Drawing irrigation water from upstream of the Heihe River expands the area on which their livelihoods depend.

Recently, however, surface water has all been used up, and the system has been expanded to include the subterranean world as well. This fact also means that the range of the system on which people's livelihoods depends has expanded to a global scale. That is to say, our system has expanded as far as it can go, and it can only be said that we have now reached an era in which existing methods for solving problems by expanding the range of a system can no longer be used.

We have to find, therefore, completely different methods for solving problems that do not rely on solutions based on expanding the existing system. We are living in just such an age.

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

Our project aims to comprehend the history of interaction between agriculture and environment in three major types of agricultural environment in Eurasia, namely the "*mugi*", "monsoon" and "vegeculture" zones, from an interdisciplinary perspective. Based on the research, we will attempt to suggest 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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Goal of our Project

Agriculture has largely modified and destroyed the ecosystem, and it has been said that the beginning of agriculture corresponds to the beginning of environmental destruction. In present day Eurasia, between Central Asian desert, where it is almost impossible to conduct any agricultural activity, and Monsoon region, where greenery and water still abound, there is large differences in agricultural productivity and the degree of environmental destruction.

The goal of our project is to grasp different aspects of environmental destruction under several types of climate, during its ten thousand years of relationship with agriculture (reconstruction of 'a ten-thousand-year history of relationship between agriculture and environment'). We will try to gain comprehensive understanding of this relationship, focusing on the impact that the loss of "genetic diversity" had over environmental destruction.

Note 1:
Genetic diversity
The scale of genetic diversity is measured using methods of statistical genetics. The diversity of cultivars is estimated using the Shannon's formula.

Research Themes and Method

There are different types of agricultural products in Eurasia, such as rice and wheat. The backgrounds of these productions, *i.e.* ecosystem (human ecosystem = "*sato*") and their histories are also very different. We subdivided Eurasia into three zones (abbreviated as Monsoon zone, *Mugi* (winter annual crop) zone, and Vegeculture zone), and established research groups that correspond to each of them (**Fig. 1**). In addition, the Slash-and-burn agriculture group was newly established in the fiscal year 2007, to study issues on culture and ideology concerning traditional agricultural techniques.

In each group, we selected a few sites where we have conducted:

i) DNA and morphological analyses of botanical remains (**Photo 1**) discovered in archaeological sites (= assessment of genetic diversities[1]),
ii) Absolute dating
iii) Characterization of artifacts (by stable isotope analyses).
iv) Identification of plant remains such as seeds, pollen, phytolith, diatom and wooden pieces discovered in soil core (= reconstruction of the ecosystem)
v) Ecological survey on current *sato*, using historical documents and ethnographic data.
vi) Research on agricultural technology (including the hydrological balance and the amount of applied fertilizer), ethnobotany and circulation of agricultural products.

Figure 1 Research fields of this project

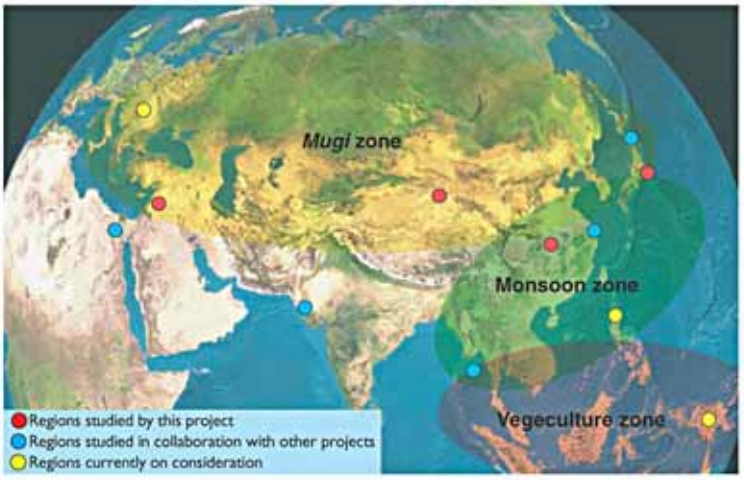

Photo 1 Sumac family pollen seen through electron microscope (from the Ikeshima Fukuman-ji site, Osaka, 2007)

Photo 2 Deposition of gravel, presumably traces of flood (from the Ikeshima Fukuman-ji site, Osaka, 2007)

Agricultural activity underwent occasional collapses every now and then.

