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Message from the Director-General

The Research Institute for Humanity and Nature (RIHN) was established in April 2001 to conduct integrated research in the field of global environmental studies. In 2004, RIHN became one of the original members of the National Institutes for the Humanities (NIHU), as an Inter-University Research Institute Corporation.

Environmental degradation can be understood as an imbalance in interactions between human beings and natural systems. Our mission is therefore to conduct solution-oriented research aimed at exploring how interactions between humanity and nature ought to be. RIHN conducts interdisciplinary research spanning the natural sciences, humanities, and social sciences, and transdisciplinary research, collaborating with various stakeholders in society.

Fiscal year 2019 marks the fourth year of our Phase III Medium-Term Plan. Under the three Research Programs, and one Core Program, we conducted nine full research projects. The RIHN Center was promoting to organically integrate and support the Research Programs/Projects, including both domestic and international collaboration. As part of RIHN's international activities, RIHN is hosting the Asian Regional Centre for Future Earth, which is expected to promote the overall research and capacity buildings of Future Earth in Asia. Under the initiative of Director General (with the Council for Research Strategy), the Public Relations Unit, the Institutional Research (IR) Unit and the International Publication Unit (IPU) functioned actively. With the new structure in place, we are pursuing our mission even more vigorously through enhanced collaboration within our institute, across our diverse research community, and with society in general.

This annual report describes the updated outcome of these activities of RIHN for the FY2019.I do hope this report will help you to understand the overall activity within the FY2019.

With best regards,

YASUNARI Tetsuzo
Director-General
Research Institute for Humanity and Nature

Research Activities

Research Program1: Societal Transformation under Environmental Change

Program Director: SUGIHARA Kaoru

○ Research Subject and Objectives

Goal of the Program

This program aims at providing realistic perspectives and options to facilitate the transformation towards a society that can flexibly respond to environmental changes caused by human activities such as global warming and air pollution, as well as to natural disasters.

Mission Statement

To demonstrate the fundamental significance of global environmental sustainability for human society, we need to make the links between environmental change and natural disasters, and social issues such as livelihood, inequality, social security and conflict, intellectually explicit, and reinforce them in the real world. RIHN's Societal Transformation under Environmental Change research program contributes to this task.

The Program follows two lines of enquiry. The first conducts research on Asia's long-term paths of social and economic development in relation to climate change and environmental history. Such studies offer historical understandings of the human-nature interface, and evaluate each region's political and economic conditions and cultural and social potentialities in comparative perspective. For example, postwar development of the industrial complex along the Asia's Pacific coast was made possible by the combination of imported fossil fuels and utilization of rich local resources of land, water and biomass. Industrial development in the region produced both rapid economic growth and at times severe environmental pollution and degradation. It is important to recognize the causes and consequences of these historical processes in their own light, as well as for their significance to future societal change and policy deliberations.

The Program's second line of enquiry examines the kinds of motivations that affect people's livelihood, by working closely with various stakeholders in local society in Asia. Our project based in Sumatra's tropical peat swamp forest, for example, has identified four principal kinds of motivations - local livelihood; profit of local farmers and agricultural and industrial enterprises; local and centrally-based governance; and conservation measures implemented by governments, NGOs and international institutions -, and examines how they can best be coordinated to promote sustainability at the village level. Project research also helps implement policies at local, national and international levels. This ongoing project, which cooperates with local universities, companies and officials, has already contributed to the development of regional and national policies to control peatland fires, which became a significant environmental issue in Indonesia and beyond.

This program coordinates a variety of research projects along these lines in order to develop a perspective that helps direct research and social transformation in Asia.

○ Progress and Results in 2019

The study of the Great Acceleration in Asia and its impact on global sustainability

The first line of enquiry has been pursued mainly at the program itself. At the last EREC Annual Report, I described preliminary results of my assessment of Asia's significance for the 'Great Acceleration' of human intervention in the nature since around 1950, and suggested the ways in which Asia's high economic growth beginning in Japan in the 1950s to expand to other parts of Asia, including China today, were responsible for the rapid change in global resource use, hence global warming. In many respects Asia was more important than the West in terms of the *speed* of these changes.

During AY2019 the program has studied this topic further in various ways, through program seminars (for details see below), interactions with the invited scholar and other historians and social scientists, and the participation in international conferences.

(1) Program seminars

In order to seek interactions between the program, projects and RIHN mission, the program started a seminar series in 2018 on land use, national development plans, energy transition, pollution and the resource nexus, with Dr Masuhara (Program 1) as the main organizer and the participation of key project members. During AY2019 three seminars were organized around the theme of development paths and their responses to adapt to environmental and locational diversities in Asia. A broad vision that emerged from these seminars is outlined in Section 3.

Invited speakers included Professors Jin Sato (University of Tokyo) who discussed the interlocking relationships between developmental policy and environmental protection with special reference to Southeast Asia; Michio Akiyama (University of Shiga Prefecture) the role of water resource management in the history of national development plans in post-war Japan; Yoshitaka Negishi (Miyazaki University) the more recent history of the seafront industrial complex policy around the major Japanese cities; Roy Bin Wong (UCLA and RIHN invited scholar) the resource use, resource governance and the public policy; Zhou Muzhi (Tokyo Keizai University) the 'megalopolis in China: seen from integrated urban development indicators'; Asuka Yamaguchi the role of forest resources in Japan's industrialization. In addition, Dr Masuhara presented results of his work on the role of multi-purpose dams in post-war Japan. Efforts were made to develop a context in which we could understand how resource use was promoted and the resource mix changed over time in Japan, China and Southeast Asia.

(2) The literature on WEF nexus and SDGs

In the international workshop and earlier program seminars in AY2018, the program discussed the issues relating to the resource nexus in some depth. Meanwhile, RIHN granted a small budget to Professor Taniguchi to engage in the study on the relationship between the nexus and the Sustainable Development Goals (SDGs). Program 1 and Program 2 were involved in this initiative.

We found many papers discussing the relationships between the water-energy-food (WEF) nexus and the SDGs, among which there was a paper proposing the nexus considerations of synergies and trade-offs from three to five factors of 'land-water-energy-food-materials'. While this sort of extension still leaves a large gap with the classical political economy's factor endowment approach (of land, labour and capital), the five-factor nexus embraces the special significance of 'materials', as distinct from energy, hence highlighting the importance of timber, steel and plastics among others as material foundations of the capitalist world economy. It also takes on the role of land, as distinct from water and food, which enriches the links with the three projects of Program 1.

Interdisciplinary and transdisciplinary projects

The second line of enquiry has been pursued by the three main projects.

(1) Kozan project: FR3

This project is concerned with the environmentally vulnerable societies in tropical peatland. With fully developed academic and political contacts in Indonesia, it conducts broadly three lines of research; the socio-economic, political and historical analysis of the communities, corporations and governance structure; the climate change and peatland development studies focusing on rainfall, water and material cycles; and international comparisons of the Indonesian cases. In collaboration with other projects funded by JICA, CIFOR and at Kyoto University, the project made a good progress, particularly on the first and second lines of research. Professor Kozan, new project leader, continued to lead the implementation of the local water management program, and the team helped the activities of the local community. Efforts were made to link research on rainfall patterns to the themes of biomass and peatland conditions, fire and health hazards, and state and local government policies.

Professor Mizuno retired as project leader in March 2019, and assumed professorship at the University of Indonesia. He continues to be a valuable member of the project.

(2) Yoshida project: FR 2

This project seeks to establish the methodology for the interdisciplinary evaluation of ecosystem-based disaster risk reduction (Eco-DRR). The three groups made an impressive progress, collecting data and hazard maps, formulating criteria, actually evaluating risks, and assessing them from both local and national perspectives. Research on the three main local sites produced some notable results, while local and traditional knowledge group published relevant historical information. Efforts continue to see the relevance of insurance in identifying economic incentives leading to Eco-DRR.

There is a good prospect that the project will develop a standard methodology capturing the major functions of the ecosystem within the current research framework. Social science and policy aspects of the methodology could be strengthened, partly by further discussion on land ownership in cooperation with the program.

(3) Hayashida project: PR

Hayashida project studies stubble burning in North India, by combining the Punjab-based agricultural studies, the public health approach and the regional impact of stubble burning on air pollution in Delhi and across the Indo-Gangetic Plain. It seeks a more embracing understanding of environmental sustainability than hitherto by taking into account not just water shortage and soil erosion as a result of the introduction of (rice-wheat) double cropping system but also air pollution and health hazard, in order to determine the course of sustainable agriculture and socio-economic development. Inputs of atmospheric science are critical in connecting local issues to regional environmental sustainability concerns.

During AY2019 the project made a good progress on the preparation for a large-scale survey, installation of PM2.5 instruments and research partnership agreements.

Other activities

The program has included a partly archaeological and partly contemporary project on resilience under Professor Habu and a very long-term climate history project (estimating temperature and rainfall) under Professor Nakatsuka in the past. During AY2019 all three main projects under this program focused on contemporary Asian topics with clear reference to stakeholder interests from interdisciplinary and transdisciplinary perspective, broadly in line with the second line of enquiry mentioned above. In addition, Professor Habu, currently visiting professor at RIHN, began a new agroecology project under the sponsorship of Sumitomo Foundation (and administered at Program 1).

The main issue now is how to make the first line of research on the role of Asia in global historical perspective more forcefully into contact with the second line of enquiries into the more specific issues related to problem-solving and future design. The underlying common interest remains a contribution to social transformation in Asia.

As a result of program seminars and cross-program or institutional-level research activities described below, some sense of ‘program identity’, if not yet ‘intellectual coherence’, is emerging.

【 Research directives 】

In this section I mainly describe PD’s research activities and their relevance to the program.

The great acceleration in Asia and the nature of capitalism

Based on the discussions at program seminars and domestic meetings during the previous year, I presented a paper “The Great Acceleration in Asia: Beyond ‘Coal and North America’” at a conference on ‘Convergence/Divergence: New Approaches to the Global History of Capitalism’ at Brasenose College, Oxford, in September 2019. A version of the paper was also presented at the program seminar in October.

The first part of the paper discussed the ‘Great Divergence’ debate, the most significant debate in global history for the last twenty years. The debate focused on the comparison of living standards between Asia and Europe around 1800 and the conditions for industrialization. One of the key issues for the latter was the availability of coal, that is, the idea that England benefitted from the availability of cheap coal at convenient places whereas other parts of the world where similar living standards were observed did not. I presented comparative charts on this ‘first energy transition’ with respect to England and Japan, and showed that both countries went through a rapid change in energy supply from biomass to coal, and argued that Japan’s transition occurred later but faster. This has a bearing on the possible re-characterization of industrial capitalism, as a system not only originated in Britain and unique to Western Europe but as one which depended on the smooth transition from biomass to fossil fuels for its global diffusion.

The second part of the paper suggested that there was the ‘second energy transition’, namely from coal to oil, especially in the second half of the twentieth century, and that Japan since the 1950s and East Asia in the later decades realized this transition faster than the main industrial districts of the Rhine river region in Western Europe and the Great Lakes region in North America (both regions depended on coal for locational and institutional reasons). The emergence of sea-front industrial complex in Japan and other parts of East Asia combined imported oil and natural gas with local resources such as land, water and labour under the initiative of the developmental state, and proceeded with both the Great Acceleration and the environmental degradation which accompanied it. The nature of industrial capitalism is thus firmly related to the explosive resource use that was made possible on a global scale, and is directly responsible for the threat to global environmental sustainability. The development of the fossil-fuel-driven world economy was a historically specific phenomenon.

This East Asian model does not cover the opposite side of the story, namely the fate of the resource suppliers in the periphery. I published a paper on ‘Changing Patterns of Sarawak Exports, 1870-2016’ (co-authored) in November 2019 in an edited volume

on *the Anthropogenic Tropical Forests* (Springer), which describes how East Asia's energy transition to fossil-fuels affected the local resource economy of Southeast Asia. The relationships between resource export economies and the developed countries, such as Japan, affect the assessment of the East Asian model, as well as Western models.

Changing nature of the local, regional and global nexus

On the basis of extensive discussion on the resource nexus within the program and RIHN as a whole, I formulated my own interpretation of how the original rural-urban nexus had been extended to the regional and global ones in the Asian historical context. Part of this was presented in RIHN meetings in February and March 2020. I was invited to present this theme at the roundtable organized by the Harvard-Yenching Institute on the 24th of March, Boston, which was unfortunately cancelled due to the spread of COVID-19.

The notion of the 'distribution nexus' derives from my research on Asian trade history. I started a new research project on the statistical investigation into the history of the Indian Ocean (AY2019-2021), and presented the reinterpretation of the role of entrepots such as Hong Kong and Singapore as well as minor ports as the 'distribution nexus', which enabled local and regional trade to act as mitigating forces of local resource constraints. I further related this regional trade growth to the general population increase in Asia since the nineteenth century under Western colonialism and domination.

After the Second World War, a rapid growth of world trade with decolonization and the American hegemony made it possible for countries engaged in free trade such as Japan, NIEs and ASEAN (and later China to some extent) to import fossil fuels freely. In Japan rapid economic growth to c.1970 was accompanied by national land development plans, driven by 'developmentalism', which penetrated into designing urban and industrial space. Because imports of fossil fuels and other raw materials were fundamental to industrial development, seafront industrial complexes were created around major urban centres along the Pacific coast. The Tokyo Bay became the largest 'resource nexus' in Asia (and in the world built largely in reclaimed land) at this point in time. Other East Asian countries also created the resource nexus. In China much larger ones than Japan's emerged.

The microelectronics revolution, which combined cheap labour with the locationally mobile high technology, helped the deepening of the energy transition taking place around the resource nexus in East Asia and parts of Southeast Asia by the last decades of the twentieth century. The subsequent information and digital revolution further expanded the possibilities of combining local, regional and global resources, well beyond the fossil-fuel-driven resource nexus described above. We are now beginning to recognize the development of the more locationally fragmented but globally connected nexus, some of which could be built on the locally more 'sustainability-driven' nexus. The combination of fragmentation and global integration has not been evident in either the distribution nexus nor the resource nexus. The regional and global governance systems should respond to these local needs and initiatives, which could be the first step towards the transformation of the rules and principles of global environmental governance.

Historical population trends, the growth ideology and resource use

One broad vision for connecting the historical perspective to the three projects is the assessment of population trends in Asia. In Indonesia and India where Kozan and Hayashida projects operate respectively, a large population carrying capacity and its rising trend resulted in the greater use of resources, hence a major factor behind environmental degradation. In India especially, expansion of arable land led to deforestation, while the green revolution and intensive farming lowered the underground water table. Yoshida project directly addresses the issues relating to contemporary 'population-declining' society of Japan, but this society has been built on the slow population increase prior to the decline over a century and more. That most human 'responses to environmental problems' occurred under population pressure forms a key path dependency.

An important insight can be gained by discussing the availability of local resources such as water, land and ecosystem services in relation to population increase, and recognize the impact of its reversal on the nature of human-nature interactions over the long run.

In the second 'energy transition' phase, the growth ideology (and the rise of per capita income) encouraged the greater use of fossil fuels. The ideology is largely sustained in emerging states today. At the same time, population pressure continues in tropical Asia and Africa, hence pressures on land, water, forests and other biomass resources remain real. The main battleground for global environmental sustainability centres on tropical populous regions on the one hand, and the global environment itself on the other.

I am working on these ideas in collaboration with Professors Gareth Austin (University of Cambridge) and Tirthankar Roy (London School of Economics).

○Project Members

○ Naoki Masuhara (Research Institute for Humanity and Nature,Senior Researcher)

○ Future Themes

Extension of program discussion to humanities

I discussed the FS proposal by Professor Daniel Niles, which was an attempt to develop a cultural approach to environmental knowledge. Although his proposal was rejected, placing the humanity-centred approach to the forefront in inter- and trans-disciplinary research is important for RIHN.

During AY2020 Program 1 will host Professors Julia Thomas (University of Notre Dame) and David Pietz (University of Arizona) as invited scholar and visiting fellow respectively. Meanwhile, Professor Bin Wong talked to many researchers at RIHN during his stay at RIHN as an invited scholar, and his efforts were highly appreciated. It is hoped that a general discussion on the role of humanities for the understanding of the Anthropocene and environmental history will be enriched through seminars and other interactions.

Collaborations with the International Publication Unit

In April 2018 the International Publication Unit (IPU) was established, and I was appointed as its head. It engages in the editorial work of *Global Sustainability,* a Cambridge University Press journal, in which Professor Yasunari and I work on the 'humanities' collection, among others, as section editors. So far three papers that had been published through RIHN. The IPU also made the RIHN series of 'Global Environmental Studies' from Springer as part of its work. It appointed Dr Hayato Sugimoto as research associate in October. He worked exclusively for IPU, with the support of Ms Yumiko Iwasaki of Program 1.

IPU acts as an important window for RIHN's international presence. All program activities are thematically connected to IPU-related publication and editorial work. Further publications are expected during AY2020.

●Achievements

○Books

【Chapters/Sections】

- Kobayashi, A. and Sugihara, K. 2019 "Changing Patterns of Sarawak Exports, c.1870 to 2013". Noboru Ishikawa and Ryoji Soda (ed.) *Anthropogenic Tropical Forests: Human–Nature Interfaces on the Plantation Frontier*. Advances in Asian Human-Environmental Research. Springer, Singapore, pp.563-585. DOI:10.1007/978-981-13-7513-2
- Sugihara, K. 2019 "Multiple Paths to Industrialization: A Global Context of the Rise of Emerging States". Otsuka, K. and Sugihara, K. (ed.) *Paths to the Emerging State in Asia and Africa*. Emerging-Economy State and International Policy Studies. Springer, pp.1-33. DOI:10.1007/978-981-13-3131-2
- Sugihara, K. 2019 "The Asian Path of Economic Development: Intra-regional Trade, Industrialization and the Developmental State". Shiraishi, T. and Sonobe, T. (ed.) *The Emerging States and Economies: Their Origins, Drivers and Challenges Ahead*. Emerging-Economy State and International Policy Studies. Springer, pp.73-99. DOI:10.1007/978-981-13-2634-9

○Editing

【Editing / Co-editing】

- Otsuka, K. and Sugihara, K. (ed.) 2019 *Paths to the Emerging State in Asia and Africa*. Emerging-Economy State and International Policy Studies. Springer, 292pp. https://doi.org/10.1007/978-981-13-3131-2

○Research Presentations

【Oral Presentation】

- Masuhara, N., Lee, S. and Taniguchi, M. "From Region to City: Down-scaling issues of Water-Energy-Food Nexus in Japan". 2019 AGU Fall Meeting, 2019.12.09-2019.12.13, San Francisco, California, USA.
- Sugihara, K. "Past and Present of the Seafront Industrial Complex: A Comparative Perspective". Second Research Seminar for Program 1, 2019.10.07, Research Institute for Humanity and Nature, Kyoto.
- Masuhara, N. "The Land-Water-Energy-Food-Materials Nexus and the Role of Multi-purpose Dams in Japan". Second Research Seminar for Program 1, 2019.10.07, Research Institute for Humanity and Nature, Kyoto.

・Sugihara, K. "Indian Ocean Trade, 1910-1950". International Seminar on Economic History, Grants-in-Aid for Scientific Research (B) 'A Statistical Study of Indian Ocean Trade: Towards a Reappraisal of Regional Trade in Modern World History', 2019.08.08, GRIPS, Tokyo.

【Invited Lecture / Honorary Lecture / Panelist】

・Sugihara, K. “The Great Acceleration in Asia: Beyond ‘Coal and North America’". Convergence/Divergence: New Approaches to the Global History of Capitalism Conference, 2019.09.28, Brasenose College, Oxford, United Kingdom.

・Naoki Masuhara (Panelist) Issues and possibilities for making Kyoto smart city from Water-Energy nexus perspective. Open Seminar on Kyoto Decarbonization through Smart City Development, 2019.05.13, Research Institute for Humanity and Nature, Kyoto.

Stage: Full Research

Project Name: Toward the Regeneration of Tropical Peatland Societies: Building International Research Network on Paludiculture and Sustainable Peatland Management

Abbreviated Title: Tropical Peatland Societies

Project Leader: KOZAN Osamu

Program 1: Societal Transformation under Environmental Change

URL: http://www.chikyu.ac.jp/peatlands/

Key Words: Peatland, Tropical peatland societies, Rehabilitation, Environmental vulnerability, Transformability

○ Research Subject and Objectives

a) Problem, background, and objective

The degradation of tropical peat swamps in Southeast Asia has increasingly become problematic in the context of international environmental conservations. Due to their physical characteristics, tropical peat swamp forests have been difficult to utilize, and therefore, spared from development for a long time. However, drainage associated with plantation development of fast-growing and oil palm trees has led to a decrease in groundwater table levels and the drying of peat swamp forest.

This has in turn resulted in an increase in CO2 emissions, by peat decomposition, and frequent fires (Hirano 2009, 2012, 2014). In Indonesia alone, an estimated 2.1 million hectares of forest – most of them peatlands – that were burned in 2015. The resultant haze caused incalculable damage to the local economy and has impacted the health of not only the local people, but also those in Malaysia and Singapore. In 2015, 0.5 million people in the region were diagnosed with upper respiratory infections. Haze has become a trans-boundary environmental, economic, and political issue.

In Indonesia, the political and social situation around peatland has made the sustainable management of the peat environment a difficult task. Most peatland is classified as state forest, and state appropriation has created contestation, overlapping, and insecurity over forest tenure conditions (RRI 2008, RRI 2012, Sunderlin, Hatcher, and Liddle 2008, White and Martine 2002). Companies that were given concessions in peatland areas developed plantations, roads, and canals under weak state regulations, attracting people to move in. The complexity and vagueness of land possession has prevented the local villagers from managing peatland sustainably and continuously. As a result, the peat swamp has dried up, resulting in degradation, and in turn, widespread fires. (10, 55, 56,57, 58, 59, 65)

How can society develop institutions to control and manage these fires and mitigate degradation? Our research project will conduct transdisciplinary research into the social-ecological systems in tropical peatlands to understand and address their vulnerabilities. Ultimately the project intends to elucidate the transformability of environmentally vulnerable societies.

b) Methodology, structure and schedule

The methodology of the project is characterized by a deep commitment to local communities and policy processes that attempt to reach solutions. We aim to obtain concrete and detailed data of the transformation of peat environment and peatland communities in the villages of Tanjung Leban (Bengkalis district) and Rantau Baru (Plalawan district), Riau province, Indonesia. The research includes transdisciplinary approaches: surveying the socio-economic conditions of each household, investigating the socio-economic history of the peatland societies, establishing the institutions and organizations that promote participation in peatland restoration activities amongst villagers, arranging the application of paludiculture (Sustainable peatland livelihood activities), monitoring water levels, CO2 emissions and biodiversity in the peat environment, examining the governance of peatland at the level of local and central governance, suggesting effective policy to administrators, and investigating the influence of haze.

c) Expected results

Through our research activities based around peatland restoration in the main research villages, we will draw an integrated map of the peatland ecosystem, and establish a reliable management guideline that can be applied to peatland restoration in other areas. In addition, by comparing the situations of peatlands in various areas, we will explore the characteristics of peat environment and societies in the world and address the transformability of environmentally vulnerable societies.

d) Project organization and membership

The project is composed of three work groups, consisting of researchers, officials and NGO members of Japanese and Indonesian origin, amongst other nationalities.

1) The Community, Corporate and Governance Group deals with the socio-economic matters of peatland societies. Study will focus on livelihood strategies, land tenure, and resource use to identify factors that cause peat degradation. They will work with local institutions and organizations at the village level to establish mitigation and adaptation practices. This group consists of economists, anthropologists, sociologists, political scientists, experts on company management, and experts on administration/ governance.

2) The Material Cycling Group conducts intensive multi-disciplinary research, particularly on water and material cycles, in several representative peatlands in Southeast Asia for the integration of natural and social scientific mapping to better understand peatland ecosystems. The group also investigates the influence of peatland haze and fires, and assesses the health hazards associated with them. The group consists of hydrologists, meteorologists, botanists and pedologists.

3) The International Research Group compares the social and ecological situations of peatlands in the world, and integrates experiences on sustainable peatland management. This group organizes international workshops and seminars to promote communications between academic institutions. The members include experts on international relations, political science, and experienced scientists who conduct research within peatland outside of Indonesia.

e) Contribution to the program

The project has always paid special attention to the motives of the stakeholders. That is; the conservation efforts carried out by governments and NGOs, the livelihood of the local people, and the profit-making of the companies involved. This is in order to look for solutions that can satisfy all parties and promote fruitful entanglements and interactions between them. These explorations are in accordance with the motivations that were addressed in the Program Statement. In addition, the attempt to consider the transformation of peatland societies provides a case for the social and economic development in response to environmental change in Asia.

CONTRIBUTION TO THE PROGRAM

A study summarizing the relationship between climate change and fires in tropical peatland is an attempt to clarify how global environmental change will affect regional and specific disasters. This is very important as a basis for considering the relationship between environmental change and society, which is a major framework of Program 1. Attempts to analyse the impact of peat fires on society and its response to social fires that occurred frequently this year were based on elucidating both the “Asian development path” and “Motivation for survival” listed in Program 1.

Structuring the program around the relationship between the three central themes of the History of Development, Peat Environment and Climate Change enables us to discuss the sustainable development of peatland societies. Namely, in integrating processes between studies on climate change, especially rainfall patterns/changes, and the characteristics of peatland exploitation, we can identify the characteristics of vulnerability and the processes of transformability at play. Vulnerable peat swamp forests cannot be restored and the degradation of peatlands has led to catastrophes, but now people aim to restore the peatlands, albeit not to their original state as peat swamp forests but instead as vegetated rewetted peatlands through social and political means within local societies, allowing for the sustainable integration of peatland environments within the scope of their livelihoods. Such discussions have led to engagement with administrators aimed at negotiating effective peatland restoration programs in which people can positively participate. The subject matter of transformability thus contributes to mapping Asia’s paths of socio-economic development in relation to climate change and environmental history and allows for the examination of the motivations that affect people’s livelihoods, as noted in the Program 1 statement.

In addition, some research activities can respectively contribute to the aim of the Program 1. Some members in the Community, Corporate and Governance group and Material Cycling group began implementing a social forestry program in the village of Tanjung Leban. This is following new government policies which legitimize the community’s ownership of forests that were hitherto designated as state forest. Such policies are facilitated by the community practice of social forestry. It has been broadly observed in other Asian countries that, once the state government claims the state-ownership of most areas of land, the government gradually guarantees the people land rights over time. Through the implementation and observation of the social forestry program, we intend to maintain a process of socio-political development reliant upon land rights throughout the rapid transformation of peatland environments.

○ Progress and Results in 2019

PROJECT PROGRESS DURING THE FR PERIOD TO DATE.

During the period of Full Research, the project formulated research organization, structure and network holding a number of seminars and workshops. For example, following the MOU signed by RIHN, Kyoto and Hokkaido universities and Peatland

Restoration Agency (BRG: Badan Restorasi Gambut) in August 2016, we invited the Indonesian Minister of Environment and Forestry, the Chief of Presidential Exclusive Office, and the Director and Deputies of BRG to Japan and held some seminars in April 2017. In February 2018, RIHN, BRG and JICA held an international seminar in Jakarta for exchanging the tentative results of peatland restoration activities and research. In July 2018 and March 2019, RIHN and Kyoto University in collaboration with JICA held a conference with key local government officials in Bengkalis district and organized a social forestry workshop together with local people at the village of Tanjung Leban in Bengkalis district. In March 2019, the 3rd Anniversary of Indonesia-Kyoto Collaborative Agreements for Peatland Restoration in Indonesia organized by RIHN, Kyoto University, the government of Indonesia was held. The research networks established through these seminars/workshops can enormously contribute to the progress of our project as trans-disciplinary study, and we will continuously try to hold them (For specification on the seminars/workshops during FR3).

In FR1 (April 2017- March 2018), each of three work groups also made the progress of their respective research topics and collaborated with local peoples. For example, based on the result of previous study, in which the stronger the land rights, the better the management even after the burning of the peatlands; the Community, Corporate and Governance Group suggested to central and local officials that the government should give local people living around peat environment the property rights to the land that they have cultivated. As a result, the policies of social forestry, which allow people the right to use the land for 35 years, have made progress in Riau at present. The Material Cycling group made the preparation of collecting systematic basic data in order to create the model of peatland restoration based on rewetting, reforestation and assessing the impact of haze caused by the peatland fires. As a result, for example, a team of the group started a collaboration with JICA development program and implementing paludiculture through social forestry adopting the scientific knowledge obtained from researches. In addition, a team analyzed data of air pollution, which has been continuously obtained from the monitoring of PM2.5, NO, O3, CO and NO2 in Pekanbaru, and one of the results of this analysis has been published by a leading international journal. The International Research Group developed collaborative ties with the Russian Science Academy, and the Far East Asian Branch in order to carry out collaborative study on peatlands. The group discussed the prospects of a joint research program, especially concerned with the ecological, social and epidemiological studies on peatland fire.

In FR2 (April 2018- March 2019), we have tried to integrate the studies taking place within History of Development, Peat Environment and Climate Change, with the driving concepts of Vulnerability and Transformability being at the centre of our research. Vulnerability is the degree to which a system, or part of a system, may react adversely during the occurrence of a hazardous event (Posey 2009), on the other hand transformability is the capacity to create a fundamentally new system when ecological, economic, or social (including political) conditions render the existing system untenable. (Walker, et al 2004).

Following these concepts and approaches, the Community, Corporate and Governance Group explored the history of the peatland's exploitation at the hands of companies and local people for the purpose of studying vulnerability. Through these studies, we found out the vulnerability of the governance and trade related to peatland exploitation. The Material Cycling Group started the data collection of health hazard caused by haze in cooperation with hospitals in the Riau and Central Kalimantan provinces. The network of monitoring air pollutant during peatland fires has expanded over time, with some of the findings being published in an international journal. The group also published a thesis, in which they showed the dynamics of CO2 and CH4. The group studied from the locus of material cycling, recording vegetation, water and soil changes affected by processes that contribute to peatland degradation, especially fire.

In terms of the studies on transformability, a team began promoting the implementation of social forestry in combination with the peatland restoration program. This approach would entail higher participation amongst locals with the peatland restoration program as it would lead to the improvement of their land rights. So far, the implementation of the social forestry and peat restoration programs have enabled land disputes to be negotiated. We refer to this approach as the "entitlement approach", as the improvement of legislation concerning land rights improves issues surrounding entitlement. In securing land titles, we can in turn secure the active participation of local people in the peatland rehabilitation program. The transformability process does not only entail a change in the landscape, but also an improvement to people's livelihood and entitlement. The improvements of peatland societies supported by innovations in paludiculture technology, organization and agrarian structures consist of the factors that form the new model of peatland society that can potentially spread to other areas.

Our idea of transformability is not limited to the local society. A member of the Community, Corporate and Governance Group has found that, as a result of the rapid expansion of palm-oil production (which includes the pervasive planting activity on the peatland) and the export of crude palm oil, that the production of tradable goods has been stagnant in Indonesia while consumption and the production of non-tradable goods grew. This resource intensive development, or primary commodity intensive development that sacrifices industrialization, or the development of tradable goods industry, displays a contrast with East Asia's export-oriented industrial activity. Both patterns of development contain bias, so we intend to establish a peatland society that is not biased towards primary commodity intensive development. We intend to develop a society that does not sacrifice the environment, industry and agriculture. One of the solutions is to curb the expansion of oil palm planting on the peatland, with the preferred alternative being to develop the oleo-chemical industry and paludiculture that involves the development of the processing industry.

PROGRESS SINCE THE LAST REPORTING

As for the progress of the research project as a whole, we have elaborated on the research concept and reinforced the PR activities. On the other hand, each work group has made progresses toward drawing an integrated map of the peatland and land surface condition. Due to the effects of El Nino (modoki) and dipole mode, many peat fires occurred in both Sumatra and Kalimantan islands since July of this year, and the air pollution data of these fires were obtained.

The Community, Corporate and Governance Group has made progress in their studies, especially on water management and land use / ownership mapping at the village level. The group started to fix the borders between hamlets utilizing World View satellite images. We printed out the satellite images and showed them to the community members and walked around hamlets with GPS trackers together with the community members to fix the hamlet borders. We also utilized a drone in order to make clearer the village conditions. Hamlets have borders with the neighbouring villages, but there was no serious border conflict between the M village and the neighbouring villages in fixing the hamlet borders of M village partly because the M village head had a better communication with the neighbouring village heads and informal leaders. In the next stage, they checked the land utilization especially in the peat land. We conducted an intensive research only on RW (Sub village) 2 and 6 and the northern half of RW1 because of the time limitation. The satellite and drone images vividly showed that the largest parts of peat land are utilized for oil palm plantation and they are owned by outsiders with a large tract of land.

