Completed Research

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

Fiscal Year Completed	Leader	Research Project
2006	HAYASAKA Tadahiro	Emissions of Greenhouse Gases and Aerosols, and Human Activities in East Asia
	KANAE Shinjiro	Global Water Cycle Variation and the Current World Water Resources Issues and Their Perspectives
	WATANABE Tsugihiro	Impact of Climate Changes on Agricultural Production System in the Arid Areas
	NAKAWO Masayoshi	Historical Evolution of the Adaptability in an Oasis Region to Water Resource Changes
	YACHI Shigeo	Multi-Disciplinary Research for Understanding Interactions between Humans and Nature in the Lake Biwa-Yodo River Watershed
2007	FUKUSHIMA Yoshihiro	Recent Rapid Change of Water Circulation in the Yellow River and Its Effects on Environment
	ICHIKAWA Masahiro	Sustainability and Biodiversity Assessment on Forest Utilization Options
	AKIMICHI Tomoya	A Trans-Disciplinary Study on Regional Eco-History in Tropical Monsoon Asia: 1945-2005
2008	SEKINO Tatsuki	Interaction between Environmental Quality of the Watershed and Environmental Consciousness
	TAKASO Tokushiro	Interactions between Natural Environment and Human Social Systems in Subtropical Islands
2009	SHIRAIWA Takayuki	Human Activities in Northeastern Asia and their Impact on Biological Productivity in the North Pacific Ocean
2010	TANIGUCHI Makoto	Human Impacts on Urban Subsurface Environments
	YUMOTO Takakazu	A New Cultural and Historical Exploration into Human-Nature Relationships in the Japanese Archipelago
	SATO Yo-Ichiro	Agriculture and Environment Interactions in Eurasia: Past, Present and Future
2011	KAWABATA Zen'ichiro	Effects of Environmental Change on the Interactions between Pathogens and Humans
	KUBOTA Jumpei	Historical Interactions between Multi-Cultural Societies and the Natural Environment in a Semi-Arid Region in Central Eurasia
	OSADA Toshiki	Environmental Change and the Indus Civilization
	UCHIYAMA Junzo	Neolithisation and Modernisation: Landscape History on East Asian Inland Seas
	UMETSU Chieko	Vulnerability and Resilience of Social-Ecological Systems
2012	OKUMIYA Kiyohito	Human Life, Aging and Disease in High-Altitude Environments: Physio-Medical, Ecological and Cultural Adaptation in "Highland Civilizations"
	SAKAI Shoko	Collapse and Restoration of Ecosystem Networks with Human Activity
	MOJI Kazuhiko	Environmental Change and Infectious Disease in Tropical Asia
2013	HIYAMA Tetsuya	Global Warming and the Human-Nature Dimension in Siberia: Social Adaptation to the Changes of the Terrestrial Ecosystem, with an Emphasis on Water Environments
	NAWATA Hiroshi	A Study of Human Subsistence Ecosystems in Arab Societies: To Combat Livelihood Degradation for the Post-oil Era
	KADA Ryohei	Managing Environmental Risks to Food and Health Security in Asian Watersheds
2014	MURAMATSU Shin	Megacities and the Global Environment
2015	KUBOTA Jumpei D. Agnes RAMPISELA	Designing Local Frameworks for Integrated Water Resources Management
2016	HABU Junko	Long-term Sustainability through Place-Based, Small-Scale Economies: Approaches from Historical Ecology
	SATO Tetsu KIKUCHI Naoki	Creation and Sustainable Governance of New Commons through Formation of Integrated Local Environmental Knowledge
	ISHIKAWA Satoshi	Coastal Area-capability Enhancement in Southeast Asia
	TANAKA Ueru	Desertification and Livelihood in Semi-Arid Afro-Eurasia

Long-term Sustainability through Place-Based, Small-Scale Economies: Approaches from Historical Ecology

Project Leader **HABU Junko** University of California, Berkeley

Objectives and theoretical background

The purpose of this project was to examine the importance of place-based, small-scale food production. Geographically, our project focused on the North Pacific Rim: northern Japan as the core area of research, and the west coast of North America as comparative sites (Figure 1). Our working hypothesis was that highly specialized subsistence (food production) strategies can support a larger community for a short period but a decrease in subsistence and food diversity increases vulnerability in the long-run. Archaeological and paleoenvironmental studies were used to test this hypothesis. Ethnographic and ecological studies allowed comparative analysis of the scale and resilience of contemporary small-scale food systems and communities.