Figure 2 The correlation model of agriculture and environment

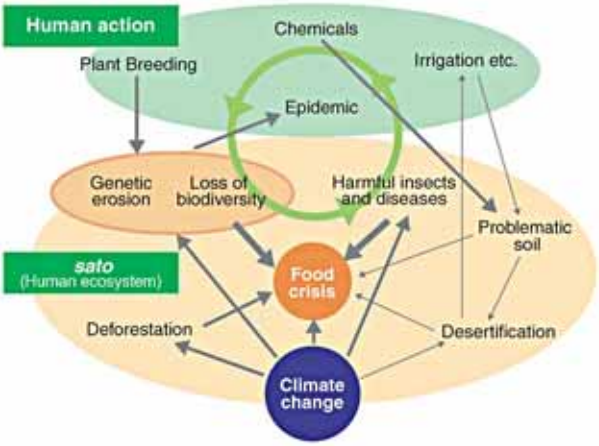

Photo 3 Standing in the desert (Xinjiang Uygur Autonomous Region, China, 2007)

We need to go through such a desert area to go to the Xiaohe Tomb site.

Photo 4 Yam house (Milne Bay District, Papua New Guinea, 2008)

Yam is socially important foodstuff stored in Yam houses.

Present Research Results

a) It has become clear that human agricultural activity did not grow incessantly, but there were numerous collapses in the history.

Monsoon Zone Group: As a cause of these collapses, we focused on environmental factors, represented by floods, and studied the process of collapse and recovery of agricultural activity following environmental changes (Ikeshima Fukuman-ji site, Osaka, **Photo 2**). We also began our research to clarify the relationship between agriculture and environment at the beginning of rice cultivation (Long-Que-Zhuang site, Jiangsu Province, China).

Mugi Zone Group: We examined past agricultural situation in West Asia and northwest China, and focused on examples of the collapse of agricultural activity in these regions (Xiaohe Tomb site in Xinjiang Uygur Autonomous Region, China, **Photo 3**) We studied mutual influence between the development of agricultural activity and environment, *e.g.* salt accumulation due to excessive irrigation.

b) In August 2007, the Monsoon Zone Group and Mugi Zone Group successfully co-organized the First International Symposium "Recent Advancements of Archaeobotany in Eurasia" at RIHN and received fourteen speakers from eight countries. It was decided at the symposium to create a database of ancient plant remains on the collaborative basis.

c) The Vegeculture Zone Group fixed its fields of research as the Philippines and Papua New Guinea, where there is high chance of learning about the beginning of vegeculture, and these areas are mutually related. Little research has been carried out so far concerning environmental history in these regions, so we expect to achieve innovative results. In November and December 2007, preparatory meetings were held with research partners from each of these two regions, and in February 2008, preliminary research was carried out in a yam culture zone of Papua New Guinea (**Photo 4**).

d) Based on the idea of the evolution of agricultural activity and its regional diversity due to the climate, we began our study for further understanding of the relationship between human and nature in contemporary society. We focused especially on slash-and-burn agriculture and in November 2007, we held the first Slash-and-burn Agriculture Summit in Kochi City, where we invited practitioners of this method from different regions (Slash-and-burn Agriculture Group). In addition, at RIHN we have regularly organized seminars on environmental ideology, where we developed discussion on the relationship between humanity and nature inviting specialists of different fields.

Future Research Plans

We will refine the draft correlation model of agriculture and environment (**Fig. 2**) that we have created earlier. The Monsoon Zone Group and *Mugi* Zone Group will try to clarify how people managed to recover from frequent collapses, by examining the production method, changes in the surrounding environment and process of the loss of biodiversity of cultivars in the above mentioned sites.