The Material Cycling Group reconstructed 22-years of historical monthly rainfall data at 24 colonial observation stations in Sumatera, Indonesia during the Dutch colonial era 1879–1900. Regional and interannual variations of the western and eastern side of Sumatera are analysed by using monthly rainfall data and daily rainfall data during 1879–1900 and 1971–2014, respectively. Comparison of the seasonal cycle in both periods indicate that the recent monthly rainfall amounts increased (decreased) in June–December (January–May), remarkably at the stations in the northern side of 0.5°S latitudes, the eastern coast. They utilized Unmanned aerial systems (UASs) to collect high-resolution RGB imagery and multispectral images for the study area. The data were used to develop general land use/land cover (LULC) information for the site. This study indicates that UAS-based FVC estimations can be used for observing fast-growing acacia trees at a fine scale resolution, which may assist current restoration programs in Indonesia.

As for paludiculture, the members persuaded the villagers to participate in the restoration activities and also held a Focus Group Discussion (FGD) in the village of Tanjung Leban, Bengkalis district. As a result, more than thirty households located on about 200-hectare area of private land decided to join the paludiculture program. Villagers planted vanilla and indigenous trees, rewetting the dried peatlands. The group has investigated the soil and plant changes following the occurrence of fire to clarify the vulnerability of peatland and develop an innovative method of paludiculture.

The International Research Group held a workshop in May 2019 and confirmed a framework compatible with the situations of peatlands around the world. The group investigated the social influences of forest fire in Central Kalimantan province, Indonesia. They obtained the air pollution data of these fires were since July 2019, and held an epidemiology workshop at Palangka Raya University in December 2019.

MOST NOTABLE OUTPUTS TO DATE

・Books

1. KOZAN, O., 2019, Trend Analysis of Rainfall Characteristics in the Kemena and Tatau River Basins, Sarawak., Anthropogenic Tropical Forests: Human–Nature Interfaces on the Plantation Frontier, Springer

2. MIZUNO, K., FUJITA S Motoko, KAWAI Shuichi, ed, 2016, Catastrophe and Regeneration in Indonesia's Peatlands: Ecology, Economy and Society, Kyoto-CSEAS Series on Asian Studies 15, Singapore: National University of Singapore Press, 466p.

・Theses

3. DAS, R., WANG, X., ITOH, M., SHIODERA, S., KUWATA, M., 2019, Estimation of Metal Emissions from Tropical Peatland Burning in Indonesia by Controlled Laboratory Experiments Journal of Geophysical Research: Atmospheres 124,

4. ISHIKURA K, HIRATA R, HIRANO T, OKIMOTO Y, WONG GX, MELLING L, AERIES E, KIEW F, LO K, MUSIN K, WAILI J, ISHII Y, 2019, Carbon dioxide and methane emissions from peat soil in an undrained tropical peat swamp forest. Ecosystems

5. SATO, Y., 2019, "Reemerging Developmental State in Democratized Indonesia" in Y.Takagi, V.Kanchoochat, and T.Sonobe eds. Developmental State Building: The Politics of Emerging Economies, Springer, pp.69-96.

6. AS-SYAKUR, A. R., K. IMAOKA, K. OGAWARA, M. D. YAMANAKA, T. TANAKA, Y. KASHINO, I W. NUARSA and T. OSAWA, 2019,10, Analysis of spatial and seasonal differences in the diurnal rainfall cycle over Sumatera revealed by 17-year TRMM 3B42 dataset. SOLA 15:216-221. DOI:10.2151/sola.2019-039.

7. IIZUKA K., T. KATO, N. SI. SILSIGIA, A.Y. SOUFININGRUM and O. KOZAN., 2019, Estimating and Examining the Sensitivity of Different Vegetation Indices to Fractions of Vegetation Cover at Different Scaling Grids for Early Stage Acacia Plantation Forests Using a Fixed-Wing UAS, Remote Sensing 11(15)

8. YAMANAKA, M.D., OGINO, S.-Y., WU, P.-M., HAMADA J.-I., MORI, S., MATSUMOTO, J. and SYAMSUDIN, F., 2018/04, Maritime continent coastlines controlling Earth's climate. Prog. Earth Planet Sci. 5(21):1-28. (a review, Special Call for Excellent Papers on Hot Topics: 5. Asia Monsoon Hydroclimate)

9. SAKABE, A., ITOH, M., HIRANO, T., KUSIN, K., 2018/09, Ecosystem-scale methane flux in tropical peat swamp forest in Indonesia. Global Change Biology 24:5123-5136. DOI:10.1111/gcb.14410

10. KUWATA M., G. G. N.-NAGANATHAN, T. MIYAKAWA, M. F. KHAN, O. KOZAN, M. KAWASAKI, S. SUMIN, M. T. LATIF, 2018/08, Constraining the Emission of Particulate Matter from Indonesian Peatland Burning Using Continuous Observation Data. Journal of Geophysical Research: Atmospheres 123(17):9828-9842. DOI:10.1029/2018JD028564

11. IIZUKA K., K. WATANABE, T. KATO, N. A. PUTRI, Si. SILSIGIA, T. KAMEOKA and O. KOZAN, 2018/08, Visualizing the Spatiotemporal Trends of Thermal Characteristics in a Peatland Plantation Forest in Indonesia: Pilot Test Using Unmanned Aerial Systems (UASs). Remote Sensing 10(1345):1-15. DOI:10.3390/rs10091345

○Project Members

The Community, Corporate, and Governance Group

○	MIZUNO, Kosuke	(Research Institute for Humanity and Nature / Center for Southeast Asian Studies, Kyoto University,Professor)
□	SUGIHARA, Kaoru	(Research Institute for Humanity and Nature,Professor)
○	OKAMOTO, Masaaki	(Center for Southeast Asian Studies, Kyoto University,Professor)
○	OSAWA, Takamasa	(Research Institute for Humanity and Nature,Researcher)
○	KAJITA, Ryosuke	(Research Institute for Humanity and Nature,Researcher)
	ABE, Ryuichiro	(Rikkyo University,Lecturer)
	DHENY, Trie Wahyu Sampurno	(Geospatioal Information Agency Indonesia,Researcher)
	DIANTO, Bachriadi	(Agrarian Resource Center,Researcher)
	HASEGAWA, Takuya	(Center for Southeast Asian Studies, Kyoto University,Researcher)
	HAYASHIDA, Hideki	(Institute for Humanity and Social Sciences, Doshisha University,Associate Professor)
	HONNA, Jun	(Collage of International Relation, Ritsumeikan University,Professor)
	HOSOBUCHI, Michiko	(Center for Southeast Asian Studies, Kyoto University,Researcher)
	ITO, Tsuyoshi	(Faculty of Liberal Arts, Sophia University,Associate Professor)
	KAMEDA, Akihiro	(National Museum of Japanese History,Assistant Professor)
	KANO, Hiroyoshi	(Institute for Advanced Studies on Asia, The University of Tokyo,Professor)
	KOIZUMI, Yusuke	(Graduate School of Arts and Sciences, The University of Tokyo,Researcher)
	KONISHI, Tetsu	(Osaka University of Economics and Law,Associate Professor)
	KONO, Yasuyuki	(Kyoto University,Vice President)
	MASUDA, Kazuya	(Faculty of Agriculture and Marine Science, Kochi University,Associate Professor)
	ONDA, Nariaki	(Graduate Education and Research Training Program in Decision Science for a Sustainable Society, Kyushu University,Lecturer)
	SATO, Yuri	(Institute of Developing Economies,Commissioner)
	TERAUCHI, Daisuke	(Faculty of Sociology, Toyo University,Assistant Professor)
	VAN SCHAIK, Arthur	(Center for Southeast Asian Studies, Kyoto University,Researcher)

The Material Cycling and Ecosystem Group

◎	KOZAN, Osamu	(Center for Southeast Asian Studies, Kyoto University/Research Institute for Humanity and Nature,Associate Professor)
○	SHIMAMURA, Tetsuya	(Graduate School of Agriculture, Ehime University,Associate Professor)
○	KAWASAKI, Masahiro	(Research Institute for Humanity and Nature / Center for Southeast Asian Studies, Kyoto University,Professor)
○	YAMANAKA, Manabu. D.	(Research Institute for Humanity and Nature / Kobe University / Japan Agency for Marine-Earth Science and Technology,Researcher / Emeritus Professor / Researcher)
○	ITOH, Masayuki	(University of Hyogo,Associate Professor)

○	SHIODERA, Satomi	(Research Institute for Humanity and Nature / Center for Southeast Asian Studies, Kyoto University,Researcher)
	SAMEJIMA, Hiromitsu	(Institute for Global Environmental Strategies,Researcher)
	GUNAWAN, Haris	(Peatland Restoration Agency, Indonesia,Vice Minister)
	SUPIANDI, Sabiham	(Bogor Agricultural University,Professor)
	HIRANO, Takashi	(Research Faculty of Agriculture, Hokkaido University,Professor)
	IIZUKA, Kotaro	(Center for Spatial Information Science at the University of Tokyo,Researcher)
	IRIANA, Windy	(Graduate School of Frontier Sciences, University of Tokyo)
	KUME, Takashi	(Graduate School of Agriculture, Ehime University,Associate Professor)
	KUWATA, Mikinori	(Peking University,Assistant Professor)
	MATSUMI, Yutaka	(Institute for Space–Earth Environmental Research, Nagoya University,Professor)
	MIZUNO, Kei	(Center for Southeast Asian Studies, Kyoto University,Affiliated Associate Professor)
	MONDA, Yukako	(Graduate School of Agriculture, Kyoto University,Researcher)
	MUHAMMAD, Ahmad	(Riau University,Lecturer)
	NAKAGAWA, Hikaru	(Center for Southeast Asian Studies, Kyoto University,Assistant Professor)
	OGAWA, Mariko	(Center for Southeast Asian Studies, Kyoto University,Assistant Professor)
	OHASHI, Masafumi	(Kagoshima University,Associate Professor)
	TONOKURA, Kenichi	(Graduate School of Frontier Sciences, University of Tokyo,Professor)
	UEDA, Kayo	(Graduate School of Engineering, Kyoto University,Associate Professor)
	WATANABE, Kazuo	(Center for Southeast Asian Studies, Kyoto University,Affiliated Associate Professor)

The International Research Group

○	NAITO, Daisuke	(Graduate School of Agriculture / Center for Southeast Asian Studies, Kyoto University,Associate Professor)
○	ABE, Kennichi	(Research Institute for Humanity and Nature,Professor)
	DE JONG, Wil	(Center for Southeast Asian Studies, Kyoto University,Professor)
	ISHIKAWA, Noboru	(Center for Southeast Asian Studies, Kyoto University,Professor)
	SASAKI, Katsunori	(FoE Japan,Team Leader)

○ Future Themes

RESEARCH PLAN

a) Integrated socio-ecological and fire studies at Tanjung Leban. The mapping of the land to aid peatland rehabilitation, water management and paludiculture will be combined with a socio-economic household survey. This survey will pertain to the improvement of livelihood, socio-economic conditions such as the land titleship, the income of households and educational backgrounds in relation to the participation of people in the rehabilitation program, with the goal of identifying the effects of the rehabilitation program.

b) An environmental policy decision and its implementation by the new governor in Riau Province. In June 2018, the election for local governor was held in Riau province, with Syamsuar, who is a regent of Siak district having been elected for the upcoming term. He has made progress tackling environmental problems, surpassing the former governor who propelled the industrial development of peatlands in the province. It is an important task to explore the dynamics of environmental policies implemented by the new governor after March 2019 and clarify the structure of the governance of the environment at the provincial level.

c) Counter-mapping in the village of Rantau Baru, Pelalawan district. A sub-group of the Community, Corporate and Governance group has arranged the production of a peatland map, with many villagers participating in the process in collaboration with local NGOs. This practice of action research is intended to reinforce the villagers' land rights. We will clarify the processes of how counter-mapping stimulates the villagers' motivations towards obtaining land rights and how the district government and acacia/oil palm companies are reacting to the movement.

d) Comparative analysis of rescued rainfall data before and after deforestation. We have started digitalizing 19th century Dutch colonial data catalogued in "Regenwaarnemingen in Nederlandsch-Indie". We will analyse and compare them with operational (BMKG) data after deforestation (since the 1970s). We will also search for other climatological data and disaster records at the Dutch-Indonesian national archives.

e) Rainfall variabilities of annual/diurnal cycles and El Niño. We have started analysing the interannual/interlocal variabilities of seasonal cycles of rainfall in Sumatra up to the Independence Era (1930s-60s). We will also analyse the diurnal cycles with a predawn peak of rainfall in Riau based on satellite observations. We will make drought cautions, based on these analyses and climate predictions alongside meteorological agencies/institutes.

f) Radar hydrology and forest fire prevention. We have adopted a radar station at Sepahat fire-watch tower in Bukit Batu, Bengkalis, Riau, with the official clearance for radar installation from the local government (BPBD) of Bengkalis. We will start the continuous operation of radar observations following installation in collaboration with central-government agencies (BPPT and BRG).

g) Change in forest properties and tree species traits according to soil type transitions from tropical heath to peat swamp forests We had conducted a permanent-plot census and architectural trait analysis for dominant tree species and understood the difference in forest dynamics between tropical heath and peat swamp forests in Central Kalimantan. We will establish a series of plots according to soil type transitions from tropical heath and peat swamp forests and clarify the environmental factors to explain the change of forest properties and tree species traits between these two types of forests.

h) The relationship between species composition and environmental factors after the burning of grasslands in Indonesian peatlands. Since 2014, we have continued researching relationships between grassland communities and environmental factors following the burning of peatlands in several villages within Bengkalis Regency, Riau Province in Sumatra. We have identified several grassland communities from field research and statistical analysis, and clarified the relationship between these communities, as well as several environmental factors such as ground water level and water chemistry. We will extend our subject of study to various disturbed peatlands which have different level of disturbance severity and successional levels. We are also expanding our research area widely and test our results throughout the whole of Indonesia. Finally, we will come to general conclusions and plan a scenario for the recovery of disturbed peatlands in Indonesia.

i) Validation of land suitability for forest rehabilitation and the selection of native species for the rehabilitation of disturbed peatlands. We will establish the method to identify the land which is suitable for forest rehabilitation at the disturbed peatland. And, using experimental methods, we will clarify the ecological traits of native tree species found on-site produced by environmental adaptation and select the suitable species for forest rehabilitation there.

j) International comparative study on the current status, forest management and rehabilitation methods within tropical peatlands. We will conduct a written study on the current status of tropical peatlands and an international comparative study for forest management and the rehabilitation of it.

k) Management and strategies of oil palm and timber plantation’s companies in relation to the peatland use or peatland rehabilitation programs, and also their participation in the industrialization program for the down-stream industry. Impacts of oil palm and timber plantation’s activities to the Indonesian macro economy will be studied.

●Achievements

○Books

【Chapters/Sections】

- OKAMOTO, M. 2019,07. 永井史男・岡本正明・小林盾 (ed.) 東南アジアにおける地方ガバナンスの計量分析：タイ、フィリピン、インドネシアの地方エリートサーベイから. シリーズ転換期の国際政治. (in Japanese)
- HONNA, J. 2019 Civil-Military Relations in an Emerging State: A Perspective from Indonesia’s Democratic Consolidation. Keiichi Tsunekawa and Yasuyuki Todo (ed.) Emerging States at Crossroads. Springer Open, pp.255-270.
- OKAMOTO, M. 2019 セキュリティ民営化とインフォーマルな国家統制. 田村克己 8. 土佐桂子 (ed.) 転換期のミャンマーを生きる:「統制」と公共性の人類学. 風響社. (in Japanese)
- OKAMOTO, M. 2019 地方. 川中豪・川村晃一 (ed.) 教養の東南アジア近現代史. ミネルヴァ書房. (in Japanese)
- KOZAN, O. 2019 Trend Analysis of Rainfall Characteristics in the Kemena and Tatau River Basins, Sarawak. Anthropogenic Tropical Forests: Human–Nature Interfaces on the Plantation Frontier. Springer.

・SATO, Y. 2019 Reemerging Developmental State in Democratized Indonesia. Y.Takagi, V.Kanchoochat, and T.Sonobe (ed.) Developmental State Building: The Politics of Emerging Economies. Springer.

○**Papers**

【Original Articles】

・ISHIKURA K, HIRATA R, HIRANO T, OKIMOTO Y, WONG GX, MELLING L, AERIES E, KIEW F, LO K, MUSIN K, WAILI J, ISHII Y 2019,12 Carbon Dioxide and Methane Emissions from Peat Soil in an Undrained Tropical Peat Swamp Forest . *Ecosystems* 22(8):1852-1868. DOI:doi.org/10.1007/s10021-019-00376-8 (reviewed).

・CHEN, J., LEE, W.-C., ITOH, M., KUWATA, M. 2019,07 A Significant Portion of Water-Soluble Organic Matter in Fresh Biomass Burning Particles Does Not Contribute to Hygroscopic Growth: An Application of Polarity Segregation by 1-Octanol–Water Partitioning Method . *Environmental Science & Technology* 53(17):10034-10042. DOI:doi:10.1021/acs.est.9b01696 (reviewed).

・AS-SYAKUR, A. R., K. IMAOKA, K. OGAWARA, M. D. YAMANAKA, T. TANAKA, Y. KASHINO, I W. NUARSA and T. OSAWA 2019,10 Analysis of spatial and seasonal differences in the diurnal rainfall cycle over Sumatera revealed by 17-year TRMM 3B42 dataset. *SOLA* 15:216-221. DOI:DOI:10.2151/sola.2019-039 (reviewed).

・MIZUNO, K. 2019,08 21 世紀のインドネシア経済――スハルト政権後 20 年間の変容. *同志社大学人文科学研究所『社会科学』* 49(2):1-28. (in Japanese) (reviewed).

・YAMANAKA, M.D. 2019,07 水際・国際・学際: 「海大陸」海岸泥炭地が決める地球の気候. *水文・水資源学会誌* 32(4):189-200. DOI:DOI:10.3178/jjshwr.32.189 (in Japanese) (reviewed).

・OKAMOTO, M. 2019,07 インドネシアのジャワの非政治的官僚の政治化. 東南アジアにおける地方ガバナンスの計量分析：タイ、フィリピン、インドネシアの地方エリートサーベイから. pp.109-126. (in Japanese)

・SUNAHARA, Y., OKAMOTO, M. 2019,07 インドネシア地方自治体における政治的リーダーシップ、地方官僚制、及び自治体パフォーマンス. 永井史男, 岡本正明, 小林盾 編著 (ed.) 東南アジアにおける地方ガバナンスの計量分析-タイ，フィリピン，インドネシアの地方エリートサーベイから. pp.205-224. (in Japanese)

・OKAMOTO, M. 2019,07 東南アジアにおける地方政治研究と政治王国論. 東南アジアにおける地方ガバナンスの計量分析：タイ、フィリピン、インドネシアの地方エリートサーベイから. pp.27-48. (in Japanese)

・MIZUNO, K., Rahmat Saleh 2019,07 Nationalism, Globalization, and Transnational Movement: A Case of Oil Palm Plantation Business in Indonesia. *MASYARAKAT Jurnal Sosiologi* 24(2):211-237. (reviewed).

・LEE, W.-C., CHEN, J., BUDISULISTIORINI, S., ITOH, M., SHIODERA, S., KUWATA, M. 2019,06 Polarity-Dependent Chemical Characteristics of Water-Soluble Organic Matter from Laboratory-Generated Biomass-Burning Revealed by 1-Octanol–Water Partitioning . *Environmental Science & Technology* 53(14):8047-8056. DOI:doi:10.1021/acs.est.9b01691 (reviewed).

・MARRYANNA, L., NOGUCHI, S., KOSUGI, Y., NIIYAMA, K., ITOH, M., SATO, T., TAKANASHI, S., SITI-AISAH, S., ABD-RAHMAN, K. 2019,05 SPATIAL DISTRIBUTION OF SOIL MOISTURE AND ITS INFLUENCE ON STAND STRUCTURE IN A LOWLAND DIPTEROCARP FOREST IN PENINSULAR MALAYSIA . *Journal of Tropical Forest Science* 31(2):135-150. DOI:doi:10.26525/jtfs2019.31.2.135150 (reviewed).

・DAS, R., WANG, X., ITOH, M., SHIODERA, S., KUWATA, M. 2019,05 Estimation of Metal Emissions From Tropical Peatland Burning in Indonesia by Controlled Laboratory Experiments . *Journal of Geophysical Research: Atmospheres* 124(12):6583-6599. DOI:doi.org/10.1029/2019JD030364 (reviewed).

・KAJITA,R. 2019,05 Reconstruction of Historical Rainfall Records in24 Observation Stations in Sumatera, 1879-1900. *Discussion Paper Series, Tropical Peatland Society Project*(7):1-20. (in Japanese)

・D, BACHRIADI 2019 Reforma Agraria dan Transisi Agraria. *Working Paper ARC No. 03/WP-KTA/2019*. (Other)

・D, BACHRIADI 2019 Lika-liku Pencaplokan Tanah untuk Kilang Minyak di Jawa Pasca Reformasi. *Working Paper ARC No. 02/WP-KAPPOB/II/2018*. (Other)

・D, BACHRIADI 2019 Panas Tak Sampai Petang: Reforma Agraria yang Dipandu Hutang di Indonesia. *Working Paper ARC No. 03/WP-KAPPOB/II/2018*. (Other)

○Research Presentations

【Oral Presentation】

・棚田優祐, 田代晃一朗, 伊與田浩志, 西田耕介, 中内崚河, 梅川豊文, KAWASAKI, M. 光ファイバを用いたレーザ吸収分光法によるオーブン庫内湿度測定装置の開発. 第 40 回 日本熱物性シンポジウム, 2019.10.28-2019.10.30, 長崎ブリックホール. (in Japanese)

・MIZUNO, Kosuke Commitment and Entitlement Approach For Land Rights. ICESSD 2019 School of Environmental Science, University of Indonesia, 2019.10.22, Sari Pacific Jakarta.

・MIZUNO, Kosuke The establishment of the State Forest system and its Hostility to Local people. ICESSD 2019,School of Environmental Science, University of Indonesia, 2019.10.22, Sari Pacific Jakarta.

・YAMANAKA, M. D. Gambut Riau dan iklim dunia. Workshop Pemanfaatan Radar untuk Pemantauan Dinamika Atmosfer dan Dispersi Asap Wilayah Bengkalis dan Sekitarnya, 2019.10.17, Bengkalis, Riau, Indonesia. (Other)

・KOZAN Osamu Academic Series Seminars & Distinguished Lectures. Centennial Celebration of NCHU-KU (Kyoto University), 2019.09.24, National Chung Hsing University.

・MATSUMI, Y.,関口和彦、林田佐智子、KAWASAKI, M., NAITO, D., KOZAN, O., 山崎高幸、岡本渉、中山智喜 開発した小型 PM2.5 計測器のアジア各国での観測結果：ベトナム、インド、インドネシア、モンゴル、マレーシアなど. 第 60 回大気環境学会年会, 2019.09.18-2019.09.20, 東京農工大（府中）. (in Japanese)

・Muhammad Arif RAHMAN, Manabu D. YAMANAKA, Masahiro KAWASAKI, Devis Styo NUGROHO, Yutaka MATSUMI, Masafumi OHASHI, Hiroyuki HASHIGUCHI, Shuichi MORI, Osamu KOZAN, WEATHER RADAR DETECTION OF TROPICAL MIXED-LAYER TOP CAPPING FOREST-FIRE SMOG OVER MARITIME-CONTINENT PEATLAND. 39th International Conference on radar meteorology, 2019.09.16-2019.09.20, Nara, Japan.

・MIZUNO, Kosuke Comments on the paper ‘Making Economic Policy in an Illiberal Era: The Southeast Asian Experience’ by M. Chatib Basri and Hal Hill. Thirtieth AEPR Conference, 2019.09.14, Nikkei Building, Seminar Room.

・SATO, Y. ASEAN 地域における日本企業の現状と課題. 経済同友会アジア委員会, 2019.09.10. (in Japanese)

・YAMANAKA, M. D. Evolution of tropical coastal triple boundary zone as biosphere and anthroposphere. AsiaPEX Kickoff Conference, 2019.08.28-2019.08.30, Sapporo.

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Stage: Full Research

Project Name: Research and Social Implementation of Ecosystem-based Disaster Risk Reduction as Climate Change Adaptation in Shrinking Societies

Abbreviated Title: Eco-DRR project

Project Leader: YOSHIDA Takehito

Program 1: Societal Transformation under Environmental Change

URL: https://www.facebook.com/EcoDRR2018/

Key Words: Ecosystem-based Disaster Risk Reduction

○ Research Subject and Objectives

Problem, background, and objectives

Climate change is ongoing and projected to intensify in the future, and its impacts expand to various natural and human systems (IPCC 2014). Among the impacts, this project focuses on natural disasters, and it aims to contribute to the adaptation strategy of reducing and managing the risks of natural disasters. The risk of climate change or natural disaster results from the interaction among climate-related hazard, exposure, and vulnerability of human activities (IPCC 2012, 2014), so that adaptation to the natural disaster risk can be realized by diminishing exposure (by improving land use) and vulnerability to hazard. Our project mainly focuses on land use in order to lower the disaster risk.

Existing hard-engineering countermeasures against natural disasters have target safety levels, below which natural disasters can be prevented. Although these countermeasures are effective if the hazard level of natural disaster is below the target safety level, we are increasingly being faced with the situation, in which the hazard level goes well beyond the safety level, resulting in a devastating natural disaster. Also, conventional countermeasures are sometimes criticized for negatively affecting the natural environment and biodiversity that supply multiple ecosystem services supporting our livelihood. Eco-DRR (Ecosystem-based Disaster Risk Reduction) approaches focus on lowering the exposure of human activities to the hazard of natural disasters, by which the losses and damages of natural disasters can be reduced, if not prevented. Eco-DRR approaches take advantage of the multi-functionality of ecosystems, including their capacity to mitigate disasters while providing multiple ecosystem services (e.g. Convention on Biological Diversity 2015, UN Office for Disaster Risk Reduction 2015, Ministry of the Environment (MOE) Japan 2016). Thus, Eco-DRR approaches complement the existing conventional approaches against natural disasters, although the effectiveness and multi-functionality of Eco-DRR are not yet clearly and quantitatively understood (Science Council of Japan 2014, The Royal Society 2014).

Japan is facing aging and shrinking population, and it is leading to the abandonment of farmlands, houses, and other intensive land use, providing an opportunity for improving land use (e.g. Ministry of Land, Infrastructure, Transport and Tourism (MLIT) Japan 2015). The population of Japan increased substantially over the last century, making the risk of natural disasters larger and spreading wider. Evaluating the past change of natural disaster risks provides valuable information when considering the adaptation not only in Japan but also in other countries.

Given the above background, this project sets the two main goals.

Goal 1. Developing the methodology of evaluating the multi-functionality of Eco-DRR in terms of reducing natural disaster risks and other ecosystem services, and assessing Eco-DRR by comparing the multi-functionality between the past, the present, and the future.

Goal 2. Supporting the implementation of Eco-DRR through transdisciplinary approaches in collaboration with local communities, governments, the insurance industry, and other stakeholders.

Methodology, structure, and schedule

Three research components (described below) contribute to achieving the above two goals with the spatial scales of research.

Research component 1) Visualizing the risks of natural disasters in the present and the past

The risk components of hazards, exposure, and vulnerability for different natural disasters will be analyzed on the GIS, and then the risks of natural disasters in terms of monetary loss and the number of victims will be evaluated and visualized as the risk maps for the present and the past. By comparing the maps between the present and the past, temporal changes of the natural disaster risks will be examined, and modeling the risk for the different scenarios of exposure will contribute to assessing Eco-DRR.

Research component 2) Evaluating and modeling multi-functionality of Eco-DRR

Provisioning, regulating, and cultural ecosystem services will be evaluated on the GIS, and their spatial distribution will be modeled in relation to population distribution and land use patterns. The model will be used for evaluating the ecosystem services for different land-use scenarios to assess the potential of Eco-DRR.

Research component 3) Transdisciplinary approaches for implementing Eco-DRR in the society

Together with local stakeholders, transdisciplinary platforms will be formed at each of the local research sites by taking advantage of existing platforms. This transdisciplinary platform will function to deepen the understanding, discuss the future options, and build a consensus of the use of Eco-DRR. Multi-functionality of Eco-DRR at each local site will be evaluated and the research outcomes will be shared with local stakeholders using the transdisciplinary platform. In addition, traditional and local knowledge of Eco-DRR will be inventoried and evaluated for the multi-functionality to be shared with the general public.

In collaboration with insurance industry, a research forum will be formed to discuss the possibility and feasibility of what insurance industry can contribute to develop economic incentives of Eco-DRR. Also, various laws and institutions in national and local governments related to disaster risk reduction and land use will be assessed in the research forum as well.

Expected results

Visualization of the present status, historical changes and future scenarios of natural disaster risks and utilization of Eco-DRR will help us understand what and where natural disaster risks exist in relation to land use, how we happened to have the risks historically, and what options we have in the future. Our project also contributes to consensus building and developing social and economic incentives to promote and conserve Eco-DRR approaches by collaborating with diverse stakeholders in local communities, governments and insurance industry.

Project organization and membership

The research components 1 to 3 will be conducted by the groups and sub-groups. The total number of project members now count about 120.

Contribution to the program

Our project is affiliated with the Program 1 “Societal Transformation under Environmental Change” that aims at providing realistic perspectives and options to facilitate the transformation towards a society that can flexibly respond to environmental changes and natural disasters.

Even in the highly developed countries such as Japan, natural disasters frequently occur and cause devastating losses and damages in human society, and there is a continuing trend of natural disasters caused by storms and typhoons, and heavy rain under the ongoing climate change. Eco-DRR approaches focus on lowering the exposure of human activities to the hazard of natural disasters, by which the losses and damages of natural disasters can be reduced, if not prevented. Eco-DRR approaches take advantage of the multi-functionality of ecosystems, including their capacity to mitigate disasters while providing multiple ecosystem services. Thus, Eco-DRR approaches complement the existing conventional approaches against natural disasters, although the effectiveness and multi-functionality of Eco-DRR are not yet clearly and quantitatively understood. Our project aims at deepening the understanding of Eco-DRR in an interdisciplinary way combining natural and social sciences, and contributes to the Program 1 by addressing the links between natural disasters and social issues including declining population.

Land use and land ownership are the key issue for the social implementation of Eco-DRR, and they are the most challenging issue when we discuss the future options and build the consensus of Eco-DRR at each local research site. Our project aims at understanding the history of land use change and examining the future scenarios of land use under the conditions of climate change and shrinking population, in relation to the laws and institutions associated with land use and land ownership. Land ownership right in conformity with public welfare is described in the current constitution of Japan (Article 29) as well as in the former Meiji constitution, but the actual relationship between land ownership right and public welfare on the ground should be reviewed and assessed in light of disaster risk reduction and multi-functionality of land. Social transformation with regard to land use and land ownership will be considered in our project, which suggests the strong link between our project and the Program 1. The Program 1 has been having discussions with seminar talks by internal and external researchers on land use and land ownership, and we would like to continue contributing to it.

○ Progress and Results in 2019

Research component 1) Visualizing the risks of natural disasters in the present and the past

The methodology for evaluating and visualizing the risks of natural disasters in the present and the future was developed by examining the existing and new data sets of hazards, exposure and vulnerability. As a trial case, we evaluated the risk of flood in terms of potential economic losses and the number of potential victims at a prefecture scale of Shiga (Figure S4, S5, S6), as we will eventually evaluate and visualize the risks of natural disasters at a country-wide scale in Japan. Multiple data sets of flood hazard, exposure information including population, land use and buildings (micro-geodata), and vulnerability estimates based on the standard manual by the MLIT are combined on the GIS to estimate the potential socio-economic loss of river flood. Future challenges exist in estimating the river flood at a country-wide scale, applying the method to different types of natural disasters (landslide and coastal flood), etc.

Research component 2) Evaluating and modeling multi-functionality of Eco-DRR

The existing methodologies for evaluating and modelling ecosystem services were assessed to decide which methodology can be used for this project. Parameters and land use data sets have been reviewed and collected to be used for our analysis. As a trial case, we evaluated several ecosystem services (regulating services) at a country-wide scale of Japan (Figure S7). In addition, for the scenario analysis that will be conducted at the next step, we examined the methodology of land use change modelling at a prefecture scale of Shiga and examined the BAU (Business As Usual) and several land use policy cases (Figure S8) and its relationship with flood risk.

In order to visualize the multi-functionality of the current land use, we have to integrate the research outcomes of the Research components 1 & 2. To facilitate the data integration, we developed a new working group (Scenario WG) in the late FR2 period.

Research component 3) Transdisciplinary approaches for implementing Eco-DRR in society

We conducted research and actions for implementation of Eco-DRR at three local research sites of Shiga, Fukui and Chiba and at the country-wide scale of Japan.

