Completed Research

When a project moves to Completed Research (CR) 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. At RIHN, 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	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
2017	ENDO Aiko	Human-Environmental Security in Asia-Pacific Ring of Fire: Water-Energy-Food Nexus
2018	NAKATSUKA Takeshi	Societal Adaptation to Climate Change: Integrating Palaeoclimatological Data with Historical and Archaeological Evidences
2019	OKUDA Noboru	Biodiversity-driven Nutrient Cycling and Human Well-being in Social-Ecological Systems
	TAYASU Ichiro	Proposal and Verification of the Validity of Isotope Environmental Traceability Methodology in Environmental Studies

Biodiversity-driven Nutrient Cycling and Human Well-being in Social-Ecological Systems

Project Leader **OKUDA Noboru** Center for Ecological Research, Kyoto University

A watershed is a basic unit of water and nutrient cycling with hierarchical structure, in which a variety of local communities are embedded. While nutrient imbalances cause environmental issues at the watershed level, at the community level there may be many urgent local issues such as aging and lack of successors. Our basic idea of watershed governance is that both local and watershed issues can be solved through cross-level interactions mediated by biodiversity, leading to enhancement of social-ecological health of watershed systems (Fig. 1).

In the Yasu River sub-watershed of Lake Biwa, we found that local communities are revitalized through conservation of familiar nature, which provides ecosystem services in the social-cultural context. Style and stage of such community activities depend on social-historical background and ecosystem types. Some case studies revealed that these activities can have positive effects on biodiversity and nutrient cycling at the local level, and enhance community well-being. At least in this sub-watershed, our research suggests that biodiversity has the potential to facilitate cross-level interactions, though diffusion of such activities to the whole watershed remains a challenge.

In the Silang-Santa Rosa sub-watershed of Laguna de Bay, by contrast, biodiversity is critically endangered and most residents have lost interest in aquatic environments. Through interviews and stakeholder workshops, however, we found that groundwater can be a shared object of interest among diverse stakeholders in the watershed. Sharing knowledge on groundwater research directly related to familiar nature meaningful for local peoples' lives and livelihoods facilitated active discussions in a watershed forum as a platform for watershed governance.

Using social and natural scientific approaches, such as action research and phosphate oxygen isotope analysis, to compare different watersheds, we summarized key social-ecological characteristics affecting governance processes. Even when there is less explicit interest in biodiversity, as in the case of Silang-Santa Rosa sub-watershed, there is indication that stakeholder communication relevant to familiar nature can be facilitated if a boundary object, such as groundwater, is taken as a key focus point. Ultimately, since all lands around the planet can be seen as parts of diverse watersheds, we believe that our basic approach to watershed governance—adapted to individual social-ecological contexts—can address many global environmental issues.

As to social outcomes of our research project, in the Yasu River sub-watershed, knowledge and experience of community activities have been shared between up- and down-stream communities, enhancing discussion of watershed sustainability. In the Silang-Santa Rosa sub-watershed, a Memorandum of Agreement was concluded between the Laguna Lake Development Authority (national government) and Santa Rosa City (local government) in relation to installation of a water quality monitoring facility at the watershed level, while the women's group was transformed from a mandatory "women's desk" engagement to an environmentally-conscious group through conservation of sacred spring as familiar nature. A textbook on watershed governance will be published in FY2020, aiding the diffusion of transdisciplinary approaches developed by our project to diverse stakeholders in other watersheds.