The Vegeculture Zone Group plans to conduct field research in the Philippines in 2008, on the basis of research negotiation with the University of Philippines. Archaeological excavation in Papua New Guinea in collaboration with Otago University and Australia National University will also begin from the fiscal year 2008, aiming at reconstruction of the relationship between environmental change and early rootcrop cultivation.

The Slash-and-burn Agriculture Group will examine the actual situation of burnt field in different regions and create a database, as well as attempt to gain ideas how the relationship between human agricultural activity and environment ought to be.

Environmental Change and the Indus Civilization

From birth, human beings have created dwelling spaces with sustainable food supply 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 northwestern part of the Indian subcontinent. Indus people established cities and urban lifestyle from 2600 BC to 1900 BC. The urban phase of this civilization lasted only for a much shorter period than the other ancient civilizations. Our methodology is based on humanity 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 Palaeo-environment Research Group studies the environment surrounding the Indus Civilization. Two main researches 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 censing; (ii) core-boring from lakes with an aim of reconstructing a 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 collaboration with Indian archaeologists.

The Inherited Culture Research Group studies Indian cultures for the purpose of reconstructing the historical significance of the Indus Civilization through the Vedic studies by Indologists and field

Figure 1 Concept of the Project

Figure 2 Distribution of Sites of the Indus Civilization

By using the GIS, various data are being integrated into a spatial platform.

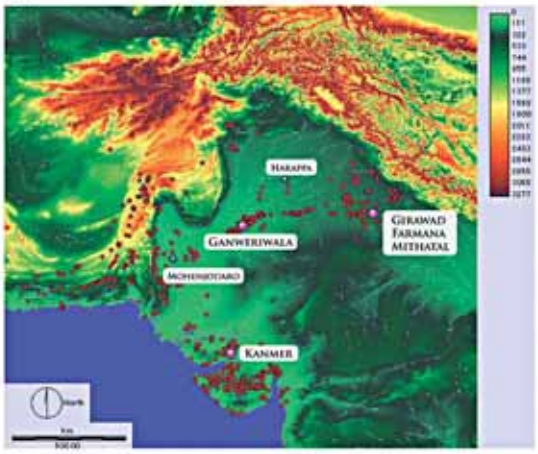


Photo 1 Stone-built Perimeter Wall at Kanmer

Excavation at Kanmer revealed that the site was enclosed by massive stone-built perimeter walls.

Photo 2 Mud-brick structure at Farmana

Mud-brick structures during the Indus Civilization were discovered at Farmana.

Photo 3 Indus Seal from Farmana

The Indus seals which depict various animals show a part of the relations between the human society and natural environment.

works 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

Our project has conducted archaeological excavations at Kanmer in Gujarat and, Girawad, Farmana and Mitathal in Haryana so far. Excavations is also planned to be made at Ganweriwala in Punjab, Pakistan.

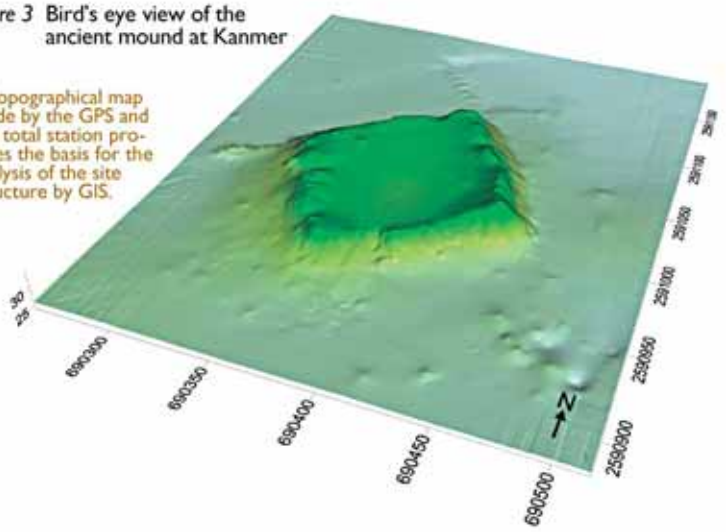
These excavations have revealed that the Indus Civilization was a society based on the utilization of diverse natural environment and diversity of societies/cultures. Further analysis on the excavated materials such as artefacts, and animal and plant remains from these sites, will contribute to our understanding on the social mechanism of the Indus Civilization and the relations between the diverse natural environment and human society.