At the Fukui site, our research and actions have been linked to the existing ecological restoration actions by collaborating with the Mikatagoko Nature Restoration Committee (in which diverse local stakeholders participate) and the Fukui Prefecture government, and by adding disaster risk reduction components we have been trying to implement Eco-DRR at this site. We evaluated the ecological impacts of a trial measure of shoreline restoration using traditional techniques, and the research outcomes were used to incorporate the traditional measure into the guideline of future shoreline restoration by the Mikatagoko Nature Restoration Committee (Figure S9). Other ongoing research includes evaluating the relationship among the current land use, disaster risks and biodiversity, analysing the historic relationship between natural disasters and natural resource use, inventory of local residents' experiences of natural disasters.

At the Shiga site, our research and actions have been linked to the existing disaster risk reduction actions by collaborating with the local communities in the Hira mountain area and the Shiga Prefecture government, and by adding ecological components we have been trying to implement Eco-DRR at this site. We have been evaluating the effectiveness of traditional measures of disaster risk reduction (open levees, forest reserves, and stone fences), local biodiversity and natural resource use, and their linkages (Figure S10). Other ongoing research includes the historical relationship between land use and disaster risks, the relationship between urban planning of municipalities and flood risk, etc.

At the Chiba site, our research and actions have been linked to the existing watershed management actions by collaborating with the local stakeholders including those of the Lake Inbanuma Watershed Management Committee, and we have been trying to implement Eco-DRR within the framework of watershed management at this site. Functions of flood mitigating, nutrient removal, and habitat formation for diverse organisms of "yatsu" wetlands (developed at the bottom of small valley) have been studied, and the research outcomes are used for the guideline of management and restoration of "yatsu" functions (to be released soon) (Figure S11). Other ongoing research includes examining functions of grasslands developed on upland areas, environmental economic analysis of the values of flood mitigation, water quality improvement, and environmental education.

At these sites and others in Saga, Toyama and Tohoku areas, the traditional and local knowledge of Eco-DRR including the history of land use management, flood and landslide control measures built during the Edo period, management of shelter woods around houses, etc. have been collected (Figure S9). These traditional and local knowledge of Eco-DRR will be made accessible to the general public by publishing a series of booklets to facilitate the understanding of these knowledge. The first book of the series was published in the summer of 2019 as the forms of printed book and e-book available at the RIHN site (Figure S12).

As for the economic incentives, we examined the feasibility of natural disaster insurance to stimulate the implementation of Eco-DRR by comparing the insurance systems of different countries, and found that the current insurance system of Japan is not likely to be a good incentive in this case, although those of other countries also have different difficulties. Financial schemes (parametric insurance and resilience bond) to secure the investment for Eco-DRR were also studied by analyzing the leading examples in Mexico and California. Various laws and institutions of the Japanese government have also been examined.

General activities

We had a general meeting of the project in October 2019 and about 50 project members joined to share the research results and discuss the future research plans. In advance of the general meeting, we had a meeting for the core group, with which leaders and sub-leaders of research groups are affiliated. Another meeting of the core group will be held in March 2020.

The international affairs sub-group contributed to discussions and negotiations relating to Eco-DRR and publications including guidelines in various international organizations such as UN Global Platform on DRR, G20 Climate Sustainability Working Group, Risk KAN of Future Earth, Partnership for Environment and Disaster Risk Reduction, IUCN, the Ramsar Convention, the Convention on Biological Diversity, Japan International Cooperation Agency etc.

○Project Members

◎ YOSHIDA, Takehito (Research Institute for Humanity and Nature (RIHN) & Department of General Systems Studies, University of Tokyo,Associate Professor,Project management, Transdisciplinary platforms, TLK research)

○ AIBA, Masahiro (Research Institute for Humanity and Nature (RIHN),Specially Appointed Associate Professors,Forest Ecology)

Group 1 (Natural disaster risk assessment)

○ ICHINOSE, Tomohiro (Faculty of Environment and Information Studies, Keio University,Professor,Visualizing and modelling risks of natural disasters, Transdisciplinary platforms)

○ SHIBASAKI, Ryosuke (Center for Spatial Information Science, University of Tokyo,Professor,Visualizing and modelling risks of natural disasters)

○ AKIYAMA, Yuki (Center for Spatial Information Science, University of Tokyo,Assistant Professor,Visualizing and modelling risks of natural disasters)

○ UEHARA, Misato (Shinshu University,Associate Professor,Visualizing and modelling risks of natural disasters)

AKASAKA, Takumi (Department of Life Science and Agriculture, Obihiro University of Agriculture and Veterinary Medicine,Assistant Professor,Visualizing and modelling risks of natural disasters)

ITAGAWA, Satoru (Faculty of Environment and Information Studies, Keio University,Project Researcher,Visualizing and modelling risks of natural disasters)

IMAI, Yota (Tokushima University,Graduate Student,Visualizing and modelling risks of natural disasters, Transdisciplinary platforms)

IMOTO, Ikuko (Keio Research Intsitute at SFC,Senior Researcher,Visualizing and modelling risks of natural disasters)

KAMADA, Mahito (Tokushima University,Professor,Transdisciplinary platforms)

HUANG, Wanhui (Research Institute for Humanity and Nature,Researcher,Regional Environmental Studies, GIS)

TAKAHASHI, Seiichiro (LPD Landscape Planning & Design inc.,Technical advisor,Landscape architecture)

TAKI, Kentaro (The University of Shiga Prefecture,Associate Professor,Transdisciplinary platforms, Visualizing and modelling risks of natural disasters, Developing incentives and institutions)

NAGAI, Masahiko (Center for Spatial Information Science, University of Tokyo,Project Associate Professor,Evaluating and modelling multi-functionality, Developing incentives and institutions)

NAKAMURA, Futoshi (Hokkaido University,Professor,External advisor)

FURUTANI, Tomoyuki (Faculty of Policy Management, Keio University,Professor,Visualizing and modelling risks of natural disasters)

FURUMAI, Hiroaki (Graduate School of Engineering, University of Tokyo,Professor,Visualizing and modelling risks of natural disasters)

MUTO, Yasunori (Tokushima University,Professor,Visualizing and modelling risks of natural disasters, Transdisciplinary platforms)

MURAKAMI, Akinobu (Faculty of Engineering, Information and Systems, University of Tsukuba,Associate Professor,Visualizing and modelling risks of natural disasters, Developing incentives and institutions)

YAMADA, Yumi (Keio University,Extraordinary scientist,Visualizing and modelling risks of natural disasters, Transdisciplinary platforms)

Group 2 (Multifunctionality evaluation)

○ SAITO, Osamu (United Nations University, Institute for the Advanced Study of Sustainability (UNU-IAS); Graduate School of Agricultural and Life Sciences, University of Tokyo,Academic Director, Academic Program Officer; Visiting Associate Professor,Evaluating and modelling multi-functionality)

○ HASHIMOTO, Shizuka (Graduate School of Agricultural and Life Sciences, University of Tokyo,Associate Professor,Evaluating and modelling multi-functionality)

ITO, Motomi	(Graduate School of Arts and Sciences, University of Tokyo,Professor,Evaluating and modelling multi-functionality)
Ogawa, Keishi	(Graduate School of Agricultural and Life Sciences, University of Tokyo,Graduate Student,Farm Business Management and Rural Development)
KURASHIMA, Osamu	(Graduate School of Arts and Sciences, University of Tokyo,Project Researcher,Evaluating and modelling multi-functionality)
HUANG, Wanhui	(Research Institute for Humanity and Nature,Researcher,Regional Environmental Studies, GIS)
TSUCHIYA, Kazuaki	(Graduate School of Agricultural and Life Sciences, University of Tokyo,Assistant Professor,Evaluating and modelling multi-functionality)
HARASHINA, Koji	(Faculty of Agriculture, Iwate University,Associate Professor,Evaluating and modelling multi-functionality)
HORI, Keiko	(United Nations University, Institute for the Advanced Study of Sustainability (UNU-IAS),Research Asistant,Environment creation studies, Sustainability science)
MATSUI, Takanori	(Osaka University,Assistant Professor,Evaluating and modelling multi-functionality)
MANAGI, Shunsuke	(Faculty of Engineering, Kyushu University,Professor,Transdisciplinary platforms, Developing incentives and institutions)
MIYASHITA, Tadashi	(Graduate School of Agricultural and Life Sciences, University of Tokyo,Professor,Evaluating and modelling multi-functionality)
MORI, Akira	(Yokohama National University,Associate Professor,Evaluating and modelling multi-functionality, International affairs)
YAGI, Hironori	(Graduate School of Agricultural and Life Sciences, University of Tokyo,Associate Professor,Evaluating and modelling multi-functionality)
YAGI, Nobuyuki	(Graduate School of Agricultural and Life Sciences, University of Tokyo,Associate Professor,Evaluating and modelling multi-functionality)
YAMAJI, Eiji	(Graduate School of Frontier Sciences, University of Tokyo,Professor,Evaluating and modelling multi-functionality)

Group 3 (Social implementation)･FUKUI subgroup

◎ YOSHIDA, Takehito	(Research Institute for Humanity and Nature (RIHN) & Department of General Systems Studies, University of Tokyo,Associate Professor,Project management, Transdisciplinary platforms, TLK research)
ISHII, Jun	(Fukui Prefectural Satoyama-Satoumi Research Institute,Researcher,Transdisciplinary platforms)
ICHINOSE, Tomohiro	(Faculty of Environment and Information Studies, Keio University,Professor,Visualizing and modelling risks of natural disasters, Transdisciplinary platforms)
UCHIDA, Kei	(Graduate School of Arts and Sciences, University of Tokyo,Project Researcher,Visualizing and modelling risks of natural disasters)
KASADA, Minoru	(Graduate School of Arts and Sciences, University of Tokyo,Project Researcher,Transdisciplinary platforms)
KITAGAWA, Junko	(Fukui Prefectural Satoyama-Satoumi Research Institute,Chief Scientist,Transdisciplinary platforms)
KOJIMA, Hideaki	(Wakasa Mikata Museum of Jomon Period,Curator,Transdisciplinary platforms)
SHINOHARA, Naoto	(Graduate School of Agricultural and Life Sciences, University of Tokyo,Graduate Student,Transdisciplinary platforms)
TAHARA, Daisuke	(Faculty of Marine Science and Technology, Fukui Prefectural University,Associate Professor,Fish Physiology and Ecology)
NAKAMURA, Ryo	(Fukui Prefectural Satoyama-Satoumi Research Institute,Researcher,Transdisciplinary platforms)
FUKUSHIMA, Mariko	(University of Tokyo,Graduate Student,Transdisciplinary platforms)
MIYAMOTO, Yasushi	(Fukui Prefectural Satoyama-Satoumi Research Institute,Researcher,Transdisciplinary platforms)
YAMADA, Yumi	(Keio University,Extraordinary scientist,Visualizing and modelling risks of natural disasters, Transdisciplinary platforms)

Group 3 (Social implementation)･SHIGA subgroup

○ FUKAMACHI, Katsue	(Graduate School of Global Environmental Studies, Kyoto University,Associate Professor,Transdisciplinary platforms, TLK research)
○ MIYOSHI, Iwao	(Kyoto Prefectural University,Assistant Professor,Transdisciplinary platforms)
○ TAKI, Kentaro	(The University of Shiga Prefecture,Associate Professor,Transdisciplinary platforms, Visualizing and modelling risks of natural disasters, Developing incentives and institutions)
AZUMA, Sachiyo	(The University of Shiga Prefecture,Associate Professor,Transdisciplinary platforms)
AYABE, Kaho	(Graduate School of Agriculture, Kyoto-University,Graduate Student,Landscape architecture)
ANDO, Koichi	(Graduate School of Agriculture, Kyoto-University,Graduate Student,Landscape architecture)

WANG, Wen	(Graduate School of Global Environmental Studies, Kyoto University,Graduate student,Landscape architecture)
OSAWA, Sotaro	(Graduate School of Engineering, Kyoto University,Graduate Student,Architecture)
OCHIAI, Chiho	(Graduate School of Global Environmental Studies, Kyoto University,Assistant Professor,Community disaster prevention, Community participation type disaster reconstruction)
ONITSUKA, Kenichiro	(Graduate School of Global Environmental Studies, Kyoto University,Assistant Professor,Rural planning studies, Rural informationization)
KATOH, Sadahisa	(Center for Global Partnerships and Education, Okayama University,Associate Professor,Transdisciplinary platforms)
KAMATANI, Kaoru	(College of Gastronomy Management, Ritsumeikan University,Associate Professor,Japanese history)
KUBOTA, Yoshiaki	(University of Toyama,Professor,Transdisciplinary platforms)
KOBAYASHI, Hirohide	(Kyoto University,Associate Professor,Transdisciplinary platforms)
SHIMADA, Kazuhisa	(The University of Shiga Prefecture,Associate Professor,Transdisciplinary platforms)
TAKAHASHI, Hiroki	(Otsu City Museum of History,Curator,Japanese history)
TAKAMURA, Noriko	(National Institute for Environmental Studies,Fellow,Transdisciplinary platforms)
NARITA, Mayu	(Graduate School of Engineering, Kyoto University,Graduate Student,Architecture)
NINOMIYA, Kento	(Gurauate School of Agriculture, Kyoto University,Graduate Student,Rural planning studies, Rural informationization)
NOMA, Naohiko	(School of Environmental Science, University of Shiga Prefecture,Associate Professor,Plant ecology)
HASHIMOTO, Shizuka	(Graduate School of Agricultural and Life Sciences, University of Tokyo,Associate Professor,Evaluating and modelling multi-functionality)
MIZUTANI, Shusuke	(Graduate School of Global Environmental Studies, Kyoto University,Graduate Student,Landscape architecture)
MIMASU, Yurika	(Lake Biwa Museum, Shiga Prefecture,Assistant Curator,Art)
MURAKAMI, Shuichi	(The University of Shiga Prefecture,Professor,Transdisciplinary platforms)
YAMAMOTO, Akiko	(Takashima city board of education,Supervisor,Regional history)
YAMAMOTO, Kiyotatsu	(University of Tokyo,Associate Professor,Transdisciplinary platforms)
WATANABE, Keiichi	(Lake Biwa Museum, Shiga Prefecture,Curator,Folkloristics)
WANG, Jingying	(Kyoto University Graduate School of Global Environmental Studies,Graduate Student,Traditional architecture)

Group 3 (Social implementation)･CHIBA subgroup

○	NISHIHIRO, Jun	(Toho University,Associate Professor,Transdisciplinary platforms)
○	SHOJI, Taro	(Toho University,Visiting Researcher,Transdisciplinary platforms)
	ONUMA, Ayumi	(Faculty of Economics, Keio University,Professor,Transdisciplinary platforms, Forum for natural disaster insurance)
	SHIBATA, Yuki	(Toho University,Associate Professor,Environpolitics)
	TSUGE, Takahiro	(Konan University,Professor,Transdisciplinary platforms, Developing incentives and institutions)
	HASEGAWA, Masami	(Toho University,Professor,Transdisciplinary platforms)
	SATAKE, Yasutaka	(Pacific Consultants Co.,LTD.,Disaster prevention)
	OGASAWARA, Shogo	(Pacific Consultants Co.,LTD.,Environmental policy)

Group 3 (Social implementation)･Incentive & Institution subgroup

○	URASHIMA, Hiroko	(Corporate Social Responsibility Section, Corporate Planning Department, MS&AD Insurance Group Holdings, Inc.,Section Head,Transdisciplinary platforms, Developing incentives and institutions)
○	NISHIDA, Takaaki	(Mitsubishi UFJ Research and Consulting Co., Ltd.,Deputy Chief Scientist,Developing incentives and institutions)
	IIDA, Akiko	(University of Tokyo,Assistant Professor,Transdisciplinary platforms, Developing incentives and institutions)
	ICHINOSE, Tomohiro	(Faculty of Environment and Information Studies, Keio University,Professor,Visualizing and modelling risks of natural disasters, Transdisciplinary platforms)
	ONUMA, Ayumi	(Faculty of Economics, Keio University,Professor,Transdisciplinary platforms, Forum for natural disaster insurance)
	OKANO, Takahiro	(Ministry of the Environment,Environment policy,Developing incentives and institutions)

KANIE, Yasumasa	(MS & AD Insurance Group Holdings, Inc.,Section Head,Transdisciplinary platforms, Developing incentives and institutions)
TAKI, Kentaro	(The University of Shiga Prefecture,Associate Professor,Transdisciplinary platforms, Visualizing and modelling risks of natural disasters, Developing incentives and institutions)
TAKEYA, Takako	(Mitsubishi UFJ Research and Consulting Co., Ltd.,Researcher,Developing incentives and institutions)
TSUGE, Takahiro	(Konan University,Professor,Transdisciplinary platforms, Developing incentives and institutions)
TSUCHIYA, Kazuaki	(Graduate School of Agricultural and Life Sciences, University of Tokyo,Assistant Professor,Evaluating and modelling multi-functionality)
HARAGUCHI, Makoto	(InterRisk Research Institute & Consulting, Inc.,Manager, Senior consultant,Developing incentives and institutions)
FUKAMACHI, Katsue	(Graduate School of Global Environmental Studies, Kyoto University,Associate Professor,Transdisciplinary platforms, TLK research)
MANAGI, Shunsuke	(Faculty of Engineering, Kyushu University,Professor,Transdisciplinary platforms, Developing incentives and institutions)
MURAKAMI, Akinobu	(Faculty of Engineering, Information and Systems, University of Tsukuba,Associate Professor,Visualizing and modelling risks of natural disasters, Developing incentives and institutions)
YOSHIDA, Takehito	(Research Institute for Humanity and Nature (RIHN) & Department of General Systems Studies, University of Tokyo,Associate Professor,Project management, Transdisciplinary platforms, TLK research)

Group 3 (Social implementation)･Traditional Local Knowledge subgroup

○ FUKAMACHI, Katsue	(Graduate School of Global Environmental Studies, Kyoto University,Associate Professor,Transdisciplinary platforms, TLK research)
AZUMA, Sachiyo	(The University of Shiga Prefecture,Associate Professor,Transdisciplinary platforms)
IBA, Chiemi	(Graduate School of Engineering, Kyoto University,Associate Professor,Architecture)
UCHIYAMA, Yuta	(Tohoku University,Researcher,Transdisciplinary platforms, TLK research, International affairs)
WANG, Wen	(Graduate School of Global Environmental Studies, Kyoto University,Graduate student,Landscape architecture)
OSAWA, Sotaro	(Graduate School of Engineering, Kyoto University,Graduate Student,Architecture)
OKU, Hirokazu	(University of Toyama Faculty of Art and Design,Associate Professor,Landscape architecture)
OGURA, Daisuke	(Graduate School of Engineering, Kyoto University,Professor,Architecture)
OCHIAI, Chiho	(Graduate School of Global Environmental Studies, Kyoto University,Assistant Professor,Community disaster prevention, Community participation type disaster reconstruction)
KAKINUMA, Kaoru	(Frontier Research Institute for Interdisciplinary Sciences, Tohoku University,Assistant Professor,Environmentology)
KAJIMA, Syuichiri	(Graduate School of Environmental Studies, Tohoku University,Graduate Student,Environpolitics, Environmental economics)
KAMATANI, Kaoru	(College of Gastronomy Management, Ritsumeikan University,Associate Professor,Japanese history)
KITAMURA, Keita	(Graduate School of Engineering, Kyushu University,Graduate Student,Watershed Management)
LUKMAN, Kevin M	(Graduate School of Environmental Studies, Tohoku University,Graduate Student,Forest community)
KOHSAKA, Ryo	(Graduate School of Environmental Studies, Tohoku University,Professor,Evaluating and modelling multi-functionality, International affairs)
KOBAYASHI, Hirohide	(Kyoto University,Associate Professor,Transdisciplinary platforms)
SAITO, Haruo	(University of Tokyo,Assistant Professor,TLK research)
SHIMADA, Kazuhisa	(The University of Shiga Prefecture,Associate Professor,Transdisciplinary platforms)
JAMIN, Celine	(Graduate School of Global Environmental Studies, Kyoto University,Graduate Student,Architecture)
TAKAHASHI, Hiroki	(Otsu City Museum of History,Curator,Japanese history)
TASHIRO, Ai	(Graduate School of Environmental Studies, Tohoku University,Researcher,Environmental epidemiology)
TSAI, Sunglun	(Graduate School of Global Environmental Studies, Kyoto University,Graduate Student,Architecture)
TERAMURA, Jun	(Graduate School of Engineering, Kyushu University,Researcher,Watershed Management)
NISHIJIMA, Kazuyoshi	(Disaster Prevention Research Institute Kyoto University,Associate Professor,Meteorology)
FUNAHASHI, Tomomi	(Graduate School of Global Environmental Studies, Kyoto University,Graduate Student,Ecosystem Conservation)

FURUTA, Naoya	(Taisho University; International Union for Conservation of Nature and Natural Resources(IUCN),Professor; Coordinator,International affairs, Developing incentives and institutions)
MIYAJI, Mari	(Graduate School of Global Environmental Studies, Kyoto University,Graduate Student,Architecture)
YAMAMOTO, Akiko	(Takashima city board of education,Supervisor,Regional history)
YOSHIDA, Takehito	(Research Institute for Humanity and Nature (RIHN) & Department of General Systems Studies, University of Tokyo,Associate Professor,Project management, Transdisciplinary platforms, TLK research)
WATANABE, Keiichi	(Lake Biwa Museum, Shiga Prefecture,Curator,Folkloristics)

International Address subgroup

○ FURUTA Naoya	(Taisho University; International Union for Conservation of Nature and Natural Resources(IUCN),Professor; Coordinator,International affairs, Developing incentives and institutions)
UCHIYAMA, Yuta	(Tohoku University,Researcher,Transdisciplinary platforms, TLK research, International affairs)
KAWASHIMA, Yutaka	(Japan International Cooperation Agency,Government Office,International affairs)
KOHSAKA, Ryo	(Graduate School of Environmental Studies, Tohoku University,Professor,Evaluating and modelling multi-functionality, International affairs)
HOTES, Stefan	(Faculty of Science and Engineering, Chuo University,Professor,Ecology)
MIYAZAKI, Hiroyuki	(Center for Spatial Information Science, University of Tokyo; School of Engineering and Technology, Asian Institute of Technology,Project Assistant Professor; Visiting Associate Professor,Visualizing and modelling risks of natural disasters, International affairs)
MORI, Akira	(Yokohama National University,Associate Professor,Evaluating and modelling multi-functionality, International affairs)
YAMAZAKI, Takashi	(JICA,Adviser,Forest policy)
RYO, Masahiro	(Free University of Berlin,Researcher,Watershed hydrology)

Adviser

□ KAYABA, Yuichi	(Public Works Research Institute,Senior Scientist,External advisor)
□ KURAMORO, Yosuke	(Ministry of the Environment Government of Japan,Specialist,Environmental administration)
□ SATO, Shigeyoshi	(Ministry of the Environment Government of Japan,Assistant Director,Environmental administration)
□ SHIMATANI, Yukihiro	(Kyushu University,Professor,External advisor)
□ TAKEUCHI, Kazuhiko	(Integrated Research System for Sustainability Science, University of Tokyo,Director and Professor,External advisor)
□ NAKAMURA, Futoshi	(Hokkaido University,Professor,External advisor)
□ WASHITANI, Izumi	(Department of Integrated Science and Engineering for Sustainable Society, Chuo University,Professor,External advisor)
□ SUGIHARA, Kaoru	(Research Institute for Humanity and Nature,Specially Appointed Professor,Economic History)
□ Nakashizuka, Tohru	(Research Institute for Humanity and Nature,Specially Appointed Professor,Forest ecology)
□ SAIJO, Tatsuyoshi	(Research Institute for Humanity and Nature,Specially Appointed Professor,Future Design)
□ MASUHARA, Naoki	(Research Institute for Humanity and Nature,Senior Researcher,Public Administration)
□ TANIGUCHI, Makoto	(Research Institute for Humanity and Nature,Professor,Hydrology)

○ Future Themes

Research component 1) Visualizing the risks of natural disasters in the present and the past

The risk components of hazards, exposure and vulnerability for different natural disasters (river flood, coastal flood and rainfall-induced landslides) will be analysed on the GIS by digitizing and integrating different source data (existing GIS data, various paper maps, government statistics, our own observation data, etc.). Then, the risks of different natural disasters in terms of monetary loss (according to the government manual, MLIT 2005) and the number of victims will be evaluated as the product of the components and visualized as the natural disaster risk maps. The risk maps for the present will cover the all area of Japan including. The future disaster risks will also be modeled as a function of land use and population distribution, and the future risks will be examined for different scenarios that will be constructed together with the research component 2.

Research component 2) Evaluating and modeling multi-functionality of Eco-DRR

Provisioning, regulating and cultural ecosystem services will be evaluated on the GIS by the existing and currently developing methods using the existing data and statistics, and our own observation data. Then, the spatial distribution of these

ecosystem services will be analysed and modelled in relation to the spatial distribution of population and land use. The model will be used for evaluating the change of ecosystem services for the different scenarios of land use to assess the potential multi-functionality of Eco-DRR together with the research component 1. The spatial range of this research covers the all area of Japan.

Research component 3) Transdisciplinary approaches for implementing Eco-DRR in society

Together with local stakeholders including residents, farmers, fishermen, NGOs and local government officials, transdisciplinary platforms are formed at each of the local research sites by taking advantage of existing platforms such as a nature restoration committee, a regional association and a watershed management committee. These transdisciplinary platforms are functioning to deepen the understanding, discuss the future options, and build the consensus of using Eco-DRR among local stakeholders. Research outcomes of the project are also shared in the platform. Depending on the consensus building in the platform, we will support the actual implementation of Eco-DRR by making policy recommendations, contributing to land use planning, etc.

We continue the inventory of traditional and local knowledge of Eco-DRR, and we will evaluate the multi-functionality using the methodology of the research components 1 and 2. We will publish the second and possibly third books of the series that will make the traditional and local knowledge of Eco-DRR accessible to the general public.

As for the economic incentives, we will continue the analysis of natural disaster insurance and some financial schemes in terms of the role of stimulating the implementation of Eco-DRR. Also, various laws and institutions of the national and local governments related to disaster risk reduction and land use will be further assessed to examine the possibility of using existing legal frameworks for the promotion of Eco-DRR and to find the gaps that the existing laws and institutions do not secure.

Integration of the research outcomes

As research outcomes of each group and sub-group accumulate, we started and continue discussions toward the integration into a single, common conceptual scheme in order to simulate further discussions on better research directions and to identify the research gaps that the present research plan is not covering. As a part of the integration, we developed a new working group focusing on the integration of outcomes of research components 1 & 2 and conducting scenario analysis in consideration of climate change and population decline.

●Achievements

○Books

【Chapters/Sections】

・Tomita R, Hasu Project (a NGO in Mikatagoko area), Yoshida T. 2019 Sharing Experiences and Associated Knowledge in the Changing Waterscape: An Intergenerational Sharing Program in Mikatagoko Area, Japan. Saito O. (ed.) *Sharing Ecosystem Services*. Science for Sustainable Societies, 7. Springer, Singapore, pp.87-115. DOI:10.1007/978-981-13-8067-9_5

○Editing

【Editing / Co-editing】

・Managi S. (ed.) 2019 Wealth, Inclusive Growth and Sustainability. 470pp. doi:10.4324/9780429400636

○Papers

【Original Articles】

・Matsui T, Haga C, Saito O, et al. 2019 Spatially explicit residential and working population assumptions for projecting and assessing natural capital and ecosystem services in Japan. *Sustainability Science* 14(1):23-37. DOI:10.1007/s11625-018-0605-y (reviewed).

・Yamada Y, Itagawa S, Yoshida T, et al. 2019 Predicting the distribution of released Oriental White Stork (*Ciconia boyciana*) in central Japan. *Ecological Research* 34(2):277-285. DOI:10.1111/1440-1703.1063 (reviewed).

・DasGupta R, Hashimoto S, Okuro T, Basu M. 2019 Scenario-based land change modelling in the Indian Sundarban delta: An exploratory analysis of plausible alternative regional futures. *Sustainability Science* 14(1):221-240. DOI:10.1007/s11625-018-0642-6 (reviewed).

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・Sahle M, Saito O, Fürst C, Yeshitela K. 2019 Quantifying and mapping of water-related ecosystem services for enhancing the security of the food-water-energy nexus in tropical data–sparse catchment. *Science of The Total Environment* 646:573-586. DOI:10.1016/j.scitotenv.2018.07.347 (reviewed).

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・Saito O, Kamiyama C, Hashimoto S, et al. 2019 Co-design of national-scale future scenarios in Japan to predict and assess natural capital and ecosystem services. *Sustainability Science* 14(1):5-21. DOI:10.1007/s11625-018-0587-9 (reviewed).

・Uehara M. 2019 Holistic Landscape Planning's Value for Natural Disaster Reconstruction: Willingness to Pay for New Residonce in Different Reconstruction Plannning Approaches. *International Journal of GEOMATE* 16(56):92-97. DOI:10.21660/2019.56.4601 (reviewed).

・Hori K, Kamiyama C, Saito O. 2019 Exploring the relationship between ecosystems and human well-being by understanding the preferences for natural capital-based and produced capital-based ecosystem services. *Sustainability Science* 14(1):107-118. DOI:10.1007/s11625-018-0632-8 (reviewed).

・Tashiro A, Uchiyama Y, Kohsaka R. 2019 Impact of Geographical Indication schemes on traditional knowledge in changing agricultural landscapes: An empirical analysis from Japan. *Journal of Rural Studies* 68:46-53. DOI:10.1016/j.jrurstud.2019.03.014 (reviewed).

・Saito O, Kobayashi T, Hiroi M, et al. 2019 Seasonal changes in the biomass of floating leaved plant, *Trapa* spp., and its relation with a leaf beetle, *Galerucella nipponensis*, in Lake Inba, Japan. *Limnology* 20(1):21-28. DOI:10.1007/s10201-018-0554-2 (reviewed).

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・Tashiro A, Kohsaka R. 2019 Universal Health Coverage: Healthcare system for Universal Health Coverage under Partnerships. Leal Filho W. (ed.) *Partnerships for the Goals*. *Encyclopedia of the UN Sustainable Development Goals*. Springer, Cham, DOI:10.1007/978-3-319-71067-9_18-1 (reviewed).

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・Tomita R, Hasu Project (an NGO in Mikatagoko area), Yoshida T. 2019 Sharing Experiences and Associated Knowledge in the Changing Waterscape: An Intergenerational Sharing Program in Mikatagoko Area, Japan. Saito O (ed.) *Sharing Ecosystem Services*. *Science for Sustainable Societies*. Springer, Singapore, pp.87-115. DOI:10.1007/978-981-13-8067-9_5

・Hein W, Wilson C, Lee B, et al. 2019 Climate change and natural disasters: Government mitigation activities and public property demand response. *Land Use Policy* 82:436-443. DOI:10.1016/j.landusepol.2018.12.026 (reviewed).

・Kim JY, Yano T, Nakanishi R, et al. 2019 Artificial wave breakers promote the establishment of alien aquatic plants in a shallow lake. *Biological Invasions* 21:1545-1556. DOI:10.1007/s10530-019-01915-z (reviewed).

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・Teramura J, Shimatani Y. 2019 Quantifying Disaster Casualties Centered on Flooding in the Chikugo River Middle Basin in the Past 400 Years to Determine the Historical Context of the July 2017 Northern Kyushu Torrential Rainfall. *Journal of Disaster Research* 14(8):1014-1023. DOI:10.20965/jdr.2019.p1014 (reviewed).

・Otake Y, Kagami M, Kuriyama T, Yoshida T. 2019 Spatial heterogeneity in induced defense of Brachionus calyciflorus within a single lake caused by a bed of floating-leaved macrophyte Trapa species. *Limnology* 20(1):29-38. DOI:10.1007/s10201-017-0534-y (reviewed).

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○Research Presentations

【Oral Presentation】

・Morimoto J, Aiba M, Furukawa F, et al. Assessment of windthrow risk by successive typhoons with heavy rain in northern Japan. *The 9th International Wind and Trees Conference*, 2020.02.24-2020.02.28, Rotorua, New Zealand.

・Ichinose T. Sustainable reconstruction from disasters based on natural capital in Aso region, Kumamoto Prefecture. *10th International Consortium of Landscape and Ecological Engineering*, 2019.10.31-2019.11.02, Seoul and Cheonan, Korea.

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・Ichinose T, Imoto I. Reforestation for disaster risk reduction and land-use changes in 100 years on Rokko Mountain, Kobe City, Japan. *8th World Conference on Ecological Restoration*, 2019.09.24-2019.09.28, Cape Town, South Africa.