The theoretical genesis of this project is the approach of historical ecology, which examines long- and short-term cultural change while emphasizing the impact of human activities on the environment. In particular, this project proposed that high levels of **diversity**, **networks** and **local autonomy** (or **sovereignty**), all of which are strongly correlated with the **scale** and **resilience** of the system, are the keys to achieving the **long-term sustainability** of socioeconomic systems (Figure 2).

Achievements

I. *Longue-Durée* Group

1) Primary Focus: Early-Middle Jomon (ca. 3900–2300 BC) in Northern Japan: Using archaeological indicators of food/subsistence diversity, demography, ritual, climate change and other social/environmental factors, this team tested our main hypothesis with data from northern Japan. AMS ^{14}C dating confirmed that changes in food/subsistence diversity and settlement patterns occurred at around 3000 BC, 700 years before major climate cooling (the Bond 3 event). Contrary to previous interpretations, our results therefore indicate that the Bond 3 event was not the cause of the population decrease at the end of the Middle Jomon.

2) Key Comparative Studies: Evidence from California and the Northwest Coast of North America, in contrast, indicate that wide food diversity allowed native communities in these regions to steadily increase in population through time until the European contact.

II. Contemporary Society Group

1) Primary Focus: Rural Communities in Northern Japan: Our interviews in the Hei River Area, Miyako City, indicated that food/subsistence diversity supported by traditional ecological knowledge (TEK) has played a critical role in the resilience of food systems and communities, especially in times of flooding, typhoon, and earthquakes. At Joboji, Ninohe City, our interviews indicate that multiple backup plans supported by wide subsistence diversity and TEK have historically been at the core of local survival strategies. At Fukushima City and its vicinity, where environmental damage caused by the 2011 nuclear plant accident is serious, we found that TEK and local networks are critical for maintaining farmers and residents' lifeways, identities and pride.

2) Key Comparative Studies: We examined indigenous small-scale communities and alternative food producers as two other types of small-scale communities on both sides of the North Pacific Rim. This research revealed the importance of TEK and social networks in maintaining resilient socioeconomic systems within local land- and sea-scapes.

III. Implementation, Outreach and Policy Proposal Group

This group developed public outreach programs to instigate and promote the importance of food/subsistence diversity, TEK and local identity. Workshops with local residents were held in the Hei River Area, Hokkaido and California. Other notable outcomes include the Kyoto 2016 Agroecology Declaration, university courses on agroecology at the University of California and Seika Univeristy, a Resolution by the World Archaeological Congress related to resource overexploitation, and transdisciplinary research with Native American tribes. These research activities were conducted in consultations with members of the Integrated History and Futures of People on Earth (IHOPE) program, for which our project is featured as a regional case study.

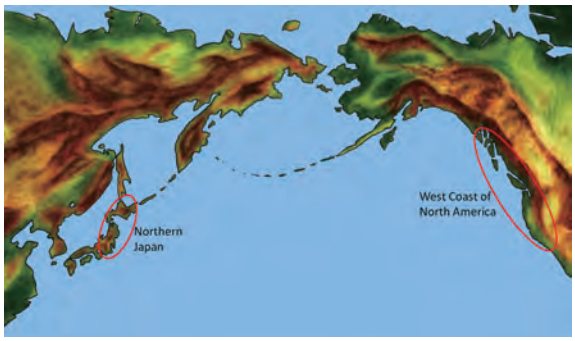

Figure 1 Main Research Areas

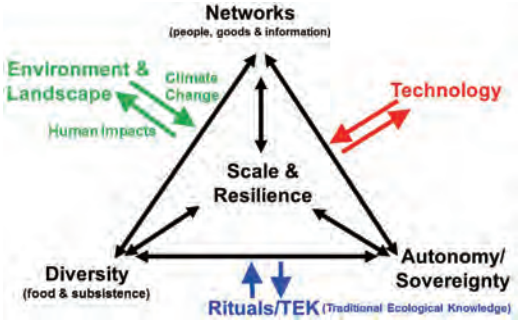

Figure 2 Key Aspects in the Discussion of System Scale and Resilience

Creation and Sustainable Governance of New Commons through Formation of Integrated Local Environmental Knowledge

Project Leader **SATO Tetsu** Ehime University
Co-Project Leader **KIKUCHI Naoki** RIHN