The Palaeo-Environmental Research Group has started survey in the Saurashtra peninsula and on the dry-bed of the Ghaggar River in Haryana and Rajasthan. The Subsistence System Research Group conducted botanical and antholopological survey on the utilization of emmer wheat in south India, as well as the analysis of excavated plant remains from the sites. The Inherited Culture Research Group is preparing language maps of South Asia, as well as studying the Vedic texts.

By integrating the results from the four research groups, this project aims at investigating into the relations between the Indus Civilization and natural environment and at revealing its social structure and features.

Figure 3 Bird's eye view of the ancient mound at Kanmer

A topographical map made by the GPS and the total station provides the basis for the analysis of the site structure by GIS.



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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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.

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. 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

Figure 2 Concept of landscape

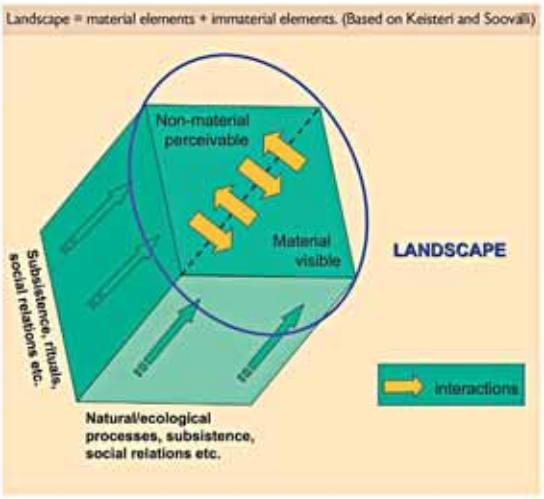

Photo 1 Shirakawa village, Japan

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

Photo 2 Project members looking at ancient port remains at the early Neolithic Dienlashan site in China.

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 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.

Results up to now

All eight project work groups have been carrying out their field work according to their research plans. 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. Up to 2008, the database format for both Neolithisation and Modernisation has been elaborated and the data insertion for Biwako and Hokuriku is almost completed.

NEOMAP project has signed international collaboration agreements with Far-East National University in Russia and The Sainsbury Institute for the Study of Japanese Arts and Cultures in UK. Discussions have been held with scholars from Estonia, Belgium, Holland, England, Germany and elsewhere.

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 Society of Biosophia Studies, Lake Biwa Museum, Okinawa University) and abroad (SISJAC in UK, Far-East National University in Russia).

Plans for 2008

2008 will see intensive field work in all the 8 regions. The topics that will be addressed by the individual researchers in all the research groups can be divided into four major common themes. (1) The birth and expansion of agriculture (rice paddy system, migratory waterfowl hunting, raised floor stock houses, gardening agriculture). (2) 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. (3) 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. (4) Travelling and creation of mental landscape images.

In addition we will continue the database construction and start converting the inserted GIS data into visual maps. The research outcomes will be presented through symposia, workshops and publications.

Interactions between man and the environment in Mesopotamia

This project focuses on the period around the time of the Third Dynasty of Ur in Mesopotamia. The people of this period suffered from the double stress of population increase and water shortage. It aims to examine the interaction between people and nature on a comprehensive scale involving both physical/material and spiritual/mental spheres.

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Objectives of Research

Proxy data indicate that there was a trend towards increased aridity across the Middle East and Central-South Asia from the late 3rd through to the late 2nd millennium BC. At that time, Southern Mesopotamia was densely populated following an urban explosion.