・Muto Y, Yoshioka N, Miyoshi M, et al. Retarding Capacity Estimation of Wetland Paddy Fields Under Climate Change and Land Use Change. *38th IAHR World Congress*, 2019.09.01-2019.09.06, Panama City, Panama. DOI:10.3850/38WC092019-1265

・Ochiai C, Osawa S, Narita M. Conservation of Traditional Stone-Defense Called “Shishi-Gaki” against Wild Boar and Landslide: Case Study of 18th Century’s Structure at Hira Area of Shiga. *2019 International Conference Asia-Pacific Planning Societies*, 2019.08.22-2019.08.24, Seoul, Korea.

・Osawa S, Ochiai C. Stone Culture and Village of Minamikomatsu: Case Study from Minamikomatsu in Shiga prefecture, Japan. *2019 International Conference Asia-Pacific Planning Societies*, 2019.08.22-2019.08.24, Seoul, Korea.

・Narita M, Ochiai C. Transformation of Settlement Influenced by Water-Related Disasters: Case Study of Minamikomatsu Village in Shiga Prefecture. *2019 International Conference Asia-Pacific Planning Societies*, 2019.08.22-2019.08.24, Seoul, Korea.

- Nishihiro J, Kato H, Ohtsuki K, Kohzu A. Restored wetlands from abandoned-paddy can contribute to the climate change adaptation: conceptual study and some evidences from watershed of Lake Inbanuma, Japan. *2019 Society of Wetland Scientists-Asia Chapter and Korean Wetlands Society Joint Meeting*, 2019.08.19-2019.08.22, Suncheon City, Republic of Korea.
- Furuta N. Ecosystem Approaches as Nature-based Solutions for Climate Change Adaptation. *G20 Climate Sustainability Working Group (CSWG): 2nd Meeting 2019*, 2019.04.15-2019.04.17, Nagano City, Japan.

【Poster Presentation】

- Hashimoto S. Exploring alternative futures of biodiversity and ecosystem services from national to local scales. *10th International Consortium of Landscape and Ecological Engineering*, 2019.10.31-2019.11.02, Seoul and Cheonan, Korea.
- Huang W, Hashimoto S, Yoshida T, et al. A nature-based approach to mitigate flood risk improves ecosystem services provision in Shiga, Japan. *Ecosystem Service Partnership 10th world conference*, 2019.10.21-2019.10.25, Hannover, Germany.
- Kitagawa J, Seto K, Kojima H, et al. The climate condition and vegetation change by flood during the Late Yayoi period in Wakasa region, central Japan. *20th Congress of the International Union for Quaternary Research*, 2019.07.25-2019.07.31, Dublin, Ireland.
- Fukamachi K. Reduction of flood and sediment disaster risk using traditional knowledge of satoyama landscape on the west side of Lake Biwa, Japan. *10th International Association for Landscape Ecology World Congress*, 2019.06.01-2019.06.05, Milano, Itary.

【Invited Lecture / Honorary Lecture / Panelist】

- Hashimoto S. Exploring alternative futures of ecosystem services in Japan. *Interdisciplinary Symposium: Weaving Climate Change and Ecosystem Services with Big Data*, 2019.12.12, Seoul, Korea.
- Furuta N. Advancing Ecosystem based Disaster Risk Reduction as Nature based Solutions. *The 2nd ASEAN - Japan Meeting Point of Collaboration by Stakeholders and Researchers for Reducing Environmental Problems in ASEAN Countries*, 2019.12.11, Nay Pyi Taw, Myanmar.

Research Program2: Fair Use and Management of Diverse Resources

Program Director: NAKASHIZUKA Tohru

○ Research Subject and Objectives

Program Goal

Taking tradeoffs into account, this program provides multifaceted options to stakeholders involved in production, distribution, and consumption of resources, in order to realize fair use, optimal management, and wise governance of diverse resources including energy, water and ecological resources.

Mission

As has been pointed out in recent years by initiatives such as Future Earth, since global environmental problems are interlinked, it is not effective to attempt to solve isolated issues and co-design and co-production of results together with a range of stakeholders is essential. Recently, the nexus structure among energy, water and food has been emphasized as a resource issue, but in order to build a highly sustainable society, we need to safeguard humanity's base for survival through more comprehensive understandings that take into account not only these resources, but also ecological resources including ecosystem services and cultural resources. In particular, the comprehensive management of diverse resources, taking into consideration cultural resources that are related to high quality of life and spiritual abundance, has become important.

Resources are produced, circulated and consumed at different spatial scales by diverse stakeholders and throughout these processes there is a need for arrangements for fair use and management and methods for their evaluation. Also when considered as economic activities, the use of renewable natural resources is the key to the realization of a sustainable society and a transition of values and action from conventional thinking centered upon manufacturing capital towards an understanding of prosperity that includes hitherto externalized natural, human and social capital is needed. On the other hand, although in Asia large changes are occurring against the background of rapid economic growth, population increase and urbanization, also remaining are highly sustainable traditions of resource use that are culturally connected with the abundant subsistence base and that provide important suggestions for the future image of resource use.

While such case studies have been accumulated at RIHN thus far, there remain areas that are under-researched (for example resources such as energy, or enterprises as global stakeholders). In this program, we aim to explore resource use across multiple resources and spatial scales and with diverse stakeholders by developing new projects to address such areas while at the same time incorporating novel ideas from young scientists. Further, we will explore the conditions necessary for a transition of values and transformation of human behavior and propose policies and socio-economic institutions for the realization of fair resource management as well as criteria for their evaluation.

○ Progress and Results in 2019

Program 2 includes the following 4 projects (2 finished projects, 2 ongoing projects) up to now. One of the ongoing projects has finished by the end of this fiscal year. Another ongoing project has started full research this fiscal year.

1) Creation of sustainable governance of new commons through formation of integrated local knowledge, lead by Dr. Tetsu Sato (- Mar 2017).

This project aimed to integrate local environmental knowledge. They developed a conceptual model of knowledge-based adaptive social transformation. One of important results is about the contribution of knowledge translators for community transformation by meta-analyses of RIHN Projects. Here, they found that the existence of balanced translators is most effective, while top-down translators are not effective. These results are very suggestive to consider the institutions for resource management.

2) Human-environmental security in Asia-Pacific ring of fire: Water-Energy-Food Nexus, lead by D. Aiko Endo (- Mar 2018).

This project aimed to sustainable management of Water-Energy-Food nexus, which is one of the key issues of Program 2. They achieved a lot to meet the two primary objectives; A) to understand the complexity of the WEF nexus system, and B) to create policy options to solve the identified nexus problems under scientific evidence and uncertainty. They developed a method to analyze multiple resources among local stake holders the end of this this fiscal year.

3) Biodiversity-driven Nutrient Cycling and Human Well-being in Social-Ecological Systems, lead by Dr. Noboru Okuda (-Mar 2020).

The third project dealt with biodiversity and nutrient cycling for well-being in watershed level. They aim to establish a method of multi-level governance for sustainable watershed system, which also include the management issues of multiple resources. In particular, they think local biodiversity could be a driving force to manage water quality and nutrient cycling, and at the same time, human well-being. They also want to refer the poverty and wealth disparity by comparing the two watersheds, one in developed (Japan) and another in developing countries (Philippines). They elucidated the effectiveness of environmental icons (frog species in Japanese case, and sacred water spring in Philippines case) to change the behavior of local peoples.

4) Mapping the Environmental Impact Footprint of Cities, Companies, and Household, lead by Dr. Keiichiro Kanemoto (-Mar 2024)

The project aims to clarify the geographical connection of the human activities and consequent impacts on environment and human life by analyzing global input-output tables together with the data on the impacts of human activities. They have made geographical information system on carbon footprint of 13,000 cities, and expand it to various resources and impacts in coming years.

Dr. Sato's project contributed to develop the meta-analyzing methods on governance among multi-stakeholders, while Dr. Endo's project developed analytical methods on practical management system in local scale. Dr. Okuda's project is providing another example of multi-resource management (water, nutrient and ecological resources), which is rather different from Dr. Endo's project. Since these projects are the studies mostly on local scale, we tried to make discussion on resource dynamics and stakeholders mostly in regional or local scales, including private sectors. Kanemoto's project deals with such cause-effect connections in various special scales and resources. Thus, the projects in the Program 2 can cover wide range of spatial scale, resources and stakeholders.

Synergy Effects

Other than these outputs from projects above, we made discussions among scientists on the concept of 'fair use'of resources and the methodology to describe and analyze the inter-linkages among multi-resources and multi-stakeholders. We reviewed international literatures on 'equity', which is one of the key concepts relating to fairness. We are now preparing the method.

We have been making a discussion to propose the evaluation system on 'fair use'of multi- resources by multi-stakeholders. We had a international sympodium on this issue and deepened the discussion. We are also developing a method to describe the situation of local resource use. We would like to provide the analyzing basis for the areas of projects which RIHN engaged in to enable the comparison among the research sites. To do this, we have established a data base on resource use in prefecture level in Japan to discuss the fairness and sustainability of resource use in local scale last year. This year, we enlarged the data base into ecosystem services of municipality in Japan. This could be combined with some other data base of carbon footprint developed by Kanemoto's project.

○Project Members

Kunihiko Kobayashi (Research Institute for Humanity and Nature Program2,Researcher)

○ Future Themes

We want to develop the discussion on the fairness of the resource use including the analyses of actual situation and problems on the ground at the research sites of the RIHN projects. Also, we would like to develop the database on resource use into both finer

(municipality level) and larger (international) scales. Synthesis towards the goal of the Program 2 should be enhanced including the invitation of the new projects, which may deal with other resources and stakeholders.

●Achievements

○Papers

【Original Articles】

- Endo A, Yamada M, Miyashita Y, Sugimoto R, Ishii A, Nishijima J, Fujii M, Kato T, Hamamoto H, Kimura M, Kumazawa T, JiaguoQi1 J 2020,02 Dynamics of water–energy–food nexus methodology, methods, and tools. *Current Opinion in Environmental Science & Health* 13:46-60. DOI:https://doi.org/10.1016/j.coesh.2019.10.004 (reviewed).
- Yoshifuji, N., Kumagai, T., Kume, T., Tateishi, M., Inoue, Y., Aoneyama, A. & Nakashizuka, T. 2019,12 Limited stomatal regulation of the largest-size class of Dryobalanops aromatica in a Bornean tropical rainforest in response to artificial soil moisture reduction. *Journal of Plant Research*. DOI:https://doi.org/10.1007/s10265-019-01161-3 (reviewed).
- Imai, H., Kohsaka, R. & Nakashizuka, T. 2019,10 A multi-year investigation of the factors underlying decreasing interactions of children and adults with natural environments in japan. *Human Ecology* 47(5):717-731. DOI:https://doi.org/10.1007/s10745-019-00108-5 (reviewed).
- Ushio M, Osada Y, Kumagai T, Kume T, Pungga R, Nakashizuka T, Itioka T, Sakai S 2019,10 Dynamic and synergistic influences of air temperature and rainfall on general flowering in a Bornean lowland tropical forest. *Ecological Research*. DOI:https://doi.org/10.1111/1440-1703.12057 (reviewed).
- Suzuki, M., Umeki, K., Orman, O., Shibata, M., Tanaka, H., Iida, S., Nakashizuka, M. Masaki, T. 2019,08 When and why trees decrease their resource allocation to apical growth? The importance of reproductive onset. *Oecologia*. DOI:https://doi.org/10.1007/s00442-019-04477-y (reviewed).
- Masaki, M., Nakashizuka, T., Niiyama, K., Tanaka, H., Iida, S., Bullock, J.M., Naoe, S. Shigeo Iida3), James M. Bullock4) and Shoji Naoe 2019,08 Impact of the spatial uncertainty of seed dispersal on tree colonization dynamics in a temperate forest. *Oikos*. (reviewed).

○Research Presentations

【Invited Lecture / Honorary Lecture / Panelist】

- Nakashizuka, T. Effects of climate change on forest ecosystems in Japan. The e-ASIA JRP Congference on Climatic Change and Natural Disaster., 2019.08.14, Vladivostok, Russia.

Stage: Full Research

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

Abbreviated Title: Ecological Recycling Project (e-REC Project)

Project Leader: OKUDA Noboru

Program 2: Fair Use and Management of Diverse Resources / Diversity Program

Key Words: Biodiversity, Ecosystem service, Human well-being, Nutrient balance, Watershed governance

○ Research Subject and Objectives

With the rapid socio-economic growth at the global level, overexploitation of basal resources due to mass production and consumption has led to disturbance of natural biogeochemical cycles of macronutrients, such as nitrogen and phosphorus (Sutton et al. 2013). Such nutrient imbalances have caused serious environmental issues, such as cultural eutrophication and biodiversity loss, resulting in deterioration of ecosystem services (Anderson et al. 2002, Hoagland et al. 2002, Smith and Schindler 2009). At present, it has been recognized that these issues are so common and prevalent throughout the planet, posing a risk to sustainable human development (Rockström et al. 2009). Issues derived from nutrient imbalances emerge at the watershed level because the watershed itself is a spatial unit of water and nutrient cycles. Since such watershed issues are complicatedly entangled with a variety of local issues as cause and/or effect, watershed management has difficulty in reconciliation with the local issues. Here our project (hereafter, *e*-REC) proposes adaptive watershed governance for the inclusive solution to both local and watershed issues through cross- level interactions between macro- and microscopic approaches, addressing a shared goal to enhance social-ecological health of watershed systems, which are indicated by three components, biodiversity, nutrient cycling and well-being.

In order to solve environmental issues emerging at the watershed level, conventional watershed management, in which governments and researchers take the initiative, have taken institutional, technological and economic approaches in their beliefs that identification and elimination of causal factors for such issues result in the overall solution for every stakeholders (Abell et al. 2002, Bressers and Kuks 2004, ILEC 2005). However, they have been often confronted with difficulty in the solution to local issues because there exist tension and conflict for priority to the solution between the local and watershed levels. Considering such hierarchy of watershed system, the previous RIHN Project (RIHN Project 3-1 2007, Wada 2009) proposed a basic idea on how to balance out between the local and watershed issues in the watershed management. Taking advantage of its deliverables, we are engaged in the adaptive watershed governance for the inclusive solution to local and watershed issues, in order to test its utility and applicability to a wide range of watersheds in the world toward the ultimate solution of nutrient imbalances as the global environmental issue.

The concept of proposed watershed governance is based on a working hypothesis, so-called ‘four-gear hypothesis’, that biodiversity, nutrient cycling and well-being are interdependent on each other through community activity. As the microscopic social- cultural approach to enhance these components at the local level, we begin with participatory and action researches to reinforce human-nature relations through community activities for conservation of ‘familiar nature’, i.e., natural objects of special significance to local life and livelihood. As the community activities promote sharing of cultural values of the familiar nature among the community members, on one hand, community-based well-being is enhanced with accumulation of bonding social capitals. On the other hand, such conservation activities can enhance nutrient cycling directly and/or indirectly through ecological functions of biodiversity.

As the macroscopic scientific approach, we conduct synoptic researches to visualize spatial pattern of biodiversity, nutrient cycling and well-being at the watershed level. If community activities can contribute to enhancement of biodiversity, nutrient cycling and well-being, they may benefit stakeholders other than the community members in ways not easily registered by the local cultural values, but inspired by the social-ecological health of watershed. In disseminating such scientific knowledge to the public, the *e*-REC facilitates social involvement in the community activities by non-community members who appreciate the value of social-ecological health. This shared awareness allows accumulation of bridging social capitals and further enhances community- based well-being. As scientific knowledge is extensively shared among stakeholders in the watershed, community members may gain societal appreciation and institutional support, resulting in community empowerment. To facilitate sharing of such knowledge and experience of community and research activities through the watershed governance, we hold seminars and workshops. We also construct an integrated model, which will provide as a participatory scenario-making tool for diverse stakeholders to envision social-ecological health of watershed system.

To test the four-gear hypothesis, we are engaged in the watershed governance in two contrasting

watersheds in Asia: the Yasu River sub-watershed of Lake Biwa (Japan) as a model of infrastructure- oriented society and the Silang-Santa Rosa sub-watershed of Laguna de Bay (Philippines) as a model of high-nutrient loading society. In the former watershed, 4 rural communities from the up- to downstream areas and 1 coastal urban community are selected as study sites, and

1 rural community in the midstream area of the latter watershed. Through within- and between-watershed comparison, we discuss what social-ecological factors affect utility of our governance approach and consider its applicability to other watersheds.

In the *e*-REC, 7 discipline-based research units are organized to test working hypotheses on natural and social processes of the watershed governance, and a total of 15 site- or issue-specific working groups to co-work with stakeholders at the study sites. We are also collaborating with two core projects (Environmental Traceability Project and OpenTS Project) in Core Program to apply their theories and methodology to our study system. Thee-REC can contribute to Program 2 because it seeks for the solution to conflicts for multiple resource uses and priority issues among diverse stakeholders at multi-spatial scale, in terms of fairness and equity.

CONTRIBUTION TO THE PROGRAM

Program 2 explores wise and fair management systems capable of addressing multiple resource uses by multiple stakeholders at multi-spatial scale. Through the watershed governance proposed by *e*-REC, we aim to seek for feasible approaches, which can lead to the solution of conflicts for the multiple resource uses and priority issues among diverse stakeholders at local and watershed levels, in terms of fairness and equity. It is expected that such a governance approach can be a promising way to wise and fair management of ecological resources, such as water, nutrients and biodiversity, which extend over the multi-spatial scale.

In the Silang-Santa Rosa sub-watershed of Laguna de Bay, for instance, the society has a lot of social-environmental issues attributed to disordered uses of groundwater resources by a variety of stakeholders (Lambino et al. 2018). Based on our synoptic research showing that some household wells have high concentration of groundwater nitrate with the potential risks for human health, such 15 18 as a blue baby syndrome, we conducted nitrateδ15 N-δ18O dual isotope analysis to identify sources of the nitrate pollution, collaborating with a core project (Environmental Traceability Project) under the direction of Core Program. This collaborative research suggested the possibility that the groundwater nitrate pollution can be derived partly from chemical fertilizers used in the upstream croplands and partly from septic wastes in the midstream community (Privaldos et al. 2018). While sharing of our assessment results at the stakeholder assembly last November, our project contributed to conclusion of MOA between a national governmental institute, Laguna Lake Development Authority, and a local government, City of Santa Rosa, for installation of facility to monitor water quality. It is expected that sharing of such scientific knowledge will be useful for wise and fair management of water resources in this watershed in the future.

Our synoptic researches also revealed that land conversion from forest to agricultural and residential areas is a driver for nutrient imbalances and resultant biodiversity loss in the Laguna de Bay Watershed (Peralta et al. 2019, 2020). In general, globalization has facilitated the import of forestry and agricultural products from developing to developed countries, which exploit natural resources from the latter, imposing heavy environmental loads on their watersheds though this may not be the case anymore in the Laguna de Bay Watershed, in which agricultural products are currently provided mainly for domestic consumption. In order to understand unfairness of resource uses at the multi-spatial scale, we have the advantage of synergy with the Program 2 through incorporation of international frameworks into our research scheme. Considering the international unfairness of resource uses under globalization, our collaborative research intended to conduct phosphorous flow analysis at the multi-spatial scale from watersheds to the globe in order to assess phosphorous footprints. The phosphorous flow analysis at the national level was already applied to the Japanese society by a member of *e*-REC (Matsubae et al. 2009) and the global one is ready for publication (Oita et al. under review). To fill the gap of multi-spatial scale, we constructed the phosphorous flow analysis for a social-ecological system of the Lake Biwa Watershed.

As another case of multiple resource uses within the watershed, we treat with macrophyte overgrowth and composting in the south basin of Lake Biwa, collaborating with a core project (OpenTS Project) which seeks for open governance to transcend knowledge gaps among stakeholders. At present, this project is developing portal and local currency systems to share knowledge and experience of macrophyte resource uses under collaboration with NPOs and local governments. Through application of these systems, we will examine how open data and open governance can contribute to fair and sustainable uses of ecological resources by diverse stakeholders.

○ Progress and Results in 2019

1. PROJECT PROGRESS DURING FULL RESEARCH

1) Outcomes of project as a whole

Based on results of synoptic researches, we constructed relation diagrams to show how human activities can affect biodiversity and nutrient cycling through nutrient imbalances in the two watersheds. Our comparative study contrasted human impacts on stream and lake ecosystems between the two watersheds. In the Lake Biwa Watershed in which domestic and industrial phosphorous (P) loadings are reduced by sewage treatment systems, agricultural activities are a primary driver for biodiversity loss and thus alteration of biodiversity-driven nutrient cycling. In the Laguna de Bay Watershed in which sewage treatment

systems have not yet been established, by contrast, urbanization is a primary driver for stream biodiversity loss through heavy domestic P loading, while agricultural nitrogen loading caused groundwater pollution (Privaldos et al. 2018) and nutrient imbalances in coastal waters.

In the Yasu River sub-watershed, the synoptic questionnaire survey on subjective well-being suggested that social capitals and interaction with nature can affect the well-being.

In parallel, we demonstrated that community activities can affect biodiversity and nutrient cycling at the local level. Our comparison suggested that familiar nature as a part of biodiversity can play a key role in driving four gears at the local level though there is variation in its relative significance among the communities. We also discussed what social-ecological factors can affect consequences of community-based governance. In the Laguna de Bay Watershed, by contrast, biodiversity was not always effective in the community-based governance. Such a difference can be attributed to ecological and social-historical backgrounds of the two watersheds.

Seminars and stakeholder assemblies were effective in facilitation of knowledge-sharing among diverse stakeholders and subsequently in their involvement in the governance activities.

2) Specific activities of working groups

a) Forest conservation Working

In the upstream forest community, we found that actor groups who are engaged in forest conservation have diversified community activities with loose connection. For them, forest-derived values are expanding from profit and property to fun under declining forestry but their intention is consistent to return the profit from the forests to their own community for its financial independence.

b) SATOYAMA conservation Working

In the midstream farmer community, we demonstrated that action to conserve familiar nature, which serves as indigenous environmental indicators, was effective in promotion of eco-friendly farming, resulting in increased wetland biodiversity and reduced P loading from the rice paddies (Asano et al. 2017, 2018).

c) Nursery rice paddy Working

We revealed that an endemic crucian carp can home to its natal rice paddy using otolith Sr isotope analysis. A seminar was effective in sharing of local and scientific knowledge on nursery rice paddy among participants, making this activity attractive to diverse stakeholders.

d) Lagoon restoration Working

In a coastal community in which a public program on lagoon environmental restoration was recently completed, we conducted biodiversity and nutrient researches in lagoons, using advanced technique, such as environmental DNA, δ18O*p* analysis and otolith Sr isotope analysis (Wu et al. 2019; Yi et al. 2019). We shared scientific knowledge on familiar nature as well as on water quality with community members who have planned to practice community activities.

e) Macrophyte composting Working

We demonstrated that macrophyte composting has a positive effect on plant growth through alteration of soil microbial communities and genetic diversity related to P metabolism (Osono et al. 2015, Matsuoka et al. 2019). We also conducted questionnaire survey on macrophyte issues targeting coastal urban communities under collaboration with OpenTS Project to discuss macrophyte resource utilization with stakeholders through workshops (Kondo et al. 2019).

f) Yasu River Working

Using the δ18 O*p* analysis, we visualized spatial pattern of P cycling in the whole catchment of Yasu River (Ishida et al. 2019). Structural equation modelling revealed that land uses have significant effects on water quality and biodiversity in stream ecosystems (Ko et al. 2018). Such alteration in turn affected trophic transfer of nutrients within the food webs (Ishikawa et al. 2017).

g) Lake Biwa Working

We assessed the relative importance of P loadings from rivers and groundwaters into the lake basin, using 222Rn concentration measurement and δ18 O*p* analysis. In the Yasu River sub-watershed, the P loading from groundwater was estimated as twice as that from river water.

h) Nutrient flow analysis Working

P flow analysis for the Lake Biwa Watershed using input-output table of Shiga Prefecture revealed that fertilizer-derived P accounts for more than half of external P inflow from outside the prefecture with 12.5% of P recycling rate. We estimated that P output can be reduced by ca. 5.6% if lodging and food service industries serve eco-friendly products and local fish food in Shiga.

i) Human well-being Working

Synoptic questionnaire survey in the Yasu River sub-watershed revealed that community trust has a positive effect on subjective well-being as social bond at individual level and a negative effect as social norm at community level, while general trust enhances the subjective well-being at watershed level (Fukushima et al. 2020). It also showed that forest-related well-being is enhanced when interacting with forest organisms, suggesting that biodiversity-driven well-being.

j) Integrated model Working

We constructed an integrated model to examine interrelation among the four social-ecological components, incorporating our synoptic data into structural equation modeling. We found that there exists decoupling between community activity and biodiversity at the watershed level, suggesting the need for action research to reinforce human-nature relations at the local level.

k) Laguna Lake Working

For a midstream farmer community of the Silang-Santa Rosa sub-watershed, we conducted action research to conserve a sacred spring as the familiar nature because biodiversity conservation is less effective in community empowerment in this watershed with low biodiversity (Siapno et al. 2018). In parallel, stakeholder assemblies have been held under initiative of watershed management council, regarding groundwater as boundary objects (Lambino et al. 2018).

l) Governance method Working

We created matrix tables to discuss utility of our governance approach and social-ecological factors affecting its consequence though within- and between-watershed comparison.

○Project Members

【Leader】

◎ OKUDA Noboru (Research Institute for Humanity and Nature,Associate Professor,Ecological Science)

【River Research Working Group】

○ IWATA Tomoya	(Department of Environmental Sciences, Faculty of Life and Environmental Sciences University of Yamanashi,Associate Professor,Professor Aquatic Ecology)
ISHIKAWA Naoto	(Japan Agency for Marine-Earth Science and Technology,Postdoctoral Fellow,Stream Ecology, Limnology)
ITOH Masayuki	(Graduate School of Simulation Studies University of Hyogo,Associate Professor,Forest Hydrology)
KO Chia-Ying	(National Taiwan University,Assistant Professor,Spatial Statistics)
OHTE Nobuhito	(Graduate School of Informatics, Kyoto University,Professor,Hydrology, Ecosystem Ecology)
OKANO Junichi	(Center for Ecological Research, Kyoto University,Postdoctoral Fellow,Stream Ecology, Behavioural Ecology)
OSAKA Ken'ichi	(School of Environmental Science, The University of Shiga Prefecture,Associate Professor,Forest Hydrology)
TOGASHI Hiroyuki	(Tohoku National Fisheries Research Institute, Fisheries Research Agency,Researcher,Community Ecology)

【Lake Research Working Group】

○ BAN Syuhei	(School of Environmental Science, The University of Shiga Prefecture,Professor,Plankton Ecology, Limnology)
INOUE Eiso	(Lake Biwa Environmental Research Institute, Shiga Prefectural,Senior Researcher,Freshwater Biology, Aquatic Entomology)
ISHIKAWA Kanako	(Lake Biwa Environmental Research Institute, Shiga Prefecture,Researcher,Environmental Microbiology. Limnology)
JIN Guangzhe	(Guangdong Ocean Universty,Researcher,Limnology)
KAGAMI Maiko	(Yokohama National University,Professor,Limnology, aquatic biology)
KAMIYA Hiroshi	(Shimane Prefectural Institute of Public Health and Environmental Science,Division Chief,Analytical Chemistry)
KATO Toshikuni	(Shimane Prefectural Institute of Public Health and Environmental Science,Researcher,Environmental Analytical Chemistry)
KUMAGAI Michio	(Lake Biwa Sigma Research Center, Ritsumeikan University,Professor,Geophysics)
MIZUNO Katsunori	(Underwater Technology Collaborative Research Center, IIS, The University of Tokyo,Assistant Professor,Underwater acoustic)
NAKANO Shin'ichi	(Center for Ecological Research, Kyoto University,Professor,Ecological Science)
NISHIHIRO Jun	(Department of Environmental Science, Faculty of Science, Toho University,Associate Professor,Conservation Ecology)

ONODERA Shin'ichi	(Graduate School of Integrated Arts and Sciences, Hiroshima University,Professor,Hydrology)
SAITO Mitsuyo	(Graduate School of Environmental and Life Science, Okayama University,Assistant Professor,Hydrology)
SAKAI Yoichiro	(Lake Biwa Environmental Research Institute Shiga Prefecture,Researcher,Limnology)
SEIKE Yasushi	(Interdisciplinary Faculty of Science and Engineering, Shimane University,Professor,Environmental Analysis)
Tomozawa Yusuke	(Department of Environmental Science, Faculty of Science, Toho University,Doctor's course student,Underground water chemistry)
UCHII Kimiko	(School of Medicine, Osaka Ohtani University,Assistant Professor,Microbial Ecology)
WANG Kunyang	(Graduate School of Integrated Arts and Sciences, Hiroshima University,Master's course student,Limnology)
YI Rong	(School of Environmental Science, The University of Shiga Prefecture,Doctor's course student,Plankton Ecology, Limnology)

【Terrestrial Research Working Group】

○ OSONO Takashi	(Doshisha University,Professor,Ecological Science)
HIROSE Dai	(School of Pharmacy, Nihon University,Assistant Professor,Mycology)
HOBARA Satoru	(College of Agriculture, Food and Environment Sciences, Rakuno Gakuen University,Professor,Biogeochemistry)
ISHIDA Atsushi	(Center for Ecological Research, Kyoto University,Professor,Plant Ecophysiogy)
MATSUOKA Shunsuke	(Graduate School of Simulation Studies University of Hyogo,Researcher,Ecological Science)
USHIO Masayuki	(Center for Ecological Research, Kyoto University,Rresearcher,Ecosystem Ecology, Microbial Ecology)

【Analytical Research Working Group】

○ TAYASU Ichiro	(Research Institute for Humanity and Nature,Professor,Ecological Science)
ABDULLAH Meshal	(Graduate School of Engineering, Tohoku University,Doctor's course student,Industrial Ecology)
AMANO Yosuke	(Tohoku National Fisheries Research Institute, Fisheries Research Agency,Technical assistant,Fish Biology Ecological Science)
FARAH Wirasenjay	(Graduate School of Engineering, Tohoku University,Master's course student,Industrial ecology)
FUJIYOSHI Rei	(Research Institute for Humanity and Nature,Researcher,Stable Isotope Ecology)
HYODO Fujio	(Research Core for Interdisciplinary Sciences, Okayama University,Associate Professor,Forest Ecology)
IDE Jun'ichiro	(Institute of Decision Science for a Sustainable Society, Kyushu University,Assistant Professor,Forest Hydrology)
KITAZAWA Daisuke	(Institute of Industrial Science, The University of Tokyo,Associate Professor,Marine Ecosystem Engineering)
KOBAYASHI Yuki	(Graduate School of Medicine of Yamaguchi University,Lecturer,Health sciences)
KOKITA Tomoyuki	(Faculty of Marine Science and Technology, Fukui Prefectural University,Associate Professor,Ecology, Evolutionary Biology)
LIU Jiarui	(Graduate School of Engineering, Tohoku University,Doctor's course student,Industrial ecology)
MARUO Masahiro	(School of Environmental Science, University of Shiga Prefecture,Professor,Analytic Chemistry)
MATSUBAE Kazuyo	(Graduate School of Engineering, Tohoku University,Professor,Industrial Ecology)
MINAMOTO Toshifumi	(Graduate School of Human Development and Environment, Kobe University,Associate professor,Molecular Ecology)
OMODA Azusa	(Graduate School of Engineering, Tohoku University,Researcher,Industrial ecology)
OTAKE Tsuguo	(International Coastal Research Center, Atmosphere and Ocean Research Institute, The University of Tokyo,Professor,Fish Biology Ecological Science)
PAYTAN Adina	(IMS, University of California Santa Cruz,Professor,Biogeochemistry)
SONG Uhram	(College of Applied Life Sciences, Jeju National University,Assistant Professor,Ecological Science)
Wu Qianqian	(Graduate School of Human Development and Environment, Kobe University,Doctor's course student,Evolutionary Ecology)
YAMANAKA Hiroki	(Department of Environmental Solution Technology, Ryukoku University,Lecturer,Fish Physiology)

【Network Research Working Group】

○ ASANO Satoshi	(Kyoto University Graduate School of Global Environmental Studies,Assistant Professor,Regional Planning)
Fukui Haruo	(Omi Environmental Conservation Foundation)

KANAO Shigefumi (Lake Biwa Museum,Curator,Fish Ecology)
KATAOKA Yoshitaka (Fishery Experiment Station, Department of Agriculture and Fisheries, Shiga Perfecture,Assistant Section Chief,Fisheries Science)
KAWABATA Takahiro (Omi Environmental Conservation Foundation,Assistant Section Chief,Environmental Policy)
KIKKO Takeshi (Fisheries Management Division, Department of Agriculture and Fisheries, Shiga Perfecture,Assistant Section Chief,Fisheries Science)
OHTSUKA Taisuke (Lake Biwa Museum,Curator,Algal biology)
Okuda Kazuomi (Shiga Prefectural Government,Lake Biwa Policy Division)
SATO Yuichi (Lake Biwa Environmental Research Institute,Researcher,Environmental Modelling)
UEHARA Yoshitoshi (Ecology)