Local ecosystem services have deteriorated all over the world for various reasons. Ecosystem services should be managed by collaboration of various stakeholders, both within and from outside the communities. In order to achieve such collaborative management, the formation and circulation of local knowledge systems deeply embedded in real local settings is desperately needed. Integrated Local Environmental Knowledge (ILEK, Fig. 1), a novel concept of local knowledge blending scientific as well as various types of knowledge systems among stakeholders, is produced, circulated and utilized in diverse cases of local transdisciplinary research and actions to support adaptive societal transformations toward sustainability. Our project aimed to clarify mechanisms to facilitate production and circulation of ILEK and ILEK-based adaptive transformation of local communities. We also analyzed mechanisms of cross-scale linkages of knowledge co-production regarding global environment problems across global, regional and local scales. Through the transdisciplinary integration of these research results, we aimed to propose the design of "science for/with society" and "society making best use of science" for bottom-up solutions of global environmental problems.

The residential researchers embedded in local communities and bilateral knowledge translators bridging gaps between different knowledge systems across different spatial scales and governance levels were found to play important roles to facilitate collective actions among diverse stakeholders to promote adaptive transformations of local communities toward sustainability. We constructed a conceptual model of ILEK-based adaptive societal transformations focusing on functions of these important actors (ILEK Triangle, Fig. 2), and identified hypothetical categories of important enablers of ILEK-based adaptive societal transformations. Transdisciplinary research partnering with diverse local stakeholders opened a new TD research approach, resulted in identification of diversity and multiplicity of bilateral knowledge translations, both within local communities and/or crossing spatial scales and governance levels, as the important factors to create linkages across different spatial scales and governance levels from local to global.

ILEK project successfully produced a new model of transdisciplinary research based on the equal partnership with diverse local stakeholders to create collective actions in local communities and promoting their bottom up impacts to tackle with wicked problems regarding sustainability of local as well as global social-ecological systems. The actual processes of TD research in the project provided a new model of the solution-oriented global environmental research incorporating practical methodologies of transdisciplinary co-creation of knowledge to contribute to solutions of diverse global environmental problems. The project was conducted by transdisciplinary researchers working together with stakeholders of diverse local communities all over the world. These dedicated TD researchers in the project came together to co-produce the comprehensive standard textbook of issue-driven and solution-oriented TD research to tackle with global environmental problems through the bottom up processes from collective actions in local communities. The textbook titled "Transformations of Social-Ecological Systems: Studies in co-creating integrated knowledge toward sustainable futures" is at its final stage of production, which will synthesize the outcomes of the project to answer the ultimate research questions, namely what are the "science for/with society" and "society making best use of science" for bottom-up solutions of global environmental problems.

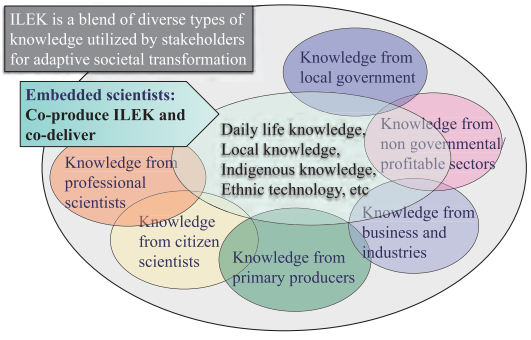

Figure 1 Structure of ILEK
Production and circulation of ILEK is not exclusively performed by professional scientists. Rather, it is usually produced and circulated by diverse actors in local communities, including skilled workers in primary industries, local government officials, local companies and NGOs, most of them being knowledge users at the same time. ILEK is formed and utilized through dynamic interactions among different actors/stakeholders in local communities, integrating scientific and local knowledge in daily livelihood and practices among stakeholders. In this process of ILEK production, scientists and experts are assuming new roles to reorganize and integrate various knowledge systems from the viewpoints of knowledge users and co-deliver ILEK to promote collaboration among diverse stakeholders for solutions of local environmental problems