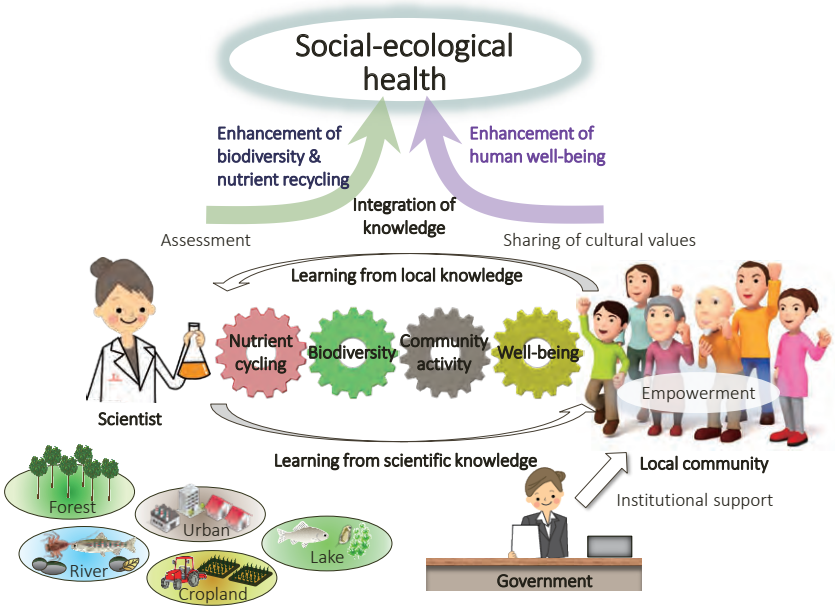

Figure 1 A conceptual schema of adaptive watershed governance

Proposal and Verification of the Validity of Isotope Environmental Traceability Methodology in Environmental Studies

Project Leader **TAYASU Ichiro** RIHN

This project investigated environmental traceability as a key concept for solution of environmental problems. Stable isotope ratios of elements, together with concentrations of elements, can trace the flow of matter and chemicals through the environment, better describe ecosystem structure and conditions, and appraise the chemical profiles of food products. Spatio-temporal variation of multiple isotope ratios can be used to study Earth systems operating at local to global scales. This information can serve as an important decision-making tool for local people considering water, food and environmental security, all of which are fundamental for the sustainability of human society.

We conducted two studies to evaluate the validity of "environmental traceability methodology" for environmental studies: 1) effectiveness of the environmental traceability concept, and 2) applicability to the food traceability. For question 1, we asked of the effective points of the methodology to solve environmental problems using a survey by questionnaire and a workshop among stakeholders. Field research took place in Japan at sites in Ono City, Fukui; Otsuchi Town, Iwate; Saijo City, Ehime; Oshino Village, Yamanashi; the Chikusa river watershed, Hyogo; Lake Biwa and surrounding watershed in Shiga; as well as in the Laguna de Bay and surrounding watershed in the Philippines. Questionnaire results indicated that certain types of stakeholder showed special appreciation for the information obtained from the environmental traceability methodology: a) people who are generally involved in the object of conservation (groundwater or river depending on the study sites); b) people who have high concern about the information obtained from the environmental traceability methodology; and c) people who showed high level of understanding about the explanation of the environmental traceability methodology in the symposium at each study site.

For question 2), we tested if the "environmental traceability" authentication by multi-isotope methods were more effective in communicating production conditions and building trust. We focused on food labels and made a web-based questionnaire online survey (N=10,000) of consumers in Japan, the USA, Germany, China and Thailand. We selected four food items that were previously detected by isotopic analysis to be falsely labeled. We set the sources of label information assured by farmer's photograph, by government institutions, by producer association, by scientific experts (including in isotopic methods), and by consumer reputation. Results showed that the expert labels based on scientific analysis were highly trusted regardless of food type or country and suggested that expert labels might play an important role as trusted sources of information in the global food system.

Although causal relationships are complicated in global environmental issues, we consider the environmental traceability methodology is valid to tackle environmental issues by sharing scientific information obtained from the methodology with various stakeholders. To disseminate the knowledge and experience, we established an internet website to serve as a platform that shares and develops the environmental traceability methodology. As a transdisciplinary context, we use the results obtained from our project research, and all the finding of Laboratory and Analysis Division in RIHN, including the cooperative research on "Environmental Isotope Study". The website will continue to connect providers of the environmental traceability methodology with potential users.

A schematic flow of the project in Oshino Village, Japan

The internet website we established to serve as a platform that shares and develops the environmental traceability methodology (a case in Oshino Village).

https://www.chikyu.ac.jp/rihn_e/project/2017-03.html