【Human Research Working Group】

○ WAKITA Kenichi (Faculty of Sociology and Social Welfare, Ryukoku University,Professor,Environmental Sociology)
FUKUSHIMA Shintaro (Tokyo Woman' s Christian University.Department of Communication School of Arts and Sciences,Lecturer,Social Science)
HIRATSUKA Junichi (NA,Former Director of Research Organizatio n of Nature and Humanity,Lake Science)
HIRAYAMA Naoko (School of Environmental Science, The University of Shiga Prefecture,Assistant Professor,limnology Policy)
LAMBINO Ria Adoracion A. (Research Institute for Humanity and Nature,Associate Professor,Environmental Governance)
KAGOHASHI Kazuki (Institute for Social Ethics, Nanzan University,Researcher,Environmental Economics)
KASHIO Tamaki (Lake Biwa Museum,Researcher,Rural sociology)
KONDO Yasuhisa (Research Institute for Humanity and Nature,Associate Professor,Archaeology, GIS)
MATSUSHITA Kyohei (Shiga University,Associate Professor,Environmental Economics)
NAKAHARA Satoe (Research Institute for Humanity and Nature,Researcher,cultural anthropology)
NONAMI Hiroshi (School of Sociology, Kwansei Gakuin University,Professor,Social Psychology)
OHNO Tomohiko (Institute of Human and Social Sciences, Kanazawa University,Associate Professor,Environmental Policy)
SAIZEN Izuru (Kyoto University Graduate School of Global Environmental Studies,Associate Professor,Regional Planning)
SAKAGAMI Masaji (Faculty of Health Sciences, Nihon Fukushi University,Professor,Applied Economics)
SANO Shizuyo (Faculty of Letters, Doshisha University,Professor,Historical Geography)
TAKAHASHI Takuya (The University of Shiga Prefecture,Professor,Forest policy and planning; corporate environmentalism)
TAKEMURA Kosuke (Shiga University,Associate Professor,Social Psychology)
TANAKA Takuya (Environmental Partnership Office Kinki,Creative Director,Environmental Science & Technology)
TANIGUCHI Yoshimitsu (Department of Biological Environment, Akita Prefectural Universiy,Professor,Sociology)
UCHIDA Yukiko (Kokoro Research Center, Kyoto University,Associate Professor,Social Psychology)
○ YACHI Shigeo (Center for Ecological Research, Kyoto University,Associate Professor,Theoretical Ecology)
ZHENG Yuejun (Faculty of Cultural and Information Science, Doshisha University,Professor,Sociometrics)

【Nutrient Management Working Group】

○ SANTOS-BORJA Adelina (Office of the General Manager, Laguna Lake Development Authority,Division Chief III, International Linkages and Research Developme nt Unit,Limnology Environmental Science Integrated Lake Basin Management)
MAGBANUA Francis (Institute of Biology, College of Science, University of the Philippines Diliman,Assistant Professor,Zoobenthos Diversity)
MENDOZA Norman (Philippine Nuclear Research Institute,Researcher,Hydrology)
PAPA Rey Donne (Department of Biological Sciences and Research Center for the Natural Sciences, University of Santo Tomas,Assistant Professor,Plankton Ecology, Limnology)
SEVILLA Fortunato B III (Department of Chemistry and Research Center for the Natural and Applied Sciences, University of Santo Tomas,Professor,Instrumentation and Analytical Chemistry)

【Advisory Board】

□ FUJITA Noboru (Center for Restoration of Regional Nature,Director,Plant Community Ecology)
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□ KAWABATA Zen'ichiro (Research Institute for Humanity and Nature,Emeritus Professor,Aquatic Ecosystem Ecology)
□ NAGASAKA Akiko (Hokkaido Research Organization Forestry Research Institute,assistant section chief,Watershed Conservation)
□ NAKASHIZUKA Toru (Research Institute for Humanity and Nature,Professor,Forest ecology, biodiversity)
□ SAKAI Shoko (Center for Ecological Research, Kyoto University,Associate Professor,Plant Ecology)
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□ URABE Jotaro (Graduate School of Life Sciences, Tohoku University,Professor,Aquatic Ecology)

【Secretariat】

IKEYA Toru (Research Institute for Humanity and Nature,Researcher,Aquatic ecology, Environmental science)
ISHIBASHI Hiroyuki (Research Institute for Humanity and Nature,Researcher,Area study and historical study on forested areas)
ISHIDA Takuya (Research Institute for Humanity and Nature,Researcher,Forest Environmental Science)
Watanabe Kirie (Research Institute for Humanity and Nature,Resarch Associate)

○ Future Themes

1) Since the Philippine Government ratified the Nagoya Protocol of CBD(Convention on Biological Diversity) on ABS (Access and Benefit Sharing) in the way of our joint research, we confronted with a regal problem related to biological specimens which were imported into Japan in transition of the protocol implementation. Considering that it took long time (more than a year) to obtain the prior informed consent (PIC) from the provider country, institutional logistic support is needed to prepare for the conclusion of the mutually agreed terms for ABS (MAT) with the counterpart organization before acceptance of the full research.

2) In order to maintain a trust with stakeholders, especially with local communities, after the completion of full research, it is desirable for RIHN to keep partnerships with them as a transdisciplinary research institute. Also, follow-up surveys by the core program are recommended to assess social outcomes of the completed research because societal changes generally take longer time than the full research period. To disseminate such social outcomes to the public as well as to the academia, the previous system, i.e., Completed Research (CR), should be reconsidered to support publication after the completion of full research.

●Achievements

○Books

【Chapters/Sections】

・Okuda, N., T. Takeyama, T. Komiya, Y. Kato, Y. Okuzaki, Z. Karube, Y. Sakai, M. Hori, I. Tayasu & T. Nagata 2020 A food web and its long-term dynamics in Lake Biwa: a stable isotope approach. Kawanabe, Hiroya, Nishino, Machiko, Maehata, Masayoshi (ed.) Lake Biwa: Interactions between Nature and Peoplee (2nd Edition). (Eds. Kawanabe, H. et al.). Springer Academic, Cham, pp.331-337.

○Papers

【Original Articles】

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○Research Presentations

【Oral Presentation】

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・Fukushima, S., K. Takemura, Y. Uchida, S. Asano & N. Okuda When does mutual trust among community members lower their happiness?: Moderating effect of residential mobility. Society for Personality and Social Psychology (SPSP) Annual Convention 2020, 2020.02.27-2020.02.29, New Orleans, USA.

- Oita, A., K.Katagiri, K.Matsubae Resource use, recycling, and energy emissions in Japanese system from nitrogen perspective. The 5th International Conference on Final Sinks (ICFS 2019), Expected on 10 Dec.2019., 2019.12.08-2019.12.11, Vienna, Austria.
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- Baludo, M.Y., R.D.S. Papa, & F.S. Magbanua Diel vertical migration of zooplankton in an ultra-oligotrophic lake in the Philippines with notes on its limnology. International Conference on Tropical Limnology, 2019.08.28-2019.08.29, Bogor, Indonesia.
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- Kondo, Y., A. Miyata, U. Ikeuchi, S. Nakahara, K. Nakashima, H. Onishi, T. Osawa, K. Ota, K. Sato, K. Ushijima, B. V. Baptista, T. Kumazawa, K. Hayashi, Y. Murayama, N. Okuda, H. Nakanishi Interlinking open science to team-based action research for socio-environmental cases. SciTS 2019 Conference, 2019.05.20-2019.05.23, Lansing, Michigan.
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- Peralta E, Magbanua FS, Briones JCA, Okuda N, Papa RDS Disentangling multiple stressors and highlighting the importance of freshwater protected area in highly urbanized watersheds in the Philippines. 41st ASM of the National Academy of Science & Technology, 2019.07.10-2019.07.11, EDSA Shangri-La Plaza, Mandaluyong City,Philippine.
- Mendoza MU, Aguilar JI, Padilla KSAR, Itoh M, Okuda N, Papa RDS The biogeochemical cycling of methane (CH4) in lakes Calibato, Pandin and Yambo: Implications on the lakes' carrying capacity. 41st ASM of the National Academy of Science & Technology, 2019.07.10-2019.07.11, EDSA Shangri-La Plaza, Mandaluyong City,Philippine.

・Lopez MLD, Papa RDS, Tuanmu M-N 2019 Predicting potential distribution of zooplankton species in Philippine freshwater ecosystems utilizing species distribution modeling. 41st ASM of the National Academy of Science & Technology, 2019.07.10-2019.07.11, EDSA Shangri-La Plaza, Mandaluyong City,Philippine.

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・Belen AE, De Leon J, Mamerto TMP, Martinez VV, Velando MK, Briones JCA, Papa RDS Freshwater sponges (Porifera: Spongilina) of the Philippines: new locality records with notes on historical records of freshwater sponges. 37th Association of Systematic Biologists of the Philippines-Symposium and Annual Meeting, 2019.05.29-2019.05.31, Western Philippines University, Palawan.

・Saito, M., Onodera, S., Tomozawa, Y., Wang, K., Ban, S., Okuda, N Evaluation for temporal variation in groundwater inflow to the lagoons connected to Lake Biwa by radon (222Rn) tracer analysis. JpGU 2019 meeting, 2019.05.26-2019.05.30, Makuhari, Chiba.

・Peralta, E. M., L. S. Batucan Jr., A. E. Belen, I. B. B. De Jesus, T. Ishida, C.-Y. Ko, Y. Kobayashi, T. Ikeya, Y. Uehara, T. Iwata, A. S. Borja, J. C. A. Briones, F. S. Magbanua, R. D. S. Papa & N. Okuda Multiple stressors and protection efforts in highly urbanized watersheds in the Philippines. JpGU 2019 meeting, 2019.05.26-2019.05.30, Makuhari, Chiba.

・Onodera, S., Saito, M., Jin, G., Rusydi, A., Tomozawa, Y., Wang, K., Ban, S., Okuda, N Phosphorus discharge via groundwater into the lake, based on lacustrine groundwater discharge (LGD) and alluvial plain sediment. JpGU 2019 meeting, 2019.05.26-2019.05.30, Makuhari, Chiba.

・Okuda, N., Z. Karube, Y. Sakai, T. Takeyama, I. Tayasu, C. Yoshimizu & T. Nagata Biodiversity increases integrated trophic position of macroinvertebrate communities in coastal food webs: Testing the vertical diversity hypothesis. JpGU 2019 meeting, 2019.05.26-2019.05.30, Makuhari, Chiba.

・Liu, X., R. Yi, M. Maruo and S. Ban Spatio-temporal dynamics of orthophosphate with implications for limitation of phytoplankton growth in north basin of Lake Biwa, Japan. JpGU 2019 meeting, 2019.05.26-2019.05.30, Makuhari, Chiba.

・Ikeya, T., T. Ishida, Y. Uehara, S. Asano, I. Tayasu, N. Okuda, M. Ushio, S. Fujinaga, C.-Y. Ko, E. M. Peralta, N. F. Ishikawa & T. Iwata The analysis of the community composition of riverine bacteria and microalgae in relation to nutrient status and diversity: the case in irrigation season in the Yasu River, Japan. JpGU 2019 meeting, 2019.05.26-2019.05.30, Makuhari, Chiba.

・Gregorio, J. A. N., E. M. Peralta, I. B. B. De Jesus, T. Ikeya, J. C. A. Briones, R. D. S. Papa, F. S. Magbanua & N. Okuda Benthic macroinvertebrate assemblages and water quality reflect the impacts of land use and land cover in Marikina Watershed, Philippines. JpGU 2019 meeting, 2019.05.26-2019.05.30, Makuhari, Chiba.

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・Oita, A., E.Webeck, K.Matsubae Food, diet and embodied nitrogen and phosphorus emission. The 13th conference of the socio-economic metabolism section of the international society for inductrial ecology (ISIE SEM 2019), 2019.05.13, Berlin, Germany.

・Peralta, E.M., A.E. Belen, J.-A.N. Gregorio, I.B.B. de Jesus, N. Mendoza, T. Ishida, J.C.A. Briones, F.S. Magbanua, N. Okuda, & R.D.S. Papa Life below water in the Anthropocene: using ecological and isotopic approaches to trace human impacts in Laguna de Bay and its watersheds. NAST and DOST Luzon Regional Scientific Meeting, 2019.04.24-2019.04.25, Don Leopoldo Sison Convention Center, Alaminos, Pangasinan, Philippines.

【Poster Presentation】

・Okuda, N., M. Milette, J. Aguilar, K. Padilla, J. Briones, R. Papa, M. Ito, M. Fujibayashi, T.-H. Tu, L.-H. Lin, P.-L. Wang, Y. Kobayashi, E. Austria, F.-K. Shiah Methanotrophic food webs in tropical lakes: a preliminary report. The 84th Annual Meeting of the Japanese Society of Limnology, 2019.09.27-2019.09.28, Kanazawa University, Kanazawa.

・Wang, K., S. Onodera, M. Saito, N. Okuda & T. Okubo Estimation of groundwater recharge and phosphorus transport under different precipitation conditions in a suburban catchment, using SWAT model. JpGU-AGU Joint Meeting 2019, 2019.05.26-2019.05.30, Makuhari, Chiba.

Stage: Full Research

Project Name: Mapping the environmental impact footprint of cities, companies, and households

Abbreviated Title: Supply chain project

Project Leader: KANEMOTO Keiichiro

Key Words: Supply chain, MRIO, environmental impacts

○ Research Subject and Objectives

The intent of this research is to encourage behavioral change by providing information to corporations, households, and cities and supporting green procurement. After we identify critical supply chains from the environmental impact perspective, we will hold a stakeholder meeting with cities, companies, households, and NGOs., where we will discuss the kinds of policy options that can be taken by policy makers and how companies can reduce their Scope 3 emissions.

○ Progress and Results in 2019

Carbon footprint of cities

In 2018, we estimated the carbon footprint of 13,000 cities. Key findings are the following:

• Globally, carbon footprints are highly concentrated in a small number of dense, high-income cities and affluent suburbs

• 100 cities drive 18% of global emissions

• In most countries (98 of 187 assessed), the top three urban areas are responsible for more than one-quarter of national emissions

• We define cities as population clusters, but in practice mapping footprints to local jurisdictional bounds is complex

• 41 of the top 200 carbon-intensive cities are in countries where total and per capita emissions are low (e.g. Dhaka, Cairo, Lima). In these cities, population and affluence combine to drive footprints at a similar scale as the highest income cities

• For large and high-income cities, their total Scope 3 footprint is much larger than the city's direct emissions

• Radical decarbonization measures (limiting nonelectric vehicles; requiring 100% renewable electricity) can induce substantial emissions reductions beyond city boundaries. In wealthy, high-consumption, high-footprint localities such measures may require only a small investment relative to median income, yet accomplish large reductions in total footprint emissions

• Local action at the city and state level can meaningfully affect national and global emissions

Carbon footprint of households: The case of food diet

We identified five key results. First, differences in household demographics (age and sex) do not explain variation in household food CF. Second, regional differences in food-related CF exist, but these are not the main explanatory factor of household differences. Third, household income and savings are weakly correlated with food-related CF. Fourth, there is 1.9 times higher in food CF between the mean household in the lowest and highest quartile. Finally, meat consumption is almost identical across the four quartiles, and it is rather consumption of fish, vegetables, confectionary, alcohol, and restaurants that differentiates high and low CF households.

○Project Members

◎ KANEMOTO Keiichiro (The Research Institute for Humanity and Nature,Associate Professor)
NGUYEN Hoang (The Research Institute for Humanity and Nature,Senior Researcher)
FRY Jacob Redman (The Research Institute for Humanity and Nature,Senior Researcher)
TAHERZADEH Oliver Ahrash (The Research Institute for Humanity and Nature,Senior Researcher)
FARABI-ASL Hadi (The Research Institute for Humanity and Nature,Researcher)
LEE Jemyung (The Research Institute for Humanity and Nature,Researcher)
YAMADA Taiki (The Research Institute for Humanity and Nature,Researcher)
KATAFUCHI Yuya (The Research Institute for Humanity and Nature,Research Associate)
NANSAI Keisuke (National Institute for Environmental Studies,Head)
CHATANI Satoru (National Institute for Environmental Studies,Chief Researcher)
NAKAOKA Masahiro (HOKKAIDO UNIVERSITY,Professor)
MATSUBAE Kazuyo (TOHOKU UNIVERSITY,Professor)
OHNO Hajime (TOHOKU UNIVERSITY,Assistant Professor)

MURAKAMI Shinsuke (The University of Tokyo,Associate Professor)
SUGIHARA Soh (Tokyo University of Agriculture and Technology,Specially Appointed Associate Professor)
OKUOKA Keijiro (Gifu University,Associate Professor)
KAGAWA Shigemi (KYUSHU UNIVERSITY,Professor)
FUJII Hidemichi (KYUSHU UNIVERSITY,Associate Professor)
SHIGETOMI Yosuke (Nagasaki University,Associate Professor)
ITSUBO Norihiro (TOKYO CITY UNIVERSITY,Professor)
KONDO Yasushi (Waseda University,Professor)
ASAYAMA Shinichiro (Waseda University,JSPS Research Fellowship for Young Scientists)
YAMAMOTO Yuki (Nagasaki University,Associate Professor)
OITA Azusa (The National Agriculture and Food Research Organization,Chief Researcher)
SUH Sangwon (University of California Santa Barbara,Professor)
ODA Tomohiro (NASA,Researcher)
HERTWICH Edgar (Norwegian University of Science and Technology,International Chair and Professor)
MORAN Daniel (Norwegian University of Science and Technology,Senior Researcher)
LENZEN Manfred (The University of Sydney,Professor)
VERONES Francesca (Norwegian University of Science and Technology,Associate Professor)
GESCHKE Arne (The University of Sydney,Professor)

○ Future Themes

In the final stage of the project, we integrate all land use and global supply chain datasets, but we will concentrate on forest and agriculture as case studies.

●Achievements

○Papers

【Original Articles】

・Keiichiro Kanemoto, Daniel Moran, Yosuke Shigetomi, Christian Reynolds, Yasushi Kondo. 2019,12 “Meat consumption does not explain differences in household food carbon footprints in Japan”. *One Earth* 1(4):464-471. DOI:10.1016/j.oneear.2019.12.004 (reviewed).

【Review Articles】

・Keiichiro Kanemoto, Daniel Moran. 2019,09 “Carbon Footprint Accounting for the Rising Global South: Status and Opportunities”. *One Earth* 1(1):35-38. DOI:10.1016/j.oneear.2019.08.006

○Research Presentations

【Oral Presentation】

・Keiichiro Kanemoto, Tesshu Hanaka. “Edge Clustering for Supply Chain Networks”. The 27th International Input-Output Conference, July 2019, Glasgow, Scotland.

・Tesshu Hanaka, Keiichiro Kanemoto, Shigemi Kagawa. “Structural Similarity Analysis based on the Network Characteristics of Sectors”. The 27th International Input-Output Conference, July 2019, Glasgow, Scotland.

Research Program3: Designing Lifeworlds of Sustainability and Wellbeing

Program Director: SAIJO Tatsuyoshi

○ Research Subject and Objectives

Our “lifeworlds” are composed of the physical spaces and socio-cultural spheres of our everyday lives. They are continually reproduced, reimagined, and evolving through an interactive and reflexive relationship with society, culture, and nature. Program 3 proposes research aimed at illuminating reciprocal linkages between diverse rural and urban lifeworlds and contributing to the solution of sustainability problems by working with various societal partners such as governments, companies, and citizen groups. Special emphasis is placed on envisioning sustainable futures that improve wellbeing and gauging their feasibility.

Missions

More than 60% of the world’s population resides in Asia and the regions surrounding it. Over a third of global environmental activity occurs there. Within these places lies an incredible diversity of cultures, histories, societies, economies, livelihoods, and ecologies. It is also affected by myriad global and local environmental issues such as population increase, air, water, soil, and coastal pollution, increasing greenhouse gas emissions, and biodiversity loss. At the same time, growing wealth disparity, social isolation, rising levels of poverty, and the disappearance of traditional culture and knowledges are emerging.

Within these processes, the combination of migration between the countryside and cities, and rural depopulation with urban concentration is accompanied by rapid socio-cultural change, resource over-use, and the deterioration of the natural environment. Both urban and rural lifeworlds are disintegrating rapidly. Consequently, through the reconstruction of the lifeworld concept and by highlighting the reciprocal linkages between rural and urban spaces, Program 3 designs lifeworlds of sustainability and wellbeing and co-creates concrete pathways for their realization.

In these same places, diverse world-views and experiences related to the ways in which humanity and nature can exist have accumulated. Pre-existing, yet latent, diverse socio-cultural elements, such as livelihood styles, lay knowledge, conflict resolution strategies, and the vitality of the people themselves can be called upon to address problems and help to chart a course toward possible future societies. Program 3 builds upon these experiences and knowledges of human-nature interaction to propose concrete changes needed to achieve a sustainable society.

Through the transformations and frameworks leading to sustainable urban and rural lifeworld design, the existing economic systems, markets, and political decision making systems will also require fundamental shifts in the way they are conceived. However, Program 3 will not investigate top-down approaches to system change, but will work with local residents, government officials, companies, citizen groups and other various stakeholders to propose sustainable alternatives and gauge their feasibility.

In order not to run the risk of developing proposals that are only applicable to specific regions or sites, Program 3 will aim for research results that are generalizable, but retain their diversity.

○ Progress and Results in 2019

FEAST Project： FR4

The environmental impact of domestic food consumption in Japan was measured by calculating its ecological footprint (EF) and showed a discrepancy between EF in urban (high EF) and rural areas (low EF) as well as in high- and low-income households (forthcoming Journal of Cleaner Production). Seven workshops and public events were held across the four Japanese sites (Kyoto: 3, Kameoka: 2, Nagano: 1, Akita: 1) on a range of issues relevant to local food policy to initiate new networks and institutions such as food policy councils (食と農の未来会議) (results to be published in Iwanami Shoten book, spring 2021). Fieldwork in the Kansai region was carried out focusing on the scalability of agroecological farms (forthcoming AgroSur) and pollinator health and stewardship activities. Smartphone app “Ecokana” (「エコかな」) with over 1.6 million food products launched in July 2020 to provide environmental, social, and health impact data on individual food products.

Sanitation Project: FR3

The Sanitation Project published the third issue (Vol. 3-1, June 2019) of the international academic journal Sanitation Value Chain (ISSN: 2432-5066), which was launched by the project, and we has edited and published articles in a wide variety of academic disciplines on the subject of Sanitation. In addition to organizing workshops at home and abroad, the project continues to conduct fieldwork in Zambia, Indonesia, Cameroon and Hokkaido (Ishikari). In Zambia, it has been conducting workshops to measure fecal contamination of participants' surroundings in collaboration with local children and youth groups to motivate them to improve their hygiene in order to sustain and spread the motivation for hygiene improvement. The project focused on the interconnection of the three values (Socio-Culture, Health & Wellbeing, and Materials) of Sanitation and explored the relationship between the social and cultural issues of Sanitation and health and material economy. The project organizes the

discussion around the issues. In addition, it conducted a meta-study of the project and published an auto-ethnography of the project as an academic paper.

SRIREP Project:FR1

Leader Sakakibara launched FR of the SRIREP project in FY2019. The project conducted case studies in Indonesia and Myanmar. In Indonesia, in collaboration with local collaborators in the ASGM (Artisanal and Small-scale Gold Mining) areas of Gorontalo Province, South Bandung in West Java, and Bombana in Southeast Sulawesi Province, basic research on the pollution of heavy metals such as mercury by ASGM was conducted including cultural and historical research, environmental impact assessment study, health impact assessment study and social-economic research. In particular, in Gorontalo State, these basic researches were almost completed, and the project set up environments for the creation and use of Transdisciplinary Boundary Objects (TBOs) and the formation of Transdisciplinary Community of Practice (TDCOP) in order to start transdisciplinary practice research. In addition, the project deepened the theoretical research on TBOs and TDCOPs, which are important in solving environmental problems. In the village of Bunikasi in South Bandung, West Java, dialogues with residents using a prototype TBO called "Health Risks of Mercury Pollution" resulted in a breakthrough in which the residents discontinued ASGM. In the Bombana region of Southeast Sulawesi Province, the project has also successfully completed basic research and started preparing a transdisciplinary practice study. Preparations for the MOU with the Myanmar Ministry of Environment are progressing smoothly in the Mandalay region of Myanmar. With the permission of the Ministry of Environment, a preliminary study was conducted in the Mandalay region of Myanmar, even before the MOU was signed. In addition, a network for a zero-mercury society at the case study level and at the national level in Indonesia, and a network at the level of ASEAN countries in collaboration with the Japan UNEP Association have been established and their collaboration has been initiated.

The following is a list of the major workshops on future design that were held in Program 3 this year.

Major conference reports and seminars in 2019:

- "Exploring 'Future Design Towns' - Social Technology Cases from Across Asia that are Revolutionizing Systems and Policy", UNDP RIC Zoom Webinar Series Session #2, Bangkok, Thailand, 30 April
- "FD for Business Design", Business Design School 2019, Kyoto Advanced Technology Institute, 18 May
- "On Future Design", Tokyo Foundation forPolicy Research, Tokyo, 21 May
- "FD for Business Design", Business Design School 2019, Kansai University, 25 May
- Session "Is modern businesscapable of implementing successful long-term strategies?", Saint Petersburg International Economic Forum 2019, St. Petersburg, Russia, 6-8 June
- "Future Design", Korean Society for Environmental Economics, Jeju Island, 27 June
- "Future Design x Kochi: Designing for a Sustainable Society from practice experiences", Kochi University of Technology, Kochi City, 7 August
- "Future Design: Bequeathing Sustainable Natural Environments and Sustainable Societies to Future Generations", Social Life Style Meeitng, Osaka, 9 August
- "Effects of Experiencing the Role of Imaginary Future Generations in Decision making: A Case Study of Participatory Deliberation in a Japanese Town", RIETI, Tokyo, 20 August
- "Future Design: Bequeathing Sustainable Natural Environments and Sustainable Societies to Future Generations", Tokushima University, Tokushima, 23 August
- "Future Design", Euoropean ESA Meeting, Dijon, D17, France, 5-7 September
- "Future Design: Bequeathing Sustainable Natural Environments and Sustainable Societies to Future Generations", Eidgenössische Technische Hochschule Zürich, Zurich, Switzerland, 10 September
- "Future Design: Bequeathing Sustainable Natural Environments and Sustainable Societies to Future Generations", Utopiana, Geneva, Switzerland, 11 September
- "Future Design: Bequeathing Sustainable Natural Environments and Sustainable Societies to Future Generations", Université de Lausanne, Lausanne, Switzerland, 12 September
- "Future Design", Hanshin Senior College, Takarazuka, 30 September
- "Future Design", Perinatal Medicine in the Hida Region, Takayama, 19 October
- "Bequeathing Sustainable Natural Environments and Sustainable Societies to Future Generations", Special Committee for Future, Kobe, 25 October
- "The fundamental framework of future design", ASU/Future Design/FEAST Workshop, Kyoto, 7-9 November
- "What is Future Design?", International Symposium at Hanoi National University, Hanoi, 12 November
- "Future Design - The Future We Envision for Ourselves - Future Community through Future Design", Uji city workshop, Kyoto, 16 November
- "Future Design", Eco Design 2019, Yokoyama, 25 November
- "Future Design: An Overview", The 23rd Experimental Social Science Conference, Tokyo, 30 November
- "Future Design", RISTEX, Tokyo, 18 December
- "Future Design: Passing on Sustainable Nature and Society to Future Generations", Okayama Prefectural Office, Okayama, 1 January, 2020

- "Future Design: Principles of Practice", Future Design Workshop 2020, Tokyo, 25-26 January
- "Future Design: Bequeathing Sustainable Natural Environments and Sustainable Societies to Future Generations", Odawara Future Design Forum, Odawara, 21 February
- "Future Design: Bequeathing Sustainable Natural Environments and Sustainable Societies to Future Generations", Univ. of Tokushima's Association for Community-Based Care Systems, Tokushima, 22 February

In addition to the above, the program director supported research projects in IS and FS that are aiming for Program 3 without interruption.

○Project Members

Every member of
FEAST, Sanitation, and
SRIREP projects.

○ Future Themes

1. Based on the various practices in the three projects of Program 3 (FEAST, Sanitation and SRIREP projects), I will continue to address the issues of transdisciplinary research (TD research), new methodologies for improving it, and their relevance to future design.
2. Close support to the leaders of IS and FS research.
3. I will continue to support the leaders of IS and FS research. In order to link these studies, I am working through approaches from the humanities, especially from a philosophical perspective.

●Achievements

○Papers

【Original Articles】

- Y. Nakagawa, R. Arai, K. Kotani, M. Nagano, T. Saijo 2019,08 Intergenerational Retrospective Viewpoint Promotes Financially Sustainable Attitude. Futures. Elsevier, DOI:10.1016/j.futures.2019.102454 (reviewed).
- Tatsuyoshi Saijo 2019,06 "Second Thoughts of Social Dilemma in Mechanism Design". Walter Trockel (ed.) Social Design. Springer Nature, Switzerland, pp.157-171.

○Research Presentations

【Invited Lecture / Honorary Lecture / Panelist】

- Tatsuyoshi Saijo session "Is modern businesscapable of implementing successful long-term strategies?". Saint Petersburg International Economic Forum 2019（SPIEF 19）, 2019.06.06-2019.06.08, St. Petersburg, Russia.
- Tatsuyoshi Saijo Exploring 'Future Design Towns' - Social Technology Cases from Across Asia that are Revolutionizing Systems and Policy. UNDP RIC Zoom Webinar Series Session #2, 2019.04.30.

Stage: Full Research

Project Name: Lifeworlds of Sustainable Food Consumption and Production: Agrifood Systems in Transition

Abbreviated Title: FEAST Project

Project Leader: Steven R. McGreevy

Program 3: Designing Lifeworlds of Sustainability and Wellbeing

URL: http://feastproject.org/

Key Words: agrifood transition, sustainable food consumption and production, foodshed mapping, participatory backcasting, Asian food ethics, social change, social practice

○ Research Subject and Objectives

Agrifood systems in Asia face a myriad of sustainability challenges related to declining environmental health, loss of food diversity, and the deterioration of small-scale farming. On the consumption side, over-reliance on globalized food flows limits consumer agency, decreases food security, and impacts health. How do we respond to these challenges?

Research on food system sustainability presents two broad approaches: **1) maintaining existing food systems** by increasing the efficiency of production, eliminating loss/waste from the system, and eliminating meat consumption; **2) complete system transformation** to distributed, regional/local, short supply chains centered around agroecological production, sufficient food consumption, and absolute reductions in energy and material throughput. The maintenance option, if acted on seriously, has the potential to cut carbon emissions in half (see Springmann et al. 2018, Falk et al. 2019, Willet et al. 2019) in a short amount of time. FEAST argues that such approaches, while moving in the right direction, don't do enough to change the underlying structures of production, distribution, consumption, and food governance to reach the 1.5o C climate change goals and may be unviable in a highly unpredictable climate and post-carbon world. **FEAST research is line with complete food system transformation**, and aims for re-imagining and re-creating regional, small-scale food systems designed for a post-growth world and food lifeworlds that re-value food as a commons.

The ways in which food is currently provided, consumed and governed need urgent change, but we **lack understanding of how agrifood transitions emerge and take root** (e.g. Bui et al 2016), and **the role of existing and alternative institutions and policy** (e.g. Meadowcroft 2011), **social practices** (e.g. Shove et al. 2012, Spaargaren 2011), and **economic arrangements in advancing sustainable food transitions** (D'Alisa et al. 2014, Infante & Gonzalez de Molina 2013).

The FEAST project takes a transdisciplinary approach to explore the realities and potential for sustainable agrifood transition at sites in Japan, Thailand, Bhutan, and China with significance for the entire region. We analyze patterns of food consumption, food-related social practices and their socio-cultural meanings, and agency to change deeply-held cultural dimensions. We map and evaluate food systems specific to national, regional, and local production, distribution, and consumption contexts. Building upon that work, we engage in action research to **partner with stakeholders to envision desirable and plausible futures** and to **initiate food citizenship-oriented experiments and actions**. FEAST co-designs and co-produces socially-robust knowledge and mechanisms that **challenge mainstream economic thinking on consumption and growth**, work to **redefine the notion of long-term food security at the regional level**, and **engage society in a public debate** on our relationship with food and nature that questions shared beliefs and values to **reacclimatize consumers as citizens and co-producers in the foodscapes** around them. FEAST contributes to a growing body of research that merges the literatures of sustainable food consumption (iPES-Food 2015, Lykke Syse & Lee Muller 2015, Reisch et. al 2013) and social transformation/transitions (Grin et al. 2010, Spaargaren et al. 2012).