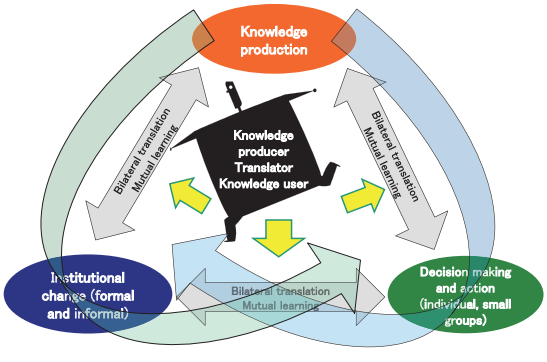

Figure 2 Conceptual model of adaptive societal transformation (ILEK Triangle)
The ILEK Triangle model is composed of an interactive system of three important elements of ILEK-based adaptive societal transformation (knowledge production, decision making and action, and formal/informal institutional change), driven by knowledge producers, knowledge users and translators. The pathways to achieve ILEK-based adaptive governance are postulated in this model with two different processes starting from knowledge production resulting in institutional changes via changes in individual decisions and actions, or directly influencing formal and informal institutions and human networks to transform individual behavior.

Coastal Area-capability Enhancement in Southeast Asia

Project Leader **ISHIKAWA Satoshi** RIHN

Coastal area ecosystem services are indispensable for rural people, but are also easily damaged by human use. Many coastal areas with high biodiversity and biological productivity are located in tropical zones of developing countries, as is the case in Southeast Asia. In such areas, ecosystem services, local livelihood and culture are closely related. Conservation and resource management strategies, however, are often derived from those of temperate regions, and usually target particular species or commercial resources with little consideration of how multiple ecologies and livelihood strategies overlap in culturally diverse contexts. In addition, in many cases, resource management and conservation activities are independently conducted by several different actors.

Ecosystem services have different significance for different peoples, depending on their interests and contexts. Although overuse and/or abuse of ecosystem services should be avoided, conservation actions should take careful account of the close relationship of local livelihoods and culture to local ecosystems, especially in rural areas lacking other livelihood opportunities. Addressing solutions to environmental problems in such contexts therefore requires linking people and policies engaged in both conservation and resource utilization.

This project attempts to examine several good ecosystem management practices based on local community participation in order to assess the conditions and functions of each actor in creating "an Area-capability cycle". We expect that an action contributing to Area-capability can link utilization and conservation and facilitate appropriate ecosystem utilizations, improve local life, cultivate ecosystem health, and foster hope for local society.

The Area-capability (AC) Cycle was proposed as one model of sequential change in the harmonization of natural resource conservation and management. The AC Cycle would be comprised of: (1) Local community use of resources unique to the region; (2) Resource users' understanding of the importance of, and care for, the environment that supports the resources used; and (3) A balance between using and caring for resources and the supporting environment, which is evaluated by outside entities.

Project research will apply the AC Cycle model to many cases in order to examine its validity and refine understanding of how to harmonize conservation and management of natural resources. We believe that the set of factors included in AC and the AC Cycle will be useful as a checklist when developing proposals for regional development and revitalization activities, assessing the balance between use and care, and clarifying the standpoint and role of each stakeholder when evaluating projects. As each AC Cycle corresponds to a resource used by a local community, we believe the number of AC Cycles can be an indicator of the abundance of local resources in a given region and, at the same time, an indicator of the potential for various types of cooperation. As such, we suggest that the number of AC Cycles could be used as an index for regional development.

Photo Group Photo at International Area-capability workshop held in December 2015, at RIHN

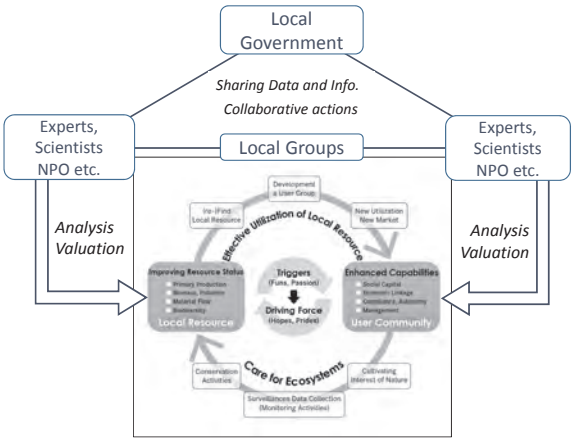

Figure Framework of AC Cycle and AC approach

Desertification and Livelihood in Semi-Arid Afro-Eurasia

Project Leader **TANAKA Ueru** RIHN

Desertification is one of the major global environmental problems. International community ratified the United Nations Convention to Combat Desertification (UNCCD) in 1994. More than 20 years have passed since, but without sufficient achievement in this field. One of the principal reasons for the lack is that the root causes of desertification are local peoples' daily livelihood and subsistence activities such as habitation, collection of fuel woods, animal husbandry and agriculture. Especially in the fragile environments of semi-arid Africa, local people have to combat desertification even as they remain reliant on the behaviors that are its cause.