The Third Dynasty of Ur (2113-2004 BC) was the last traditional Sumerian dynasty that established supremacy throughout Mesopotamia. Towards the end of this dynasty, there was widespread disorder, caused by a purported decline in agricultural productivity, soaring grain prices, the ongoing immigration and invasion of nomads, and the emigration of the native population. It is conjectured that this disorder was caused not just by political, social and economic failures, but that environmental factors also contributed to the situation resulting in the fall of the dynasty. The people of this period suffered from the tremendous double stress of population increase and water shortage. In the context of the global environmental problems we face today, a systematic examination of the ancients' attempt to cope with this complex situation should yield valuable insights.

Methodology

There are four major areas of investigation:
(1) palaeoenvironments
(2) agriculture
(3) cultural ideology
(4) social situation

It is intended to establish how closely each of these four areas is related, and how such a delicate system is maintained on the basis of mutual balances.

Expected Outcome

Our project aims to urge the public to revise a commonly-held misconception that progressive salinisation caused the collapse of Mesopotamian civilisation. The project also aims to provide useful data by reconstructing the ancient environment so as to trace the process of environmental changes to the present day.

Figure 1 The Royal Standard of Ur, Early Dynastic Period (2600-2400 BC), from Royal Tomb of Ur, The British Museum.

The scene shows Sumerian nobles attending a banquet being accompanied by musicians (upper register). The lower register shows a bull, sheep and goat being led in procession. An elaborately inlaid work of art made of lapis lazuli, shell and red limestone.

Figure 2 The royal lion hunt, Neo-Assyrian Period (645-640 BC), from North Palace, Nineveh, The British Museum.

The scene shows the Assyrian king, Ashurbanipal, killing a lion with a sword. Lions were dangerous to both humans and livestock, but it was taboo for ordinary people to kill lions, because the lion was a royal symbol. Only the king could kill lions. Lions became extinct in Iraq in the nineteenth century.

●column Scenes from Field Surveys

From the extreme cold of the world of ice to dry grasslands, hot and humid tropical forests, and further to modern cities bursting with people. Researchers drill into glaciers to take samples, make continued observations from the tops of tall trees, and go house-to-house conducting interviews. RIHN's field surveys take researchers to all areas of the world, where they employ the knowledge and methods of their specializations.

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Photographers (locations)

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4 MOJI Kazuhiko (Laos)
5 SAKAI Shoko (Malaysia)
6 TERAMURA Hirofumi (India)
7 TAKEUCHI Nozomu (Kyrgyzstan)

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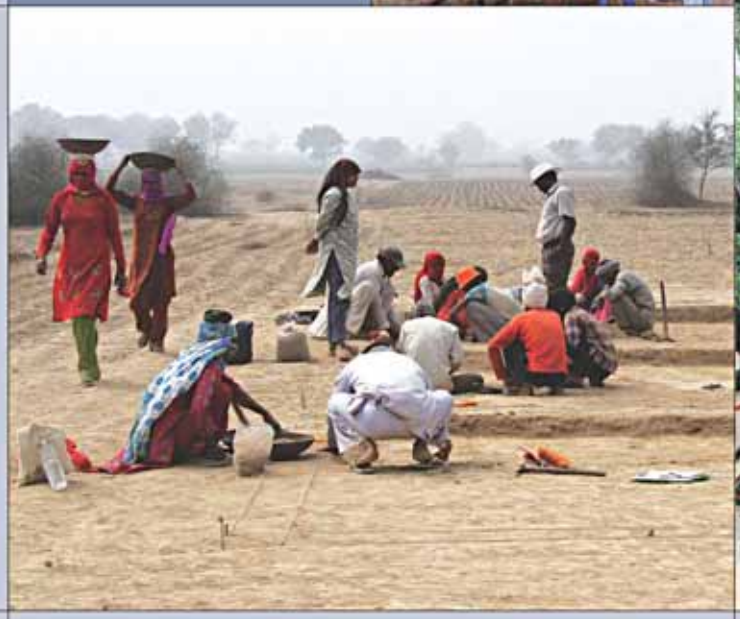

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