FEAST will produce four types of knowledge relevant to catalyzing agrifood transitions: 1) **contextual** knowledge of contemporary national, regional, and local food systems (production,distribution, and consumption); 2) co-produced **visions** of alternative food consumption and production practices and municipal transition plans identifying research, education, and policy needs; 3) **modelling and scenario**-based knowledge to inform coinciding deliberation and planning processes; 4) and knowledge related to **intervention strategies**— such as niche incubation, social learning and market transparency— on the execution and effectiveness of workshop-based consensus building toward collective action and market-oriented information- providing tools (eco-labels, food LCA smartphone app). A significant portion of the research is transdisciplinary in nature and **many final outputs are geared for public use** —including collective visioning and creation of new, empowered institutions to implement food policy. These “lighthouses” enable this project to have real-world impact beyond the five-year research period.

Contribution to Program 3

Since the beginning of the third phase, FEAST has contributed significantly to the program mission, title (lifeworlds is a concept that FEAST deals with), and in providing intellectual space to co-develop concepts and methods for the program at large.

In particular, FEAST brings intellectual robustness to the program (as well as to the entirety of RIHN) by way of introducing concepts and theories that have not yet been sufficiently absorbed by ongoing projects and the institute. FEAST has initiated discussion on key concepts such as lifeworld, sustainability, and well-being; on theories of social (ie. transition, transformation) and mindset change (ie. individual, social, and mutual learning); economic (degrowth, sufficiency, informality, doughnut economics, commons, value chains) and political alternatives (decentralized, participatory governance & new institutions); and design and planning (food waste to production & rural-urban linkages; food and energy co-production; urban greenspace and infrastructure; self-reliant local food production systems). All of these concepts are available as integrative spaces to coalesce individual research project trajectories and results into a broad, but coherent narrative around the challenging program task of "designing lifeworlds of sustainability and wellbeing."

We plan to follow up on the WSSF2018 collaborations through an edited volume with the tentative title "Food baskets for post-growth Japan: revaluing informal and wild food practices as provisioning systems." Sanitation project members will author a chapter.

Over the course of the last year, two FEAST researchers, Kazuhiko Ota and Rika Shinkai, devoted a portion of their working hours to co-leading a thematic integrative exercise for the entirety of Program 3, including three workshops.

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○ Progress and Results in 2019

Each project working group (WG) has made progress on their research plans for FR4.

WG1: Food System Mapping & Modelling

WG1 has collected and generated GIS datasets, publicly available statistics, and consumer surveys to map the "origins" and "destinations" of food flow from international and domestic wholesale markets to their place of consumption at the regional/city level at sites in Japan (Kyoto, Noshiro, Nagano). Consumer surveys and "personal foodsheds" have also provided a baseline regarding food consumption habits and localized spatial patterns for food procurement that are used by other WGs. Using satellite imagery, the current condition and potential for urban agriculture in Kyoto City was analyzed and saw a 10% decrease over a ten-year period. WG1 also measured the environmental impact of domestic food consumption in Japan by calculating its

ecological footprint (EF)-- EF of food consumption for all 47 prefectures in Japan shows a discrepancy between EF in urban (high EF) and rural areas (low EF) as well as in high- and low-income households. WG1 research showed that supplying 100% of food calories for urban areas such as Kyoto from surrounding agricultural land is a difficult challenge, but the first step toward achieving greater local/regional food security and a sustainable diet may be to focus on increasing the availability of critical missing nutrients. WG1 is now asking the question "how much of the food nutrition gap can we conceivably supply locally through changes in production (agroecological), distribution (regional food system), and consumption (diets)?" and is developing a model to study this interaction for Kyoto. This approach allows us to rethink self-sufficiency in cities based on nutritional needs.

WG2: Collaborative Approaches to Food Citizenship

WG2 is interested in the development of civic food networks (CFN) as alternative forms of food governance and their impact on food policy and agrifood system transition at the municipal and regional scale. Stakeholder workshops and reflexive action research methods are used to explore consensus building and legitimization processes leading to food policy, and the role of future visions in planning and policy undertaking. 24 public events, 20 major workshops, and many more meetings with diverse food system stakeholders have been held over the course of the project. Many forms of workshop facilitation and mediating/ exploratory tools have been developed, including games, forms of role-playing and enactment, as well as discursive formats. For example, a pluralistic futures approach was used in workshops held in Kyoto combining visioning, backcasting, and serious gaming to allow participants to "play" and experiment with possible futures and how to govern food system transitions. Last year, seven workshops and public events were held across the four Japanese sites (Kyoto: 3, Kameoka: 2, Nagano: 1, Akita: 1) on a range of issues relevant to local food policy and the issues stakeholders feel are urgent and actionable. FEAST initiated networks have formed new organizations akin to "food policy councils" to lead the process of negotiating with municipal governments to actualize local food policy on issues such as children's canteens, intellectual property pertaining to seeds, food distribution, and school lunch programs. Insights into civil society-based governance mechanisms and processes of legitimacy building unique to the Japanese context are some of the significant outputs from this work.

WG3: Agroecological Strategies in Policy and Practice

WG3 explores policy and practice dimensions of agrifood transitions toward agroecological production in Japan and Bhutan. Fieldwork and analysis on support structures, and pathways into agriculture for new organic and agroecological farmers in Japan has been consistent over the course of the project (Hisano et al. 2018, McGreevy et al. 2018). A major accomplishment for this WG, was the completion of a household survey in six rural Bhutanese districts on agricultural and food consumption change (n=440) with the help of the Royal University of Bhutan, College of Natural Resources (MOU). Results are wide-ranging and pertain to changing patterns of meat consumption and the relationship to imported foods, generational gap in what is consumed (more processed food for younger generation), insights into how farm labor and income have changed over time, strong seasonal variance in how people procure food, and the consumption and perceptions of meat and organic products. Recent focus has been on the question of scaling up agroecology and examining the working dimensions on agroecological farms. Additionally, the status and future of pollinator health and stewardship is being researched as a necessary part of agroecological (urban) food systems.

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WG4: Co-designing Agri-food Eco-branding Tools for Supporting Sustainable Regions

WG4 research is concerned with conducting innovative experiments for supporting the sustainable development of small-scale farming and farmer livelihoods via carbon offsetting techniques and co-designed marketing schemes. Last year, the eco-branding case study developed in Kameoka for COOL VEGE® was presented and submitted to the MAFF organized workshop as proposed at the MACS-G20 (the meeting of G20 agricultural chief scientists). Toolkits and guides for other municipalities to use an open eco-branding scheme will be finalized next year. Critical to the success of local food production for consumption schemes is the willingness of locals to buy locally produced food. A survey and choice experiment (n=320) found that tourists value local coffee more than residents in Northern Thailand (Nan), which has implications for food localization valorization strategies in developing countries as local food must be "embedded" in place.

WG5: Food Chain Transparency

The database of over 1.6 million processed food products was merged with FEAST generated data on fresh products and the smartphone app is scheduled to be released in beta by early spring 2020. Consumer-side app user testing and the development of an online platform with voluntary data updating are seen as possible future steps.

WG6: Decolonizing the food system imaginary

We were successful in securing Kaken funds for this research and began working on spatial informal food mapping in Kyoto and fieldwork on wild food procurement practices, such as fishing and eating hunted meats. This work will continue next year and give us a better sense of what kind of role informal food practices play in creating sustainable "shadow" food systems and in composing wild food baskets in a post-growth Japan.

Here is a brief overview of some of the many FEAST 2019 research results.

●**FEAST produced a total of 15 research papers, 1 edited volume, 2 translated works, and 59 presentations at major academic conferences and lectures for the public** in 2018-2019. Selected outputs are below:

-Second special issue in the Journal of the Japanese Institute of Landscape Architecture (Vol. 83) on the theme of **"Landscape in a post-growth society: the possibility of degrowth"** in which there were eight contributions from FEAST on a variety of themes, including new commons, landscape politics of sufficiency, and food movements & degrowth.

-FEAST's transdisciplinary, action research approach on **urban food system sustainability in Kyoto** was featured in a paper on reducing the environmental footprint of cities (*Journal of Cleaner Production*).

-FEAST hosted a session at **the Global Research Forum on Sustainable Production and Consumption Conference** held in Hong Kong entitled "Food futures in Asia: imagining and experimenting with post-growth food procurement and consumption to redefine rural-urban linkages" in which six papers were presented.

-Through our collaboration with the Global Footprint Network and WWF Japan, we were able to produce an informative **booklet on regional differences in ecological footprint aimed at municipal level policy makers .** A paper based on this data is being drafted.

●Other major results are:

-How can we reimagine neighborhood foodscapes? GIS mapping and fieldwork were carried out to map land use in Western Nagano City—this data will be used to develop new land-use scenarios and spatial designs to re-imagine land use and food production with neighborhood committees and residents.

-How do civic food networks develop in Japan? Over 20 meetings, workshops, and events were held in Kyoto, Kameoka, and Nagano, to catalyze civic food networking and co-design food policy measures. For example, ideal future school lunches were envisioned in Obuse Town and plans are being made to input results from the visioning process into the general policy planning process. The need for culturally-specific approaches to civic food policy development that center on concepts of social expectation and "side-to-side" pressure are unique to Japan.

-Can agroecological production scale-up? Fieldwork to answer this question was conducted on "lighthouse farms" (leading, influential farms) (n=15) in Japan with colleagues from UC-Berkeley. Agroecological practices and the socio-economic capacity of farms to act as models for territorial development was assessed for 18 different indicators per farm. The assessment tool is being developed for wide-spread use.

-Do household insect products contain neonicotinoid pesticides? A citizen science project to assess the degree to which neonicotinoids are present in household insect management products found 21 outdoor and 40 indoor products contained neonics. A survey of Kyoto residents found widespread support (78%) for banning neonics in Japan.

Project organization and methodology

The project is arranged into six working groups (WG), each with its own "work package" to conduct over the five-year period. Each working group has one or two chairs that oversee research activities and assist in planning, managerial processes, and strategy building. Each researcher at FEAST HQ liaisons with a particular WG Chair and helps in managing WG-related duties. Major decisions are deliberated on by the project executive committee composed of 13 core members (including WG Chairs) and

FEAST HQ. The executive committee meets together twice a year to discuss budget allotment, research plans, and coordination, once at a retreat in the summer and once during the FEAST Annual Assembly.

○Project Members

◎	MCGREEVY, Steven Robert	(Research Institute for Humanity and Nature,Associate Professor,Environmental Sociology)
○	AKITSU, Motoki	(Graduate School of Agriculture, Kyoto University,Professor,Sociology of Agriculture and Food)
○	SHIBATA, Akira	(Research Organization of Open Innovation & Collaboration, Ritsumeikan University,Professor,Policy Science)
○	TAMURA, Norie	(Research Institute for Humanity and Nature,Senior Researcher,Natural Resource Management)
○	SUDO, Shigeto	(Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization,Principal Researcher,Soil Science, Irrigation and Water Management, Environmental Science)
○	TACHIKAWA, Masashi	(Graduate School of Environmental Studies, Nagoya University,Professor,Sociology of Agriculture and Food)
○	TANIGUCHI, Yoshimitsu	(Dept. of Biological Environment, Akita Prefectural University,Professor,Environmental Sociology)
○	HARA, Yuji	(Faculty of Systems Engineering, Wakayama University,Associate Professor,Landscape Ecology)
○	TSUCHIYA, Kazuaki	(Graduate School of Agricultural and Life Sciences, The University of Tokyo,Assistant Professor,Urban Ecology, Social Ecological Systems)
○	TANAKA, Keiko	(College of Arts and Sciences, University of Kentucky,Professor,Sociology of Agriculture and Food)
○	KISHIMOTO-MO, Ayaka	(Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization,Principal Researcher,Ecosystem Ecology, Agricultural Economics)
○	NAKAMURA, Mari	(Dept. of Food Business, Nagoya Bunri University,Professor, Department Chair,Sociology of Food)
○	INABA, Atsushi	(Japan Life Cycle Assessment Facilitation Centre,Director,LCA)
	RUPPRECHT, Christoph D.D.	(Research Institute for Humanity and Nature,Senior Researcher,Geography)
	SPIEGELBERG, Maximilian	(Research Institute for Humanity and Nature,Researcher,Environmental Management)
	KOBAYASHI, Mai	(Research Institute for Humanity and Nature,Researcher,Environmental Sociology, Environmental Studies)
	OTA, Kazuhiko	(Research Institute for Humanity and Nature,Researcher,Japanese Environmental Ethics)
	SHINKAI, Rika	(Research Institute for Humanity and Nature,Researcher,Cultural Anthropology, Ethnology)
	ODA, Kimisato	(Research Institute for Humanity and Nature,Researcher,River Ecosystem)
	NILES, Daniel	(Research Institute for Humanity and Nature,Associate Professor,Geography)
	KUMAZAWA, Terukazu	(Research Institute for Humanity and Nature,Associate Professor,Environmental Planning, Regional Informatics)
	TERADA, Masahiro	(Research Institute for Humanity and Nature,Visiting Associate Professor,History, Metahistory)
	OTANI, Michitaka	(Research Institute for Humanity and Nature,Technical Assistant,Sociology)
	YAGASAKI, Yasumi	(Tohoku Agricultural Research Center, National Agriculture and Food Research Organization,Researcher,Environmental Agriculture)
	WATANABE, Kazuhito	(Agriculture, Forestry and Fisheries Policy Division, Miyagi Prefectural Government,Technical Manager,LCA)
	SHIRATO, Yasuhito	(Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization,Research Manager for Climate Change,Agricultural Policy Science, Soil Science)
	HAYASHI, Kiyotada	(Central Region Agricultural Research Center, National Agriculture and Food Research Organization,Team Leader,LCA)
	TAHARA, Kiyotaka	(National Institute of Advanced Industrial Science and Technology,Laboratory Leader,LCA)
	HORIGUCHI, Makoto	(Industry-Information Collaboration Research Center Corp,Principal Researcher,LCA)
	OSAWA, Takeshi	(Faculty of Urban Environmental Sciences, Tokyo Metropolitan University,Associate Professor,Biodiversity Informatics)
	NISHIYAMA, Mima	(Dept. of Agricultural Economies, Utsunomiya University,Associate Professor,Agrifood Systems)
	NISHINUMA, Tatsuo	(Dept. of Environmental Engineering, Utsunomiya University,Associate Professor,LCA)
	OISHI, Takanori	(ASC African Studies Center, Tokyo University of Foreign Studies,Associate Professor,Anthropology)
	WATANABE, Manabu	(Dept. of Food Science and Technology, Tokyo University of Marine Science and Technology,Associate Professor,LCA)

HISANO, Shuji	(Graduate School of Economics, Kyoto University,Professor,International Political Economy of Agriculture)
NI, Hui	(Graduate School of Economics, Kyoto University,Junior Researcher,Agricultural Economics)
HIRAGA, Midori	(Graduate School of Economics, Kyoto University,Ph.D. Student,Political Economy)
IWAHASHI, Ryo	(Graduate School of Agriculture, Kyoto University,Ph.D. Student,Sociology of Agriculture and Food)
NOMURA, Ayaka	(Graduate School of Advanced Integrated Studies in Human Survivability (Shishu-Kan), Kyoto University,Ph.D. Student,Food Waste Management)
ASHIDA, Yusuke	(Faculty of Human Sciences, Kanagawa University,Associate Professor,Regional Sociology)
DOI, Yohei	(Faculty of Tourism and Community Studies, Atomi University,Associate Professor,Rural Sociology)
SHOBAYASHI, Mikitaro	(Dept. of Intercultural Communication, Gakushuin Women's University,Professor,Agricultural Policy)
TANABIKI, Yusuke	(Dept. of Sociology, Rikkyo Universiy,Assistant Professor,Social Statistics)
IWASHIMA, Fumi	(Faculty of Policy Studies, Doshisha University,Assistant Professor,Rural Women's Policy and Gender)
OGA, Momoe	(Graduate School of Policy and Management, Doshisha University,Former Ph.D. Student,Policy Science)
YOSHIKAWA, Naoki	(Dept. of Environmental Systems Engineering, Ritsumeikan University,Lecturer,LCA)
FUJIWARA, Natsumi	(Research Organization of Science and Technology, Ritsumeikan University,Assistant Researcher,Social Engineering)
HAMADA, Shingo	(Dept. of Life Planning, Osaka Shoin Women's University,Associate Professor,Cultural Anthropology)
IHA, Katsunori	(Global Ecological Footprint Network,Researcher,Modelling)
KOJIMA, Satoshi	(Institute for Global Environmental Strategies,Principal Coordinator,Environmental Impact Assessment)
SUMOTO, Edward	(RenEnergy Crossboarder,Innovation Studies)
KAWASHIMA, Yumie	(AEON Co., Ltd.)
NGUYEN, Philip	(Gochiso Inc.,CEO,App Design)
OZAWA, Fumihiro	(Coolvege Association,Director of General Affairs Division)
MATSUDAIRA, Naoya	(AM Net,Director,Organic Farming)
KATANO, Naoko	(Kitchen Zukan,Childcare Worker,Childcare)
VERVOORT, Joost	(Copernicus Institute of Sustainable Development, Utrecht University,Assistant Professor,Environmental Governance)
MANGNUS, Astrid	(Copernicus Institute of Sustainable Development, Utrecht University,Ph.D. Candidate,Environmental Governance)
KANTAMATURAPOJ, Kanang	(International Health Policy Program, Mahidol University,Assistant Professor,Sociology)
WIBULPOLPRASERT, Suwit	(International Health Policy Program Foundation, Ministry of Public Health, Thailand,Vice Chair,Public Health)
THAITAKOO, Danai	(Dept. of Landscape Architecture, Chulalongkorn University,Associate Professor,Landscape)
SRITHANYARAT, Suebsiri	(Dept. of Landscape Architecture, Chulalongkorn University,Lecturer,Landscape)
BUNDITSAKULCHAI, Pongsun	(Dept. of Civil Engineering, Chulalongkorn University,Lecturer,Environmental Policy)
CHOW, Sungming	(Dept. of Applied Social Sciences, Hong Kong Polytechnic University,Lecturer,Socioeconomics)
ZHOU, Sheng	(Shanghai Academy of Agricultural Sciences,Group Leader,Soil Studies)
MA, Jia	(Shanghai Academy of Agricultural Sciences,Professor,Land Resource Economics, Urban Agricultural Economic Management)
ZHANG, Jining	(Shanghai Academy of Agricultural Sciences,Associate Professor,Soil Studies)
CHHETRI, Rekha	(College of Natural Resources, Royal University of Bhutan,Assistant Professor,Organic Farming)
Sonam Tashi	(College of Natural Resources, Royal University of Bhutan,Associate Professor,Organic Farming)
Katel Om	(College of Natural Resources, Royal University of Bhutan,Lecturer,Climate Change)
DUMONT, Antoinette M.	(Department of Environmental Science, Policy and Management, University of California, Berkeley,Postdoctoral Researcher,Agronomic Sciences, Bioengineering)
KAWAI, Ayako	(Fenner School of Environment & Society, Australian National University,Ph.D. Student,Sociobiology, Environmental Studies)
MATSUOKA, Yuko	(Research Institute for Humanity and Nature,Research Associate,Project Management)
KOBAYASHI, Yuko	(Research Institute for Humanity and Nature,Research Associate,Project Management)

□ KOOHAFKAN, Abolghassem Parviz (World Agricultural Heritage Foundation,President,Integrated Natural Resource Management)

○ Future Themes

FEAST will enter its final year and the primary focus will be on writing and publications. Limited data collection and stakeholder engagement will take place to wrap up research activities and transition to the "post-FEAST" phase where research results, toolkits and tools, policy plans, and educational materials will be unfurled in total. In some instances, institutions for local food governance initiated through the efforts of FEAST will continue their activities into the future.

Informal food practices and diverse food economies: We are interested in the potential that informal food practices have in creating wide-spread food provisioning opportunities as part of regional/local food systems in a post-growth, 1.5o C oriented world. We theorize that the interlinkages between informal food practices at urban and rural sites can compose alternative food *systems* and represent one form of a diverse, resilient food economy that will be necessary in the future for local food security. Building on past FEAST fieldwork and interviews, follow-up fieldwork in Japan, Bhutan, and Thailand will be conducted in coordination with overseas collaborators using funding from the Kaken project "The role of informal food practices in convivial post-growth rural lifestyles". An edited volume on this work is planned, tentatively titled "**Food baskets for post-growth Japan: revaluing informal and wild food practices as provisioning systems."**

Future agrifood policy action plans and evaluating civic food networks & institutions: This work will take place in Thailand and sites in Japan. 1) Working with colleagues in Thailand, the results from workshops held in Bangkok in Dec. 2019 on future scenarios of food practices will be compiled and published. The feedback from stakeholders will be reintegrated into a series of concrete scenarios and written into policy action plan proposals for the city's Public Health and Urban Planning departments, as well as into research papers. 2) Similarly, policy action plans will be developed at each of the Japan sites as roadmaps for future food system transition based on previous action research. We will also perform a series of follow-up interviews at each site in Japan (Kyoto, Kameoka, Noshiro, Nagano) to evaluate the social impact of the transdisciplinary process at each site with special emphasis on processes of legitimacy building and trust.

Transitioning everyday food consumption and production: Stories from a post-growth future: FEAST plans on hosting the next RIHN International Symposium as a capstone event for the project. Possible keynote speakers have been identified from the fields of sustainable consumption and production, degrowth, and agrifood sociology to help lead a discussion on how to reimagine and enact models for food production, consumption, and governance that are viable, desirable, and possible outside of the growth paradigm. Some questions that will be addressed at the symposium through highlighting FEAST research: 1) How do we redesign food production around the principles of agroecology so they might regenerate ecological synergies and sprout the seeds of sovereignty? 2) Food futures are political-- how do civic food actors rally around desirable food visions and find agency in transforming their foodsheds? 3) As food is so ingrained in culture and the rhythms of daily life, the repatterning of a post-growth food system has profound implications for the future of lifestyles, work, and health. How might sustainable food practices reconstitute foodscapes of sufficiency and conviviality, in which the line between consumer and producer is blurred? 4) Finally, can our relationship with food and agriculture redefine socio-cultural ideas of the good life and enable alternative worldviews that embrace ecological and social limits? We are planning a publication from the papers presented at the symposium.

Spin-off projects at RIHN and beyond: Multispecies stewardship and regional food system transition were two themes developed over the course of FEAST—new projects by FEAST members on these themes are currently running as Incubation Studies (IS) and have the potential to continue FEAST research into a new phase in the future. The two IS projects are "Living in the bioregion: decentralizing the primary industries" led by Norie Tamura and "Multispecies Cities: Co-designing more-than-human well-being in the Asia-Pacific" led by Christoph Rupprecht. In addition, Kazuhiko Ota submitted Core research project proposal on serious gaming methodology and approved as well. Our collaboration with Utrecht University's Copernicus Institute for Sustainable Development will develop further through a Vidi grant on anticipatory governance and simulation gaming and two PhD students will work with FEAST. Many FEAST members have also made ties with a comparative project between the UK and Japan on "Comparative Ruralities" funded by the AHRC of the UK and the ESRC that will continue next year.

Academic and "lighthouse" public outputs: As FEAST enters its final year, we will focus on academic publication and production of outputs for public education. We plan on finalizing policy reports at sites in Japan, Thailand, and Bhutan, developing K-12 curriculum for exploring food futures through the lens of school lunches and local food security, and a series of serious board games on the topic of good food governance. In addition, the following outputs are planned:

Food transparency smartphone app: This app provides data on the environmental, social, and health impacts of individual food products. A prototype developed using a redacted version of a 1.6 million entry food product database and uploaded to Apple's Testflight service is currently under its final upgrades and will be released in the spring of 2020 and limited user testing will follow.

Open climate-friendly food eco-brand starter kit: A series of toolkits aimed at farmers, brand owners, certification bodies, and municipal governments will be released to help guide communities through the process of establishing their own regional ecological-brand based carbon-negative farming techniques (ala. COOL VEGE®).

Civic food networks and local food governance institutions: The hope is that the civic food networks in Japan advanced through FEAST action research over the past four years will continue on into the future and enact the future food policy plans that were developed at each site.

Academic outputs: Over fifty academic papers and three edited volumes are currently under development for publication based on FEAST research. We suspect this will be the beginning of a multi-year post-project effort at publishing papers based on FEAST research and data. Next year, we anticipate publications in journals such as Global Sustainability, Agriculture and Human Values, Futures, PLOS One, Journal of Cleaner Production, Agroecology and Sustainable Food Systems, Journal of Consumer Studies, and Sustainability Science among others.

●Achievements

○Papers

【Original Articles】

- LeBlanc, Robin M. 2019,04 The Landscape Politics of Enough. *Journal of the Japanese Institute of Landscape Architecture* 83(1):34-36. (in Japanese) (reviewed).
- Mangnus, A. C., J. M. Vervoort, S. R. McGreevy, K. Ota, C. D. D. Rupprecht, M. Oga, and M. Kobayashi 2019,10 New pathways for governing food system transformations: a pluralistic practice-based futures approach using visioning, back-casting, and serious gaming. *Ecology and Society* 24(4). DOI:10.5751/ES-11014-240402 (reviewed).
- Matanle, Peter and Luis Antonio Sáez Pérez. 2019,04 Searching for a Depopulation Dividend in the 21st Century : Perspectives from Japan, Spain and New Zealand . *Journal of the Japanese Institute of Landscape Architecture* 83(1):37-39. (in Japanese) (reviewed).
- Ota,Kazuhiko and Yoshimitsu Taniguchi 2019,11 Learning Program for Sustainability Transition of Local Food System: A Case Study of Akita Prefectural Noshiro Shoyo High School. *Journal of Environmental Thought and Education* 12:157-166. (in Japanese) (reviewed).
- Rupprecht, C.D.D., Lei Fujiyoshi, Steven R. McGreevy, Ichiro Tayasu 2020,02 Trust me? Consumer trust in expert information on food product labels. *Food and Chemical Toxicology*. DOI:10.1016/j.fct.2020.111170 (reviewed).
- Rupprecht, C. D. D. and Lihua Cui 2020,03 Understanding Threats to Young Children's Green Space Access in Unlicensed Daycare Centers in Japan. *International Journal of Environmental Research and Public Health* 17(6). DOI:10.3390/ijerph17061948
- Suzuki, Haruhiko, Hiroaki Kakizawa, Kunihiro Hirata and Norie Tamura 2020,03 The current state of and future trends in the forest administration of municipalities: Analysis of the postal questionnaire survey. *Journal of Forest Economics* 66(1):51-60. (in Japanese)
- Tamura, Norie 2019,04 Beyond Public and Private: a New Commons of Autonomy and Solidarity. *Journal of the Japanese Institute of Landscape Architecture* 83(1):32-33. (in Japanese) (reviewed).
- Tamura, Norie and Christoph Rupprecht 2019,04 Impressions from the Sweden and Mexico Degrowth Conferences. *Journal of the Japanese Institute of Landscape Architecture* 83(1):4-5. (in Japanese) (reviewed).
- Taniguchi, Yoshimitsu 2019,04 Agro-Food Movements and Degrowth in Japan. *Journal of the Japanese Institute of Landscape Architecture* 83(1):40-41. (in Japanese) (reviewed).
- Zhang, XY, Ma J, Zhang J N, Zhou S 2019 Urban residents' willingness to pay and the influencing factors for low carbon agricultural products: An empirical analysis on low-carbon vegetables in Shanghai. *Research of Agricultural Modernization* 40(1):89-97. (in Chinese) (reviewed). (in Chinese with English abstract)

・Zhang, XY, Ma Y, Ma J, Zhang JN 2019 Metropolitan resident's cognition and willingness of payment for low-carbon agricultural products——Empirical analysis on low-carbon vegetables in Shanghai (大都市居民对低碳农产品的认知情况与支付意愿研究——基于上海市低碳蔬菜的实证). *Acta Agriculture Shanghai (上海农业学报)* 35(3):116-122. (in Chinese) (reviewed). (in Chinese with English abstract)

【Review Articles】

・Rupprecht, C.D.D. 2019,04 Degrowth and Landscape. *Journal of the Japanese Institute of Landscape Architecture* 83(1):6-7. (in Japanese) (reviewed).

・Watanabe, Yosuke, Christoph Rupprecht, Noriko Akita and Kenta Shinozawa 2019,04 Future Directions of Landscape in Post-Growth Society: Possibilities of "Degrowth". *Journal of the Japanese Institute of Landscape Architecture* 83(2):3. (in Japanese) (reviewed).

○Research Presentations

【Oral Presentation】

・Iha, Katsunori Ecological Footprint of Japanese city group and 47 prefectures. Urban Land Teleconnection and Sustainability, 2019.06.28, RIHN.

・Kawai, Ayako Attachment to saved seeds leading to distinct attitude in seed sharing. Institute of Australian Geographers Conference 2019, 2019.07.09-2019.07.13, Tasmania.

・Kawai, Ayako Motivations and values for informal management of seeds in Japan. The 17th Asia Pacific Conference, 2019.11.30-2019.12.01, Ritsumeikan Asia Pacific University.

・Kobayashi, Mai Meat in a post-development world: insights from Bhutan. American Association of Geographers Annual Meeting 2019, 2019.04.03-2019.04.07, Washington, DC, USA.

・Kobayashi, Mai To eat or not to eat: Bhutan's changing landscape of meat consumption and sin. 2019 Hong Kong Conference of the Global Research Forum on Sustainable Production and Consumption, 2019.06.26-2019.06.29, Hong Kong.

・Kobayashi, Mai and Maximilian Spiegelberg Multi-stakeholder Workshop: The future of food and agriculture in Bhutan. ASU / Future Design / FEAST Workshop on Itergenerational Futures "Opening and Enacting New Futures", 2019.11.07-2019.11.09, RIHN.

・Ma, Jia Metropolitan residents' willingness to payment and factors affecting low-carbon agricultural products: an empirical analysis on low-carbon vegetables in Shanghai. 4th International Conference on Agricultural and Biological Sciences, 2018.06.26-2918.06.29, Hangzhou, China. Best Oral Presentation Award

・Mangnus, Astrid New pathways for governing food system transformations: a pluralistic practice-based futures approach using visioning, back-casting and serious gaming. ASU / Future Design / FEAST Workshop on Itergenerational Futures "Opening and Enacting New Futures", 2019.11.07-2019.11.09, RIHN.

・Kobayashi, Mai Kyoto No.1 Seeds in Bhutan: exploring the coexistence of diversification and mainstreaming and seed commodification in the context of food sovereignty. The 17th Asia Pacific Conference, 2019.11.30-2019.12.01, Ritsumeikan Asia Pacific University.

・McGreevy, Steven R. New settlers in a withering rural Japan: changing notions of the "good life" and prospects for sustainability. American Association of Geographers Annual Meeting, 2019.04.05, Washington D.C., Marriott.

・McGreevy, Steven R. Storifying visions of future food-related social practices & mapping emergence pathways in material-competency-meaning chains: three cases from Bangkok. 2019 Hong Kong Conference of the Global Research Forum on Sustainable Production and Consumption, 2019.06.26-2019.06.29, Hong Kong.

・McGreevy, Steven R. Lifeworld-level scenarios: Re-crafting social practices for food in Bangkok. ASU / Future Design / FEAST Workshop on Itergenerational Futures "Opening and Enacting New Futures", 2019.11.07-2019.11.09, RIHN.

・McGreevy, Steven R. Sufficiency futures worth living & how to get there: niche development, practice-based scenarios, & the social imaginary. ASU / Future Design / FEAST Workshop on Intergenerational Futures "Opening and Enacting New Futures", 2019.11.07-2019.11.09, RIHN.

・McGreevy, Steven R. Transdisciplinary processes in the FEAST Project. RIHN Terra School, 2019.12.10-2019.12.12, Research Institute for Humanity and Nature.

・McGreevy, Steven R. & Kanang Kantamaturapoj "Storifying visions of future food-related social practices & mapping emergence pathways in material-competency-meaning chains: three cases from Bangkok". Global Research Forum on Sustainable Production and Consumption 2019, 2019.06.26-2019.06.29, Hong Kong, Hong Kong University of Science and Technology.