In this context, we launched an interdisciplinary project focusing on desertification and livelihood as shown in Figure. The study sites were located in the semi-arid areas of West Africa, Southern Africa and South Asia, the so-called frontlines of desertification and poverty. The objectives and activities of our project were: 1) to deepen understanding of the areas experiencing desertification, examining its causes and local strategies of adaptation; 2) to innovate some practical techniques and approaches to control desertification; and 3) to disseminate project results and experiences.

Among the remarkable findings of our project was the determination that sand cover only a few centimeters thick affects the water and nutrient dynamics of sandy soils in semi-arid environments. This finding explains the rationality of the traditional 'push-hoe' widely used in the Sahel region of Africa encompassing between the Atlantic coasts of Senegal and the Red Sea of Sudan.

Together with local people and NGO members, project activity innovated some practical techniques. These include a 'fallow-band system' to prevent wind erosion and improve crop yield, use of 'Andropogon (wild perennial grass) contour-lines' to control water erosion and generate income, 'shallow tillage with indigenous animal-driven plow from India' to conserve soil moisture, 'combination of fodder-type cowpea and indigenous Indian farming tools' to convert degraded grassland into productive land, and a 'modified agricultural extension method' including some steps of a social network survey. To be practical, the techniques were designed to combine scientific knowledge and empirical local knowledge, to use local materials, and to reduce associated costs and labor. Each has the characteristic of being: 1) able to address livelihood improvement, desertification control, and ecosystem conservation/restoration concurrently; 2) easily implemented with particular consideration for the involvement of vulnerable people; and 3) disseminated directly by person-to-person communication. Our approach is therefore beyond the human vs nature dichotomy commonly found in desertification control, rural development support, and ecosystem conservation.

Our project received eighteen academic awards for its findings and innovations. These were given not only to us as researchers but also to local people who participated in the project with their empirical and indigenous knowledge. Some of our techniques have since been adopted by rural development projects in Africa. Our achievement was to develop practical innovations that also demonstrated the effectiveness of local knowledge and involvement. The end of the project is the beginning of our new challenge.

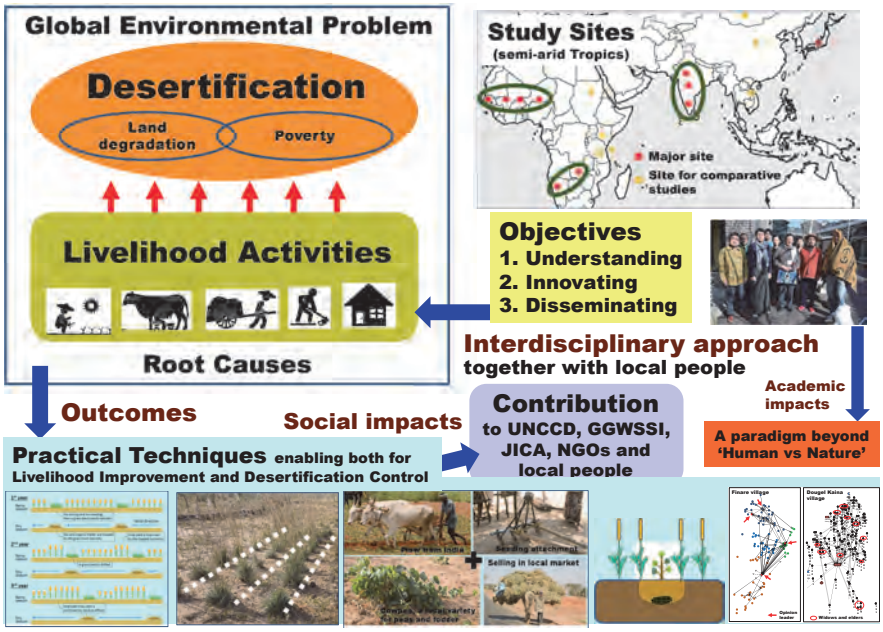

Figure Outlines of our project

http://www.chikyu.ac.jp/rihn_e/project/R-07.html