- Ota, Kazuhiko Through Forks to Fields: Using the Lens of Food Consumption to Design Sustainable Agriculture and Technologies. SPT2019, 2019.05.20-2019.05.23, Texas A&M University.
- Ota, Kazuhiko Playing with food visions—using gaming methods to experiment with sustainable food governance and refine future pathways in Japan. 2019 Hong Kong Conference of the Global Research Forum on Sustainable Production and Consumption, 2019.06.26-2019.06.29, Hong Kong.
- Ota, Kazuhiko Fudo theory, Environmental ethics, Food ethics. International Association for Japanese Philosophy 2019, 2019.10.12-2010.10.13, East-West Center, University of Hawai‘i at Mānoa.
- Ota, Kazuhiko Exercise for transdisciplinary collaboration that connects and uses future visions: A case study of the Serious Board Game Jam 2018, 2019 in Kyoto. ASU / Future Design / FEAST Workshop on Itergenerational Futures "Opening and Enacting New Futures", 2019.11.07-2019.11.09, RIHN.
- Ota, K., Vervoort, J., Iida, K., Tsujita, Y., Murakami, M., Mangnus, A. Co-creating serious game for sustainability transition: Case study of the Serious Board Game Jam 2018 in Kyoto. Digital Games Research Association 2019: Game, Play and the Emerging Ludo Mix, 2019.08.06-2019.08.09, Ritsumeikan University, Kyoto.
- Rupprecht, C. D. D. Whose social infrastructure? Young children’s green space access during daycare in aging Japan. American Association of Geographers Annual Meeting 2019, 2019.04.03-2019.04.07, Washington, DC, USA.
- Rupprecht, C. D. D. Unfamiliarity inference from Familiarity: Perception of Informal Green Space from the understanding of urban green space. American Association of Geographers Annual Meeting 2019, 2019.04.03-2019.04.07, Washington, DC, USA.
- Rupprecht, C. D. D. Imagining satomachi: A radical vision for post-growth Japanese cities based on biocultural diversity and urban landscape stewardship. 2019 Hong Kong Conference of the Global Research Forum on Sustainable Production and Consumption, 2019.06.26-2019.06.29, Hong Kong.
- Rupprecht, C. D. D. Imagining satomachi: A radical vision for post-growth Japanese cities. Urban Land Teleconnection and Sustainability seminar, 2019.07.01, The University of Tokyo.
- Rupprecht, C. D. D. Why commons are not things: commoners & communing, urban & multispecies commons. RIHN Global Environmental Problems and the Commons Study Group Meeting, 2019.10.29, RIHN.
- Rupprecht, C. D. D. Multispecies futures: the future does not belong to humans alone. ASU / Future Design / FEAST Workshop on Intergenerational Futures "Opening and Enacting New Futures", 2019.11.07-2019.11.09, RIHN.
- Rupprecht, C. D. D., Multispecies Project team Multispecies Cities: Co-designing more-than-human well-being in the Asia-Pacific. Institute of Australian Geographers Conference, 2019.07.09-2019.07.13, Hobart, Tasmania.
- Rupprecht, C. D. D., Spiegelberg, M., Shinkai, R., Gan, J. Eastern honeybee beekeeping in Japan and its socio-ecological context: a transdisciplinary, more-than-human journey. Institute of Australian Geographers Conference, 2019.07.09-2019.07.13, Hobart, Tasmania.
- Spiegelberg, Maximilian Engaging bee-stakeholders for a bee-friendly Kyoto: A transdisciplinary research process. The 46th Apimondia International Apicultural Congress, 2019.09.08-2019.09.12, Montreal, Canada.
- Spiegelberg, Maximilian, Sittidaj Pongkijvorasin Beyond extractive relationships for upland Asia: exploring dependency and sufficiency in an urbanizing age. 2019 Hong Kong Conference of the Global Research Forum on Sustainable Production and Consumption, 2019.06.26-2019.06.29, Hong Kong.
- Spiegelberg, Maximilian, Rika Shinkai, Chung-Yu Ko, I-Hsin Sung Tracking Practices of Traditional Beekeeping in Taiwan and Japan. International Meliponine Conference and Asian Apicultural Association Philippines Symposium on Pollinator Conservation, 2020.02.25-2020.02.28, University of the Philippines, Los Baños.
- Tamura, Norie The wild food basket in urban Japan — Spreading practices in a post-growth, post-industrialized country. 2019 Hong Kong Conference of the Global Research Forum on Sustainable Production and Consumption, 2019.06.26-2019.06.29, Hong Kong.
- Tamura, Norie Building imaginative capacity with rural municipality policy planners: empowering distributed futures. ASU / Future Design / FEAST Workshop on Itergenerational Futures "Opening and Enacting New Futures", 2019.11.07-2019.11.09, RIHN.
- Tamura, Norie The abolishment of the seed law in Japan – an analysis of public discourse from a perspective of communal resource management. The 17th Asia Pacific Conference, 2019.11.30-2019.12.01, Ritsumeikan Asia Pacific University.
- Tsuchiya, Kazuaki Diversification of urban diets and agricultural land use changes through teleconnections. Urban Land Teleconnection and Sustainability, 2019.06.28, RIHN.

・Tsuchiya, Kazuaki Modelling Japan's food futures: diets, land use scenarios & policy tools. ASU / Future Design / FEAST Workshop on Intergenerational Futures "Opening and Enacting New Futures", 2019.11.07-2019.11.09, RIHN.

・Vervoort, Joost Multiple pasts, multiple presents, and multiple futures in anticipatory governance. ASU / Future Design / FEAST Workshop on Intergenerational Futures "Opening and Enacting New Futures", 2019.11.07-2019.11.09, RIHN.

・Zhang JN., Zhou S., Sun HF., Zhang XX., Wang C. The characteristics of biochar pyrolyzed from agricultural straws. The 1st International Conference on Biochar Research and Application, 2019.09.20-2019.09.23, Shenyang, China.

【Poster Presentation】

・Rupprecht, C. D. D., Lei Fujiyoshi, Steven R. McGreevy and Ichiro Tayasu Trust me? Consumer trust in expert information on food product labels. 1st ISO-FOOD International Symposium on Isotopic and Other Techniques in Food Safety and Quality, 2019.04.01-2019.04.03, Piran, Slovenia. Best Poster Award

【Invited Lecture / Honorary Lecture / Panelist】

・McGreevy, Steven R. Making sense of the foodscape & radical food futures. Slyff Leaders Workshop, 2019.04.08, Oita.

・Shibata, Akira and Ayaka Kishimoto-mo "COOL VEGE®": Sequestrating soil carbon with biochar through eco-branded vegetables. International Workshop on Scaling up and out of climate-smart technologies and practices for sustainable agriculture, 2019.11.05-2019.11.07, Ministry of Agriculture, Forestry and Fisheries, Tokyo.

・Spiegelberg, Maximilian Upland futures in an urban era: Spaces between the continuation of traditions and exploration of alternative lifeworlds. 4th International Conference on Regional Development (ICRD) "Rural Development in Urban Age: Do Rural-Urban Linkages Matter?", 2019.08.06-2019.08.07, Diponegoro University, Semarang, Indonesia.

Stage: Full Research

Project Name: The Sanitation Value Chain: Designing Sanitation Systems as Eco-Community-Value System

Abbreviated Title: Sanitation

Project Leader: YAMAUCHI Taro

Program 3: Designing Lifeworlds of Sustainability and Wellbeing

URL: http://www.chikyu.ac.jp/sanitation_value_chain/

Key Words: resources oriented sanitation; value chain

○ Research Subject and Objectives

a) Problem, background, and objectives

Global environmental problem discussed in the project:

The word “sanitation” refers to the provision of facilities and services for the safe disposal and resource recovery of human urine, feces, and wastewater. Sanitation is essential for promoting health, preventing environmental pollution, conserving ecosystems, and recovering and recycling resources. Therefore, it can be said that sanitation is closely related to such current global issues as poverty, urban slums, conservation of ecosystems, and resource management. In the developing world, the population is growing rapidly, especially in urban slums, and there is high child mortality and poverty issues (see Supplementary Fig. 0-1). It has been reported that as of 2015, 2.4 billion people were still using unimproved sanitation facilities, including 946 million people who were still practicing open defecation (UN, 2015). On the other hand, depopulation and aging are progressing, especially in the rural parts of the developed world (see Supplementary Fig. 0-2), and the financial capabilities of municipalities, who manage sanitation systems, are becoming weaker and weaker.

Key question of the project:

The questions “How can we handle the waste from 10 billion people in the future?” and “How can we achieve the water and sanitation targets in the sustainable development goals (SDGs)?” are global environmental problems that need to be solved.

Working hypothesis of the research:

Hypothesis-1: Current sanitation issues are caused by the dissociation between the value that they provide and the values of individual people and/or communities.

Hypothesis-2: Sanitation technologies cannot work well without a support system. The mismatch between the prerequisites of technologies and local characteristics makes sanitation issues more complicated.

Key concept - Sanitation value chain:

The project proposes a sanitation value chain, which entails the following basic policies: 1) Put the values of people and communities at the center of the discussion, and prepare a sanitation system to drive this value chain; 2) design the sanitation system by focusing on direct incentives for individual users and communities; 3) recognize that a sanitation system is an integrated system with social and technical units; and 4) design the sanitation system by making a good match between social characteristics and the prerequisites of technologies.

Why a value chain?:

We strongly believe that 1) the planning and installation of infrastructures such as sanitation systems is nothing, but planning and installing a value chain, as shown in Supplemental Fig. 0-3, is more valuable; and 2) because of the weakening of municipalities, the prerequisites of the current management model for water and sanitation systems will be no longer be met in the future.

b) Methodology

Four research steps to achieve the goal:

In Topic 1 (Life), field and literature surveys are performed to 1) analyze the values and happiness of people; 2) understand norms relating to human excreta in the current situation, as well as historical changes; 3) re-evaluate the value of sanitation systems; 4) analyze the mismatch between the prerequisites of sanitation technologies and the region-specific characteristics of humans and communities by gathering failed cases; 5) understand historical changes in the sanitation systems of target areas; and 6) match the values of people and communities to the value provided by sanitation systems. In Topic 2 (Technology), four research activities are planned: 1) Summarizing the prerequisites of sanitation technologies; 2) re-evaluating the value of sanitation systems; 3) analyzing the mismatch between the prerequisites of sanitation technologies and the region-specific characteristics of humans and communities by gathering failed cases; and 4) developing required technologies. In Topic 3 (Co-creation), the following three steps will be adapted: 1) identifying stakeholders and understanding the structure of the values of

people and communities using a field survey; 2) analyzing the hierarchy and structure of stakeholders' value chain and evaluating their mutual affinity; and 3) developing the co-creation process. In Topic 4 (Visualization), the main activity is developing visualization methods for our concept and research results using various media and techniques. We strongly recognize the importance of visual images in the trans-disciplinary (TD) approach.

Field study:

The project will involve field studies in 1) the rural area of Ishikari River Basin, 2) rural and urban areas in Burkina Faso, 3) an urban slum in Indonesia, and 4) an urban slum in Zambia.

c) Goals and Expected results

The goals of this research project are 1) to propose that a sanitation value chain is relevant to both developing and developed countries; 2) to design several pilot studies demonstrating the significance of societal, academic, and professional involvement in the co-creation of this value chain; and 3) to contribute to the establishment of a new interdisciplinary academic foundation regarding sanitation. Examples of the sanitation value chain will be demonstrated and co-created at the pilot study sites.

d) Project organization and membership

For project management, a coordination group has been organized. Four research teams have also been organized.

e) Current status of research on resource oriented sanitation

Research groups in Switzerland, Germany, Sweden, Norway, and Finland are studying resource recovery-type sanitation. The specialist groups of the International Water Association (IWA) jointly held an international conference (S2SMALL) in October 2017. Also, the topics of the 6th Dry Toilet conference (DT2018) held in August 2018 were as follows: research on the safe use of excreta and/or urine; social and cultural aspects of sustainable sanitation; sanitation and nutrient recycling in business; cross-organizational cooperation and co-creation; hi- and low-tech solutions in urban/rural environments; "ecosan" meets the water-food-energy nexus; promoting sustainable sanitation and nutrient recycling among different stakeholders; and community engagement. Seven members of the project including the leader, sub-leader, and core members contributed to DT2018. The four research topics included in the project can make a big contribution to global research on sanitation.

Program 3 Goal

Our "lifeworlds" are composed of the physical spaces and socio-cultural spheres of our everyday lives. They are continually reproduced, reimagined, and evolved through an interactive and reflexive relationship with society, culture, and nature. Program 3 proposes research aimed at illuminating the reciprocal linkages between diverse rural and urban lifeworlds and contributing to solving sustainability problems by working with various societal partners such as governments, companies, and citizen groups. Special emphasis is placed on envisioning sustainable futures that improve wellbeing and gauging their feasibility.

Contribution to Program 3

In the mission statement of Program 3, there is the following message: "Through the reconstruction of the lifeworld concept and by highlighting the reciprocal linkages between rural and urban spaces, Program 3 designs lifeworlds of sustainability and wellbeing and co-creates concrete pathways for their realization." We think that sanitation is an essential system for lifeworlds. Sanitation contributes to human public health, material/resource recycling by society, and environmental pollution/ecosystem management. In our project, sanitation value chains for not only rural areas but also for urban areas are discussed. When it comes to the sanitation value chain for urban areas, we design material and value flows between rural and urban spaces.

Our Program 3 mission statement also says that "Pre-existing, yet latent, diverse socio-cultural elements, such as livelihood styles, lay knowledge, conflict resolution strategies, and the vitality of the people themselves can be called upon to address problems and help to chart a course toward possible future societies. Program 3 builds upon these experiences and knowledge of human-nature interaction to propose concrete changes needed to achieve a sustainable society." We could not succeed in installing a practical scale sanitation system in Burkina Faso as part of the SATREPS project, and we think that the reason for this was the lack of analysis of the human and social aspects. In our project, we carefully examine the values of people and communities, as well as norms related to human excreta at our field sites.

The mission statement includes the following message: "Program 3 will not investigate top-down approaches to system change, but will work with local residents, government officials, companies, citizen groups and other various stakeholders to propose sustainable alternatives and gauge their feasibility." The co-creation of a "sanitation value chain" is one of the important points in our sanitation project.

We will contribute to the mission by aiming to design lifeworlds; showing solutions; proposing a social transition; realizing the co-creation of a sanitation value chain with diverse stakeholders; and establishing an academic foundation for sanitation. Our program director, Dr. Saijo, has proposed the concept of "future design," and he stresses the importance of a "virtual future generation" in design. Our sanitation project has started the discussion on how to include the "virtual future generation" in the design process of a sanitation value chain.

○ Progress and Results in 2019

Project Progress during the FR Period to Date

(1) Achievement 1: The launch of an international journal on sanitation and publication of the second, third and fourth volume :

The international online journal "Sanitation Value Chain" was launched in November 2017. The ISSN is 2432-5066 (online) and the journal web site is http://www.chikyu.ac.jp/sanitation_value_chain/journal.html. We established an international editorial board of sanitation specialist from seven countries. The second, third and fourth volume of the journal was successfully issued in November 2018 and June 2019 and March 2020.

(2) Achievement 2: Holding and co-hosting 37 international and domestic conferences and workshops :

We organized 37 meetings each in 2017, 2018 and 2019 (Annex 2). Typical meetings include the Zambia Water Forum and Exhibition (ZAWAFE2017, 2018 and 2019), the International Symposium on Green Technology for Value Chains (GreenVC2017, 2018 and 2019), Workshops on Science Communication, and the Indonesia & Philippine & Japan Joint International Seminars on Water and Sanitation (Bandung, October 2017 and Manila, January 2019).

(3) Achievement 3: Conclusion of research agreement:

Implementation agreements (IAs) and research contracts (RCs) were concluded in accordance with the signing of MOUs between the Indonesian Institute of Sciences (LIPI) and RIHN in 2017, University of Zambia (Zambia) and RIHN in 2018, and AJPEE (Burkina Faso) and RIHN in 2018, and Tam-Tam mobile and Mutcare (Cameroon) in February 2020.

(4) Achievement 4: Toilets that can concentrate urine:

In order to co-create a sanitation value chain for managing human urine in urban areas, transporting urine to rural farm land is essential. The technology required for transporting urine is volume reduction technology for cost reduction. As a technology to concentrate urine, we examined the forward osmosis (FO) process this year. The results obtained were as follows: 1) The area of the forward osmotic membrane required to concentrate 1 L of urine is 55.6 cm2. This area is small enough to install the urine concentration device in a toilet bowl. 2) It was shown that 78.6% of ammonia, 97.8% of potassium, and 99.6% of phosphate can be recovered.

(5) Achievement 5: Toilets that can produce phosphorus fertilizer:

It was confirmed that the phosphorus in urine can be recovered directly from urine as calcium phosphate (DCPD) using shell as a calcium source, and we clarified the reaction pathway and rate. Thus, by installing a simple shell-packed column in the urine collection pipe of a toilet, it has become possible to make a toilet that produces phosphorus fertilizer. We set up a compost toilet with a phosphorus recovery function at RIHN and started demonstration experiments from March 2018.

(6) Achievement 6: New method for analyzing exposure pathways of pathogens using molecular biology:

We developed a new method for analyzing the infection route from feces to people. In this method, pathogenic Escherichia coli was separated and quantified using the PCR method, and the pathway was identified from the pathogenic Escherichia coli type. As a result, it was found that the type of Escherichia coli in drinking water and in feces was different, as shown in Supplementary Fig. 1-2, suggesting the importance of other sources of contamination such as livestock. Also, three prioritized exposure pathways were identified: pond bathing, outdoor playing, and drinking.

(7) Achievement 7: Evaluation of inactivation mechanism of virus during urine concentration:

The real-time qPCR method was applied to six target genome regions for monitoring MS2 (an indicator of virus) infectivity during the urine concentration process, and we found that 1) uncharged ammonia is the predominant factor in MS2 inactivation, 2) genome damage is the main mechanism of MS2 infectivity loss, and 3) MS2 infectivity loss in urine can be predicted by ion composition and speciation.

(8) Achievement 8: Agricultural technology for compost, urine, and reclaimed gray water reuse:

Salinity management of soil is essential when compost, urine, and reclaimed gray water are reused on farm land. A mathematical simulation model was developed for describing the fate of salts in a soil system, and the leaching requirement for removing salts was evaluated using this model. The fate of pathogens in the soil system was evaluated, and the health risk to farm workers was estimated.

(9) Achievement 9: Acceptability of the sanitation system was evaluated from the technical side:

We conducted a survey on a new prototype model of a composting type toilet at the LIPI and a mosque in Sapporo. The results were as follows: 1) Half of the people answered that the bad smell was a point to be checked; 2) 70% of respondents worried about excreta sticking to the toilet bowl; 3) the new-type toilet was acceptable; and 4) 70% were unsatisfied with its size and 40% felt discomfort when sitting on the toilet seat, feeling like they might fall into the hole. We also conducted a survey on dewatered digested sludge for use as a soil conditioner in Iwamizawa, Japan.

(10) Achievement 10: Visualization of research:

1) In 2018, the video “Samurai-kun Sanitation Value Chain” (Indonesian version) was revised and screened at a junior high school and among flower farmers in Bandung. The Japanese version was screened at RIHN’s Open House event; 2) the playlist of SVC video archives has been opened up to the public on YouTube. 3) Original toilet paper was produced as a promotional item for the project using illustrations to make our research concept visible. 4) We participated in RIHN’s project on visualization of state-of-the-art research.

(11) Achivement 11: Intensive fieldwork at field sites:

Indonesia site: 1) Health of infants and their fecal management by caretakers; 2) norms, consciousness, and values relating to human waste; 3) mental health and living conditions of urban slum dwellers; and 4) presentation of research results at an international conference (GreenVC2019).

Ishikari site: 1) Design of a water source management system coordinated with local high schools and local governments and its demonstration (Fig.1-5); 2) technology packages suitable for regional autonomous water supply (membrane treatment, sensor rings, data handling) installed locally, data collection; 3) interviewed the Furano city water supply and sewer division on the issue of septic tank management.

Burkina Faso site: 1) Conducted surveys on the private sector’s removal of sludge from households in the capital city and rural areas, revealing that the number of private companies was rapidly increasing in the capital city, whereas in rural areas, a few workers independently removed the sludge by developing manual techniques through their own efforts31)-32) (Output numbers: 392, 396); 2) concluded an MOU, IA, and RC with a local non-governmental organization (NGO).

Zambia site: 1) Implemented a session and an exhibition booth at ZAWAFE2019; 2) conducted field surveys and held workshops; 3) based on MOU, concluded IA and RC with the Integrated Water Resource Management of the University of Zambia.

Progress since the last reporting

(1) Achievement 1: Further examination and establishing the concept :

In the previous year (FR2), we reviewed the concept of the “sanitation value chain” and constructed a framework consisting of three values (health and well-being, materials and socio-culture). During this FR3 period, the framework was further examined, focusing not only on the three elements of value, but also on the relationship between them. Based on this new framework, we are considering publishing an academic book (in English) that summarizes the results of the project.

(2) Achievement 2: Sanitation for women :

Issues regarding sanitation and hygiene for girls and women are closely related to not only their health, but also human rights, dignity and security. Although these are considerably important issues in this context, they have been overlooked. We have started to conduct research on female sanitation and hygiene in our field sites in India, Indonesia and Cameroon. Furthermore, we also invited specialists and held a workshop on female sanitation and hygiene in November 2019 in order to share information, exchange ideas and comments and communicate with each other.

(3) Achievement 3: Visualizing the impact of WASH on health improvement :

Motivation to invest in sanitation and generate behavioral change regarding sanitation improvement represents a fundamental challenge. Assuming the lack of such motivation stems from the invisible impact or role of sanitation on the health of local people, we conducted the following research projects in peri-urban communities in Lusaka, Zambia: 1) Quantified the impact unintentional fecal exposure to humans, with a focus on fecal transmission via flies and fecal ingestion through fomites, such as cups and dishes, which can be easily contaminated under poor sanitary conditions; 2) Tested a participatory methodology of the self-visualization of fecal contamination around living environments by local youths, through which people can visually see the contamination in survey form, learn what and how much is contaminated and design improvement actions based on their data.

(4) Achievement 4: Pre-field test for demonstrating the sanitation value chain in Indonesia :

We held a workshop at Babakan Sinyar Elementary School, located in an urban slum of Bandung city, in order to demonstrate the sanitation value chain. Both school faculty and staff, as well as garbage collectors, farmers and gardening shop owners who agreed to cooperate with our project, attended the workshop. We started with the pre-field test of introducing composting toilets in the school. Two composting toilets were installed, with a sky blue one for boys and a pink one for girls. We explained to the school kids, their teachers and staff about what the composting toilet is and how to use it. This workshop was even featured in many local Indonesian media outlets, and the composting toilets were used by 102 students in the fifth grade.

(5) Achievement 5: Implementation of meta-studies :

A core team member, a cultural anthropologist, published a paper on the idea of meta-studies, which consider various disciplines as different cultures. He discussed his experience of joint research in the sanitation project as a form of auto-ethnography. Starting from this paper, and collaborating with the cultural anthropologist and the expert of science communication, they developed the idea of meta-studies as insiders. These meta-studies not only clarified the actual communication between different disciplines in our project, but also revealed that meta-studies itself can be developed as a tool through which to promote communication in the different disciplines our project.

Most Notable Outputs to Date

Award

1. Ito R, Funamizu N: The best paper award: The full authors are Guizani M, Yajima K, Kawaguchi T, Ito R, Funamizu N. The title of the paper is Morphological, chemical and Electro chemical carbon based and novel metal electrode characterization for use in water electrochemical disinfection, 1st Euro-Mediterranean Conference for Environmental Integration, November 22-25, 2017, Sousse, Tunisia.

2. Funamizu N: Environment Reconstruction and Recycling Bureau Director Award, Ministry of the Environment. October 10, 2017.

3. Funamizu N: Hokkaido Social Contribution Award, Hokkaido Government. August 4, 2018.

External fund

4. Harada H: Title: Transforming fecal sludge emptying business. Source: Bill & Melinda Gates foundation “Grand Challenges Explorations (GCE)” (Period: from May 2019 to May 2020).

Journal publication

5. The international scientific journals “Sanitation Value Chain” ISSN 2432-5058 (print), ISSN 2432-5066 (online). Editor in chief: Yamauchi T. Vol. 1, Vol. 2., Vol. 3 and Vol. 4. (http://www.chikyu.ac.jp/sanitation_value_chain/journal.html)

Videos/Photographic Works

6. Sanitation Education Program (Free lecture series), SVC Video Archives on ‘YouTube’. (https://www.youtube.com/channel/UCcDLZXSBauZWQSGE29x7lYg). (https://www.youtube.com/channel/UCP5lF0CgqTWUqv9nUKE_R8A/playlists)

Symposia/Conferences/Workshops (Organized or Co-organized)

7. The International Symposium on Green Technology for Value Chains. The first symposium: 3-5 October, 2016, the second symposium October 23-24, 2017, the third symposium November 1-2, 2018, the forth symposium October 23-24, 2019, Jakarta, Indonesia.

8. Zambia Water Forum and Exhibition (ZAWAFE) 2017, RIHN project session, June 12, 2017, RIHN project session and *Dziko Langa booth, June 12, 2018, RIHN project session and Sanitation Project booth, June 10-12, 2019, Lusaka, Zambia.*

9. International workshop for Sanitation Value Chain 2019 in Philippine “Social Acceptance of New Technology”. January 26, 2019, De La Salle University, Manila, Philippines.

Book

10. Funamizu N (ed.) (2018) Resource-Oriented Agro-sanitation Systems: Concept, Business Model, and Technology. Springer Japan, Tokyo, 314pp.

Academic Papers

11. Ushijima K., Funamizu N, Nabeshima T, Hijikata N, Ito R, Sou M, Maiga AM, Sintawardani N (2015) The Postmodern Sanitation - Agro-sanitation Business Model as a New Policy -, Water Policy, 17(2); 283-298. DOI:10.2166/wp.2014.093

12. Ito R, Tanie M, Ushijima K, Nilawati D, Sintawardani N, Funamizu N (2017) Evaluation of acceptance of a composting toilet prototype for people in slum area in Indonesia, Desalination and Water Treatment. Doi: 10.5004/dwt.2017.20880

13. Haramoto E, Kitajima M, Hata A, Torrey JR, Masago Y, Sano D, Katayama H (2018) A review on recent progress in the detection methods and prevalence of human enteric viruses in water. Water Research 135:168-186. DOI:10.1016/j.watres.2018.02.004

14. Otsuka Y, Agestika L, Widyarani, Sintawardani N, Yamauchi T (2019) Risk factor for undernutrition and diarrhea prevalence in an urban slum in Indonesia: Focus on water, sanitation, and hygiene. American Journal of Tropical Medicine and Hygiene 100(3):727-732. DOI:10.4269/ajtmh.18-0063

15. Otsuka Y, Agestika, L, Harada H, Sriwuryandari L, Sintawardani N, Yamauchi T (2019) Comprehensive assessment of handwashing and faecal contamination among elementary school children in an urban slum of Indonesia. Tropical Medicine & International Health 24(8):954-961. DOI:10.1111/tmi.13279

○Project Members

◎	YAMAUCHI Taro	(Research Institute for Humanity and Nature/ Graduate School of Health Sciences, Hokkaido University,Professor,Co-creation of Value Chain)
○	FUNAMIZU Naoyuki	(Muroran Institute of Technology,Director / Vice president,Sanitation Technology)
○	IKEMI Mayu	(Graduate School of Economics and Business Administration, Hokkaido University,Associate Professor,Sanitation & Life)
○	FUJIWARA Taku	(Research and Education Faculty, Natural Sciences Cluster, Agriculture Unit, Kochi University,Professor,Sanitation Technology)
○	USHIJIMA Ken	(Hokkaido Research Organization,Research chief,Co-creation of Value Chain)
○	KATAOKA Yoshimi	(Faculty of Engineering, Hokkaido University,Technical staff,Visualization)
○	HARADA Hidenori	(Graduate School of Asian and African Area Studies, Kyoto University, Kyoto University,Associate Professor,Sanitation Technology)
○	SHIMIZU Takao	(Kyoto Seika University,Associate Professor,Sanitation & Life)
○	SANO Daisuke	(School of Engineering, Tohoku University,Associate professor,Sanitation Technology)
○	NABESHIMA Takako	(Research Faculuty of Media and Communication, Hokkaido University,Professor,Sanitation & Life)
○	NAKAO Seiji	(Research Institute for Humanity and Nature,Specially Appointed Associate Professor,Sanitation & Life)
○	HAYASHI Koji	(Research Institute for Humanity and Nature,Researcher,Sanitation & Life)
○	SHIRAI Yuko	(Research Institute for Humanity and Nature,Researcher)
	KIMURA Ayako	(Research Institute for Humanity and Nature,Research associate)
	HONMA Saki	(Research Institute for Humanity and Nature,Research associate)
	AKAO Satoshi	(Faculty of Science and Engineering, Doshisha University,Associate Professor,Sanitation Technology)
	ITO Ryusei	(Takuma Co., Ltd.,Sanitation Technology)
	INOUE Takao	(Graduate School of Health Sciences, Hokkaido University,Assistant Professor,Sanitation & Life)
	INOUE Takashi	(Graduate School of Agriculture, Hokkaido University,Professor,Co-creation of Value Chain)
	OISHI Wakana	(School of Engineering, Tohoku Univerisity,Doctoral Student,Sanitation Technology)
	OKOSHI Ango	(Hokkaido Research Organization,Research chief,Sanitation Technology)
	KODAMA Yuya	(Graduate School of Health Sciences, Hokkaido University,Doctoral Student,Co-creation of Value Chain)
	KONISHI Tatsuki	(Graduate School of Health Sciences, Hokkaido University,Graduate School Student,Co-creation of Value Chain)
	KUSUDA Tetsuya	(Advanced Institute, Kyushu University,Senior Adviser,Sanitation Technology)
	SAI Akira	(Graduate School of Health Sciences, Hokkaido University,Research Fellow,Co-creation of Value Chain)

SASASE Tatsuya	(Graduate School of Health Sciences, Hokkaido University,Graduate School Student,Co-creation of Value Chain)
SATO Kotomi	(Graduate School of Health Sciences, Hokkaido University,Graduate School Student,Co-creation of Value Chain)
SHIGEI Makoto	(Swedish University of Agricultural Science,MSc,Sanitation Technology)
TSURUMI Mayu	(Graduate School of Global Environmental Studies, Kyoto University,Graduate School Student,Sanitation Technology)
NISHI Makoto	(Graduate School of Asian and African Area Studies, Kyoto University,Associate Professor,Sanitation & Life)
HASEGAWA Yoshiki	(Hokkaido Research Organization,Researcher,Co-Creation of Value Chain)
FUJII Shigeo	(Graduate School of Global Environmental Studies, Kyoto University,Professor,Sanitation Technology)
MASUKI Yui	(Graduate School of Asian and African Area Studies, Kyoto University,JSPS Research Fellow,Sanitation & Life)
WATANABE Kazuo	(Enter for Southeast Asian Studies, Kyoto University,Affiliated Associate Professor,Sanitation Technology)
CHUA Min Li	(Graduate School of Global Environmental Studies, Kyoto University,Doctoral Student,Sanitation Technology)
GUIZANI Mokhtar	(Faculty of Engineering, Hokkaido University,Assistant professor,Sanitation Technology)
Hermes DINALA	(Graduate School of Health Sciences, Hokkaido University,Graduate School Student,Sanitation & Life)
Sikopo P NYAMBE	(Graduate School of Health Sciences, Hokkaido University,Doctoral Student,Co-creation of Value Chain)
Aileen ORBECIDO	(DE LA SALLE UNIVERSITY,Associate Professor,Sanitation Technology)
Aswatini Manaf	(Research Unit for Clean Technology, LIPI, Indonesia,Professor,Sanitation & Life)
Amadou Hama MAIGA	(International Institute of Water and Environmental Engineering,Professor,Sanitation Technology)
Carolina	(Research Unit for Clean Technology, LIPI, Indonesia,Senior researcher,Sanitation Technology)
Diana Rahayuning WULAN	(Indonesian Institute of Sciences (LIPI),Researcher,Sanitation Technology)
HAMIDAH Umi	(Research Unit for Clean Technology, LIPI, Indonesia,Researcher,Sanitation Technology)
Imasiku Anayawa NYAMBE	(University of Zambia,Professor,Sanitation Technology)
Jonathan Jared IGNACIO	(De La Salle University,Research Assistant,Sanitation Technology)
Joseph WETHE	(The University of Ouagadougou New Dawn,Professor,Sanitation Technology)
Joseph Zulu	(University of Zambia,Lecturer,Sanitation Technology)
Jovita Tri Astuti	(Research Unit for Clean Technology, LIPI, Indonesiav,Senior researcher,Sanitation Technology)
Lopez Zavala Miguel Angel	(Instituto Tecnologico y de Estudios Superiores de Monterrey,Professor,Sanitation Technology)
Marlon ERA	(DE LA SALLE UNIVERSITY,Associate Professor,Sanitation & Life)
Neni Sintawadani	(Research Unit for Clean Technology, LIPI, Indonesia,Senior Researcher,Sanitation Technology)
Nilawati DEWI	(Indonesian Institute of Sciences (LIPI),Researcher,Sanitation Technology)
Rizkiana Restu Utami	(Polteknik Kesehatan Bandung,Research Assistant,Sanitation & Life)
Syam Surya	(University of Surya,Lecturer,Sanitation & Life)
Widyarani	(Research Unit for Clean Technology, LIPI, Indonesia,Researcher,Sanitation Technology)

○ Future Themes

(1) Four Research Topics to achieve the goals

The project is proposing a new concept, a sanitation value chain, which has the following basic policies: 1) Put the values of people and communities at the center of the discussion, and prepare a sanitation system to drive this value chain; 2) design the sanitation system by focusing on direct incentives for individual users and communities; 3) recognize that a sanitation system is an integrated system with social and technical units; 4) design the sanitation system by making a good match between the social characteristics and prerequisites of technologies. Accordingly, the goals of this research project are to 1) propose the concept of a sanitation value chain as relevant to both developing and developed countries; 2) design several pilot studies to demonstrate the significance of societal, academic, and professional involvement in the co-creation of this value chain; and 3) contribute to the establishment of a new interdisciplinary academic foundation regarding sanitation. In order to achieve the goals, we will adopt four points of view (Topics 1, 2, 3, and 4).

In Topic 1(Life), the following six research activities are planned: (1-1) Field survey for analyzing people's values and happiness; (1-2) field and literature survey on norms related to human excreta in current contexts as well as historical changes; (1-3) field and literature survey to re-evaluate the value of sanitation systems; (1-4) field and literature survey to analyze the mismatch between the prerequisites of sanitation technologies and the region-specific characteristics of humans and communities by gathering failed cases; (1-5) field and literature survey on historical changes in sanitation systems of target areas; and (1-6) matching the values of people and communities to the value provided by sanitation systems.

In Topic 2 (Technology), the following four research activities are planned: (2-1) Literature survey on the prerequisites of sanitation technologies; (2-2) field and literature survey on the prerequisites of sanitation technologies by gathering success stories; (2-3) field and literature survey to re-evaluate the value of sanitation systems; and (2-4) field and literature survey to analyze the mismatch between the prerequisites of sanitation technologies and region-specific characteristics of humans and communities by gathering failed cases.

In Topic 3 (Co-creation), the following four activities are planned: (3-1) Identifying stakeholders and understanding the structure of the values of people and communities; (3-2) analyzing the hierarchy and structure of stakeholders' value chain and evaluating their affinity; (3-3) developing the co-creation process; and (3-4) demonstrating the co-creation of a sanitation value chain.

In Topic 4 (Visualization), we will develop a transmission method using various media and methods related to our concept and research results. We strongly recognize the importance of visual images as one way to express the outcome.

(2) Fields

The project involves field studies in 1) a rural area in Ishikari River Basin, 2) a rural area in Burkina Faso, 3) an urban slum in Indonesia, and 4) an urban slum in Zambia, in addition to these, two sub-field studies (in Cameroon and India) are also being conducted.

(3) Activities in 2019

Topic 1 Life group:

(1-1) Fieldwork by cultural anthropologists in Cameroon and India; (1-2) historical studies on the history of the use of excreta in Japan; and (1-3) theoretical studies regarding the "public" and social relationship of sanitation for the integration of the project.

Topic 2 Technology group:

1) analysis of the prerequisites and material flow of sanitation technologies; 2) developing a new methodology for identifying exposure pathways of pathogens; 3) analysis of a sanitation value chain of sludge reuse for agriculture in Ishikari; and 4) developing new sanitation technologies with different prerequisites as a disinfection method for solid excreta and urine.

Topic 3 Co-creation group:

1) continuing to trial the co-creation process with actors who may relate to the sanitation value chains in Indonesia and the Ishikari river basin; 2) continuing observation of the co-creation process in Zambia and Burkina Faso; 3) summarizing and comparing the co-creation process in each field.

Topic 4 Visualization group:

1) archiving videos of events to be shared among researchers in remote areas; 2) Carrying out action research utilising visualisation in Zambia; and 3) conducting a qualitative analysis of science communication among researchers on visual representation.

Indonesia team:

Based on our field research site, Kiaracondong, which is an urban slum area in Bandung, we will do the following: 1) analyse the results from participatory observations and interview surveys with garbage workers on their work environment, life history, cash-flow, personal hygiene, priorities, values and preferences; 2) conduct questionnaire and interview surveys on women's menstrual situations and the disposal of menstrual products; 3) perform intermittent pre-field tests regarding composting toilet usage in an elementary school in order to demonstrate sanitation value chain; and 4) discuss the plan to publish a book in cooperation with RIHN and LIPI (our counterpart institute in Indonesia) during the past 15 years of collaborative research achievements.

Ishikariteam:

A local community-based water management system has already been co-created along with various local actors. Based on those experiences and that network, in FY2020 we aim to: 1) overview the sanitation problem in the Ishikari river basin with local high school students; 2) share the results with other local actors; and 3) discuss future sanitation value networks with local actors.

Burkina Faso team:

Given the number of incidents in the main frontier of Mali and Niger by jihadists, we have decided to postpone our research activities in Burkina Faso for the moment. Therefore, we will temporally join the Cameroon team to complement their research. If the security situation in Burkina Faso improves, we aim to: 1) hold a workshop at Kongoussi in Bam prefecture to share the results regarding the quality and quantity of the harvest on a pilot farm settled in Ronguin village for comparing efficiency between human excrete and animal compost; 2) conduct interviews with 10-20 households in several villages concerning toilet use and treatments in anthropological views, especially regarding the number of toilets, toilet space, positioning of toilets and the frequency of treatment; 3) participate in observations regarding sludge management in Ouagadougou and Kongussi (continuing research).

Zambia team:

We seek a people's centred approach to the investment in sanitation and realise behavioural change regarding sanitation improvement in collaboration with a local youth group called 'Dziko Langa'. We also aim to establish a resources-oriented fecal matter treatment/reuse system based on the sanitation value chain, as well as the following goals: 1) establish holistic quantification regarding the impact of WASH, with a focus on fecal transmission and unintentional faecal exposure; 2) provide methodology development of local youth's self-visualisation of faecal contamination around their living environments, followed by the implementation of this methodology as part of a package of workshops with Dziko Langa; 3) improve understanding of informal learning on sanitation through digital storytelling by Dziko Langa; 4) analyze the value flow network in peri-urban Lusaka and the role and impact of Dziko Langa; 5) analyze political consistency on sanitation and the generation mechanisms of community-based organisations related to sanitation; and 6) pilot resource-oriented faecal reuse by cotton cultivation using fecal compost, as well as testing the feasibility of its business model.

Cameroon team:

1) conduct interviews with sanitation facilities, NGOs and workers at private companies who remove faecal sludge in urban areas (Yaoundé); 2) trial a pilot farm aimed at the cultivation of fruit trees using toilet traces in local cities (Bertoua and others) and surrounding areas; 3) conduct a survey on sanitation for the Baka hunter-gatherers, who settled in the forest area. In particular, we will focus on the introduction of toilets and confirmation of usage for them. We consider both questions in the project through field surveys in urban and rural areas, and we are expecting international information dissemination on water and sanitation in Cameroon.

●Achievements

○Editing

【Editing / Co-editing】

- Yamauchi T et. al. (ed.) 2020,03. Sanitation Value Chain, 4(1). Research Institute for Humanity and Nature, Kyoto, 50pp.
- Yamauchi T et. al. (ed.) 2019,06. Sanitation Value Chain, 3(1). Research Institute for Humanity and Nature, Kyoto, 40pp.

○Papers

【Original Articles】

- Hidenori Harada, Shigeo Fujii 2020,03 Challenges and Potentials of Ecological Sanitation: Experiences from the Cases in Vietnam and Malawi. *Sanitation Value Chain* 4(1):3-16. DOI:10.34416/svc.00015 (reviewed).
- Isshiki M, Naka I, Watanabe Y, Nishida N, Kimura R, Furusawa T, Natsuhara K, Yamauchi T, Nakazawa M, Ishida T, Eddie R, Ohtsuka R, Ohashi J 2020,03 Admixture and natural selection shaped genomes of an Austronesian-speaking population in the Solomon Islands. *Scientific Reports*. (reviewed). Accepted
- Minami Fujioka, Ryusei Ito 2020,03 Development of Separation Process of Soluble Nutrients from Synthetic Dairy Slurry by Modified Solvay Process. *Sanitation Value Chain* 4(1):17-226. DOI:10.34416/svc.00016 (reviewed).

・Jiabei He, Yi Zeng, Ming Hao, Taro Yamauchi 2020,03 Knowledge, Attitudes and Practices of Sanitation and Hygiene among Primary School Students in Rural Area of Northeast China. *Sanitation Value Chain* 4(1):39-50. DOI:10.34416/svc.00018 (reviewed).

・Mokhtar Guizani, Takahiro Endo, Ryusei Ito, Naoyuki Funamizu 2020,03 Polyethylene glycol-coated magnetic nanoparticles-based draw solution for forward osmosis. *Sanitation Value Chain* 4(1):27-37. DOI:10.34416/svc.00017 (reviewed).

・Sital Uprety, Bipin Dangol, Pramina Nakarmi, Isha Dhakal, Samendra Sherchan, Joanna Shisler, Antarpreet S. Jutla, Mohan Amarasiri, Daisuke Sano, Thanh Nguyen 2020,02 Assessment of microbial risks by characterization of Escherichia coli presence to analyze the public health risks from poor water quality in Nepal. *International Journal of Hygiene and Environmental Health* 226. (reviewed). Accepted

・Andri Rachmadi, Masaaki Kitajima, Tsuyoshi Kato, Hiroyuki Kato, Satoshi Okabe, Daisuke Sano 2020,01 Required chlorination doses to fulfill the credit value for disinfection of enteric viruses in water: A critical review. *Environmental Science and Technology*. (reviewed). Accepted

・Wutyi Naing, Hidenori Harada, Shigeo Fujii, Chaw Su Su Hmwe 2019,11 Informal emptying business in Mandalay: its reasons and financial impacts. *Environmental Management*. (reviewed). Accepted

・Ryuichi Watanabe, Hidenori Harada, Hidenari Yasui, Tuan Van Le, Shigeo Fujii 2019,10 Exfiltration and infiltration effect on sewage flow and quality: a case study of Hue, Vietnam. *Environmental Technology*. DOI:10.1080/09593330.2019.1680739 (reviewed). Accepted

・Syun-suke Kadoya, Osamu Nishimura, Hiroyuki Kato, Daisuke Sano 2019,10 Predictive Water Virology: Hierarchical Bayesian Modeling for Estimating Virus Inactivation Curve. *Water*. (reviewed). Accepted

・Yasuhisa Kondo, Akihiro Miyata, Ui Ikeuchi, Satoe Nakahara, Ken'ichiro Nakashima, Hideyuki Ōnishi, Takeshi Osawa, Kazuhiko Ota, Kenichi Sato, Ken Ushijima, Bianca Vienni Baptista, Terukazu Kumazawa, Kazuhiro Hayashi, Yasuhiro Murayama, Noboru Okuda, Hisae Nakanishi 2019,10 Interlinking open science and community-based participatory research for socio-environmental issues. *Current Opinion in Environmental Sustainability* 39:54-61. DOI:10.1016/j.cosust.2019.07.001 (reviewed).

・Hasegawa J, Suzuki H, Yamauchi T 2019,08 Effect of a lower limb strength training programme on physical activity during the snowy season among community-dwelling elderly individuals. *Annals of Human Biology* 46(4):323-329. DOI:10.1080/03014460.2019.1641222 (reviewed).

・Tsuyoshi Kato, Ayano Kobayashi, Wakana Oishi, Syun-suke Kadoya, Satoshi Okabe, Naoya Ohta, Mohan Amarasiri, Daisuke Sano 2019,06 Sign-constrained linear regression for prediction of microbe concentration based on water quality datasets. *Journal of Water and Health* 17(3):404-415. (reviewed).

・Yumiko Otsuka, Lina Agestika, Hidenori Harada, Lies Sriwuryandari, Neni Sintawardani, Taro Yamauchi 2019,06 Comprehensive assessment of handwashing and faecal contamination among elementary school children in an urban slum of Indonesia. *Tropical Medicine & International Health* 24(8):954-961. DOI:10.1111/tmi.13279 (reviewed).

・Ken Ushijima, Seydou Dicko, Taro Yamauchi, Naoyuki Funamizu 2019,06 Acceptability Factors of Agro-Sanitation Business Model in Light of Time Allocation: Case of Rural Households in Burkina Faso. *Sanitation Value Chain* 3(1):25-39. DOI:10.20568/00003123 (reviewed).

・Lina Agestika, Yumiko Otsuka, Widyarani, Neni Sintawardani, Taro Yamauchi 2019,06 Handwashing Skills, Hand Bacteria Reduction, and Nutritional Status of Elementary School Children in an Urban Slum of Indonesia. *Sanitation Value Chain* 3(1):13-23. DOI:10.20568/00003122 (reviewed).

・Tetsuya Kusuda 2019,06 Development of Sanitation Toward Sustainable Society. *Sanitation Value Chain* 3(1):3-12. DOI:10.20568/00003121 (reviewed).

・Hao M, Han W, Yamauchi T 2019,05 Short-term and long-term effects of a combined intervention of rope skipping and nutrition education for overweight children in northeast China. *Asia Pacific Journal of Public Health*(31):348-358. DOI:10.1177/1010539519848275 (reviewed).

・Wang PP, Hao M, Han W, Yamauchi T 2019,04 Factors associated with nutritional status and motor development among young children. *Nursing & health sciences*(21):323-329. DOI:10.1111/nhs.12604 (reviewed).

○Research Presentations

【Oral Presentation】

・Daisuke Sano Risk management of waterborne infectious diseases in the SDG era. Tohoku University Environmental Studies Seminar 201, 2019.12.18, Brawijaya University, Indonesia.

- S. Nakao Money in Africa: Monetary Transition from the Cowry to the Franc in Upper Volta. International Workshop for the Economic History of Africa, 2019.12.17, Cambridge University, Cambridge, UK.
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【Poster Presentation】

・Min Li Chua, Hidenori Harada, Meki Chirwa, Imasiku Nyambe, Shigeo Fujii Fecal-oral transmission assessment in peri-urban Lusaka, Zambia. Kyoto University International Symposium on Education and Research in Global Environmental Studies in Asia, 2019.11.26-2019.11.28, Kyoto University, Kyoto.

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・Rin Mifune, Taro Yamauchi Rural Sanitation in Cameroon: Comparison between Hunter-gathers, Farmers and Merchants. The 4th Faculty of Health Science International Conference, 2019.07.05, Hokkaido University, Sapporo, Japan.

【Invited Lecture / Honorary Lecture / Panelist】

・Taro Yamauchi Developing the Sanitation Value Chain: Co-designing future sanitation systems through community-based participation research. 8th Zambia Water Forum and Exhibition (ZAWAFE 2019), 2019.06.10-2019.06.12, Mulungushi International Conference Centre, Lusaka, Zambia.

・Taro Yamauch Sanitation and Health: Sanitation Value Chain. Future Earth Health Knowledge-Action Network Symposium, 2019.05.20-2019.05.23, Academia Sinica, Taipei, Taiwan.

Stage: Full Research

Project Name: Co-Creation of Sustainable Regional Innovation for Reducing Risk of High-impact Environmental Pollution

Project Leader: SAKAKIBARA Masayuki

URL: https://srirep.org/

○ Research Subject and Objectives

1. Problem, background, and objectives

Mercury (Hg) is a toxic metal that seriously threatens the embryonic and early-childhood development of humans, and extremely poisonous to the human body. Mercury pollution is one of the most serious environmental issues and requires global action for its resolution (e.g. Gibb & O'Leary, 2014). Recent investigations by the United Nations Environment Programme (UNEP) have highlighted the enormity of Hg pollution in developing countries and the associated harmful effects on human health and ecosystems. One of the main causes of Hg pollution is Artisanal and small-scale gold mining (ASGM), in which Hg is used as the traditional method of amalgamation to extract gold from the ore rock and emit 37% of global anthropogenic Hg into the atmosphere. This method is quicker, simpler, and more cost-effective than alternative methods, and is widely used in many ASGM communities (e.g. Gibb & O'Leary, 2014). According to data from the UNEP, ASGM produces 15-20 % of global gold market. Almost 15 million people, including about 5 million women and children, participate in ASGM activities in more than 70 countries. The Hg pollution generated during ASGM indirectly affects more than 100 million people worldwide (UNEP, 2013; ELI, 2014). Those ASGM activities are also sources of social problems, such as land tenure issues, social instability such as migration, and conflict between residents. The vicious cycle relating to poverty and environmental degradation in developing countries has long been discussed (World Bank, 1992; UNEP, 1995). However, the behavioural patterns that make it difficult for those living under chronically impoverished conditions to escape from those conditions are still not well understood (Sen, 1999; Banerjee and Duflo, 2011).

The objectives of our FR is 1) to understand the link between poverty reduction and environmental management in ASGM areas, 2) to establish a process for constructing sustainable societies through regional innovations in ASGM areas, and 3) to strengthen environmental governance in ASEAN countries.

2. Methodology, structure and schedule

In our FR, we will conduct the following research within the context of all ASEAN countries :

a) Case studies on reduction of Hg pollution using a future scenario of ASGM in Indonesia and Myanmar; FR members will (1) undertake environmental impact assessments; (2) study living conditions, cultures, history, and regional sociology; (3) cultivate or organize transdisciplinary communities of practice (TDCOPs) used by transdisciplinary boundary object (TBO); (4) co-create future scenarios; (5) co-design and co-production of transdisciplinary practical research; (6) start social implementation research; and (7) evaluate the progress of regional innovation by social, and economic studies.

b) Study on interregional networks that aim to generate Hg-free societies in Indonesia and Myanmar; the study of interregional networks will be conducted in three steps: (1) study of social informatics and construction of a platform in each region for communication; (2) study on the design, practical use and evaluation of information technologies and establishment of the linkage among each platform in a region; and (3) study on the expansion of platforms and networks and establishment of the linkage among multiple regions to make interregional networks.

c) Study on improvements in environmental governance in ASEAN countries; (1) study on the principles and processes used for multilayer and co-operative environmental governance and holding an international forum in each country; (2) study on regional approach from regional innovation to environmental governance and establishment of an UNEP association in each country of Southeast Asia; and (3) study on the establishment of multi-layered environmental governance and Establishment of ASEAN UNEP council.

d) Theoretical and practical studies of the design, practical use, and evaluation of TBO, and cultivation, development process, and roles of TDCOP; (1) basic research of TBO and TDCOP, and co-design TBOs; (2) study on the design of TBO and TDCOP and practice along future scenario by TDCOPs using TBO; and (3) study on the practical design of TBO and TDCOPs for the regional innovation and development from network of TDCOPs to regional innovation.

The following are the summery of the schedule of our FR.

1) FR2-4 (2020-22): We will conduct a) step 3 to 5 in Indonesia and step 1 to 5 in Myanmar; b) step 1 and 2; c) step 1 and 2; and d) step 1 and 2.

2) FR Year 5 (2023): We will conduct a) step 6 and 7 in Indonesia and Myanmar; b) step 3; c) step 3; and d) step 3.

3. Expected results

The regional innovation will arise as a consequence of environmental and industrial innovations introduced with a transdisciplinary approach, including the development of a future scenario for an Hg-free society, the co-creation and practical application of TBOs, and the mobilization of TDCOPs. By strengthening environmental governance, which consists of multiple layers of co-operative organizations, we will also develop a route via which the problem of global environmental Hg pollution can be resolved.

4. Project organization and membership

The research organization consists of 1) communicator, 2) culture, history, and behavioral transformation group, 3) social science group, 4) natural science group, 5) technological development group, and 6) project management group.

5. Contribution to the program

RIHN research is organized into programmes and projects, rather than into pre-existing academic disciplines or domains. Our three research programmes and one core programme each include multiple projects, which involve studies consistent with the thematic foci of the RIHN programmes. The RIHN research programmes are organized around three themes in the Phase III Medium-Term Plan. Program 1: Transition to a society that can deal flexibly with environmental changes; Program 2: Fair use and management of diverse resources; Program 3: Design of well-being-enhancing living spaces and lifestyles. The Program 3 in RIHN, in particular, proposes research that will illuminate the reciprocal linkages between diverse rural and urban societies and contribute to the resolution of sustainability problems by working with various societal partners, such as governments, companies, and citizen groups. Special emphasis is placed on envisioning sustainable futures that improve the well-being of residents and gauging their feasibility (RIHN, 2018).

Our research project on the Southeast Asia will contribute to Program 3. In the Southeast Asia, the environmental disruption, biological diversity disappearance, expansion of the difference of the poverty and wealth, and traditional culture disappearance are rapidly progressing by the rapid expansion of the human activities accompanying economic expansion in the area. Moreover, the degradation of living space and the increased risk of global environmental pollution by ASGM activities in rural communities are accelerated by poverty.

It will provide a concrete framework for realizing a sustainable society from this research, and in that we will propose the change to society with a concrete future possibility. Furthermore, The FR of SRIREP project will take in the technique of the future design and future scenario which Program 3 has proposed as an effective technique for solving problem of regional society.

○ Progress and Results in 2019

1. Project Progress During the PR Period

In case study (a), we have propelled the survey of environmental impact assessment and health impact assessment on Hg pollution in collaboration with local university researchers in Gorontalo Province, Southern Bandung in West Java Province, and Bombana in Southeast Sulawesi Province in Indonesia.

(1) Gorontalo area: In FR1, in collaboration with members of Gorontalo State University, we conducted the surveys of natural resource, the environmental impact of Hg pollution, the health impact of Hg pollution on residents, socio-economic assessments, and cultural history. In particular, a total of 15 members participated in the survey in Bone Bolango Regency, Gorontalo Regency and North Gorontalo Regency in Gorontalo Province.

The socio-economic groups have conducted pilot survey to examine basic household characteristics of each member (sex, age, location, status of residency, education, and major daily activities), composition of household income and their degree of affluence, social network in terms of financial and in-kind transactions, and preferences for potential job opportunities. Socio-economic group and researchers from University of Lampung examined rural livelihoods of fishermen and farmers to elaborate the design composite agriculture systems in rural Gorontalo.

In addition, based on the research results during this period, some future scenarios for the Hg-free society have been revised. In this fiscal year, we started discussions with residents to cultivate a TDCOP (Cundill et al., 2015) learning about the issue of “Limboto Lake Disappearance”. During this time, activities for accreditation of Gorontalo Global Geopark were continuously carried out, and a roadmap to the geopark was proposed from SRIREP to Gorontalo Province.

(2) Southern Bandung area: In collaboration with the members of Bandung Institute of Technology, four field surveys and discussions with SH were conducted from February to September 2019 in Bunikasih village where the two discussions. Currently, chemical analysis of environmental samples and hair samples is in progress. In addition, the community and SRIREP members are planning to collaborate on a transdisciplinary practical research in the future.

(3) Publication of research results: ICTAR held in Gorontalo in 2017 will be published as a proceeding from IOP Publishing in January 2020 and TREPSEA 2018 in February 2020 respectively, including many papers by members.

In February 2019, Director General Mr. Hla Maung Thein led members of Environmental Conservation Department (ECD), MONREC including Mr. Bobby, Chief Executive Officer of Network Activities Group (NAG) visited Research Institute for Humanity and Nature (RIHN) for discussing for the collaboration with RIHN. The project leader, Mr. Jun Miyauchi and

members of SRIREP project visited Myanmar in April 2019 and discussed with senior officials: Director of Ministry of Natural Resources and Environmental Conservation, Environmental Conservation Department in Mandalay City and then with Director General and other senior officials of Ministry of Natural Resources and Environmental Conservation, Environmental Conservation Department in Nay Pyi Taw in Myanmar and explained the purpose and plan of our FR. We have agreed on the collaboration with the Ministry of Natural Resources and Environmental Conservation (MONREC), Environmental Conservation Department (ECD), and advancing the processes at this moment. Since February 2019, both members of MONREC-ECD and RIHN have been working for MOU/MOA matters for the collaboration after sharing the details of the contents of our FR.

On (b) a study of interregional networks that aim to generate Hg-free societies in Indonesia, we have established the website of research network between areas in November: “Hg-Free Society Networks " by the Indonesia citizen participation, and share the information related with the Hg pollution by ASGM etc. Currently, more than 350 members already have joined tothe facebook page of " Hg Free Society Networks " in early January 2019.

From 20th to 22nd October, the project leader attended international seminars and presented the environmental issues including Hg pollution by ASGM, sponsored by three universities in Makassar City, Indonesia, Indonesian Muslim University, Hasanuddin University, and Bosowa University.

In the research (c) on environmental governance strengthening by the countries’ citizen participation in Southeast Asia, we conducted the following research;

(1) We organized the 1st and 2nd Japan - ASEAN Medical Seminars on the Human Health Impact of Heavy Metals on 3rd May in Makassar and 5th May in Gorontalo in collaboration with some local universities, medical organizations, and Kumamoto Gakuen University. on 3rd and 5th May in collaboration with some local universities, medical organizations, and Kumamoto Gakuen University in Makassar and Gorontalo, Indonesia. Also, medical workshops regarding Hg poisoning were hold in both seminars. About 220 stakeholders participated in both seminars.also was held in both seminars. About 220 stakeholders participated in the seminars.

(2) We collaborated with UNEP's activities on environmental issues. Specifically, the “UNEP Global Environment Information Exhibition” was held in Yangon City, Myanmar from December 9th to 12th, hosted by UNEP, co-hosted by Japan Association for United Nation Environmental Programme (J-UNEP), Public Interest Incorporated Foundation Associates of the Earth (AOE), and RIHN, and sponsored by Max Myanmar Group and AYA Bank.

(3) On December 11, the 2nd TERPNEP (ASEAN-Japan Meeting Point of Collaboration by Stakeholders and Researchers for Reducing Environmental Problems in ASEAN Countries) was held in Nay pyi daw, the Republic of the Union of Myanmar, in cooperation with Ehime University, Kagawa University, Kochi University, RIHN and MONREC. Members of TRPNEP including researchers and scientists from the universities of Japan and five ASEAN countries: Brunei Darussalam, Indonesia, Malaysia, Myanmar, and Vietnam, as well as key stakeholders from Myanmar ministries, universities, NGO, and private companies, took part in the seminar.

Mr. Ohmn Win, Union Minister of Ministry of Natural Resources and Environmental Conservation, Dr. Ye Myint Swe, Deputy Minister, Managing Directors, Director Generals, and senior officials, as well as officers and researchers from different ministries including Ministry of Health and Sports, Ministry of Social Welfare, Relief and Resettlement, Ministry of Education, Ministry of Transport and Communications, Ministry of Agriculture, Livestock and Irrigation, etc., attended the seminar. The total number of seminar attendees was more than 280 in TRPNEP2019 seminar.

In the research (d), the FR member show the results of theoretical studies and some domestic case studies on community of practice. We also started the dialog with the important and isolated SHs.

2. Most Notable Outputs to Date

In the case study (a), the residents decided to stop the gold mining operation in Brakasi Village, South Bandung, which was the subject of the study, through two video screenings of Minamata disease and discussions with the residents. These results suggest that in ASGM regions that are not economically dependent on gold, "health exposure to mercury in ASGM" may function as a TBO. This result is reflected in the “future scenario”. In addition, in the Bone Bolango district of Gorontalo, during several rounds of consultations during the interim period, a proposal was made to conclude a MoU with RIHN as a prefecture and to cooperate in the project. It is expected that cooperation with various SHs, including residents, will expand in the future, and the conditions for conducting targeted social implementation research are being prepared.

For (c) Study on improvements in environmental governance in ASEAN countries: 1st and 2nd Japan - ASEAN Medical Sseminars on the Human Health Impact of Heavy Metals on 3rd May in Makassar and 5th May in Gorontalo in collaboration with some local universities, medical organizations, and Kumamoto Gakuen University. Medical workshops regarding mercury poisoning were hold in both seminars. About 220 stakeholders participated in both seminars.

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3. Project Organization and Members

The FR will be conducted within a transdisciplinary framework based on a fusion of social and natural sciences, and with the collaboration of the various SHs. The research organization consists of 1) communicator, 2) culture, history, and behavioural transformation group, 3) social science group, 4) natural science group, 5) technological development group, and 6) project management group.

1) Communicator: A "communicator" is a talented person who supports and promotes the dialogue between and mutual understanding of various SHs and researchers, and is classified as either a "long-stay communicator" or a "local communicator". A long-stay communicator is a Japanese person who stays in the region for a certain period, and a local communicator is a SH from the local community.

2) Culture, history, and behaviour transformation group: The group members consist of researchers who studied the culture, anthropology, history, and regional sociology, as well as NPO personnel. These members investigate the elements of the TBO, including its credibility, legitimacy, salience, and plasticity, and the characteristics of the SHs, such as their economic interests, environmental interests, ethics, social participation, culture, history, local knowledge, and environmental resources. They resolve the process of transformation for the SHs by the practical application of the TBO. They also investigate many aspects of the TBO and assess its future prospects.

3) Social science group: This research group specializes in economics, environmental economics, development of economics, and statistics. It determines the regional economies, policies, and industries in the investigated areas from various socio-economic viewpoints by reviewing the existing data, investigating the circumstances of each community, administering questionnaires and conducting interviews with the SHs, and collecting basic information, including the incomes and poverty levels in the research areas. The group quantifies the effects of the introduction of new industries that utilize the ecosystem services or other environmental innovations by integrating local and scientific knowledge.

4) Natural science group: This research group specializes in biology, natural geography, geology, and ecology. It undertakes interdisciplinary research on the environmental impact of mercury in the ASGM area. In each area, it investigates the ecology, chemically analyzes environmental substances, undertakes epidemiological and public health surveys, and simulates the oceanic dispersal of the mercury emitted from the ASGM areas.

Before and after the environmental innovations are instated with the co-created environmental remediation technology, and industrial innovations are implemented by the practical application of new ecosystem services. It assesses the environmental impact on each area and analyses the effects of the project scientifically.

5) Technological development group: This research group specializes in material engineering, mechanical engineering, design engineering, vegetation engineering, fisheries, and forestry. Using a transdisciplinary approach with local SHs, it identifies useful local knowledge and combines it (PROJECT ORGANIZATION AND MEMBERS, CONTINUED 2) with scientific knowledge. It develops the basis of the environmental and industrial innovations by integrating local knowledge and scientific knowledge.

6) Project management group: This group will manage the progress of the research by the other four groups, and coordinate the dialogue between communicators and scientists, and between communicators and SHs.

During the FR1, our research members submitted in the beginning FR1 has been changed partially. It is based on the request of Gorontalo State University. It was judged by the core members that this change was important to strengthen the research organization to carry out case studies in Gorontalo within the period. Specifically, the changed portion is to add some members in Gorontalo State University related with the case study.

○Project Members

◎	SAKAKIBARA, Masayuki	(Research Institute for Humanity and Nature,Professor,Research supervisor)
○	MATSUDA, Hiroyuki	(Yokohama National University,Professor,Leader of Natural Science Group)
○	SHIMAGAMI, Motoko	(Ehime University,Associate Professor,Sociology of community in ASGM area)
○	MATSUMOTO, Yuichi	(Kwansei Gakuin University,Professor,Theoretical and practical studies on TDCOP)
○	KASAMATSU, Hiroki	(Ehime University,Senior Assistant Professor,Sociology of the local community in ASGM area)
○	KIMIJIMA, Satomi	(Research Institute for Humanity and Nature,Reseacher,Case studies of ASGM sites in Indonesia and Myammar)
○	KAUNG, Xiaoxu	(Research Institute for Humanity and Nature,Reseacher,Chemical analysis of environmental samples)
○	WIN THIRI KYAW	(Research Institute for Humanity and Nature,Reseacher,Medical study on mercury toxicity in Myanmar)
	KOMATSU, Satoru	(Nagasaki University,Associate Professor,Social economic evaluation in ASGM area)
	YAMAMOTO, Yuki	(Nagasaki University,Associate Professor,Social economic evaluation in ASGM area)
	NARABAYASHI, Kenji	(Ehime University,Professor,Environmental Law in Southeast Asian Countries)
	KITAMURA, Kenji	(Kanazawa Univirsity,Assistant Professor,Theoretical study on TDCOP)

ABE, Akira	(Mie Prefectural College Of Nursing,Professor,Theoretical research on poverty and environmental ethic problems)
MIYAKITA, Takeshi	(Kumamoto Gakuen University,Professor,Research on a reconstruction of community / Epidemiologic survey on ASGM areas)
SAYANAGI, Nobuo	(Yamanashi Eiwa College,Associate Professor,Psychological study on poverty in ASEAN countries)
YAMAGUCHI, Tsutomu	(ESPEC MIC Corp.,Chief of Nagoya office,Technological support for the development of plant products)
SUGAWARA, Hisanari	(Gunma Museum of Natural History,Curator,Study on community management of global geopark)
Okamoto, Ikuko	(Toyo University,Professor,Study on internatioal development)
MIYASAKI, Hidetoshi	(Global Environmental Forum,Researcher,Practical research of value-added composite agriculture in non-polluted area)
ITO, Yutaka	(Akita Universitu,Lecturer,Social economic evaluation in ASGM area)
KOHMOTO, Daichi	(Nara University of Education,Associate Professor,Study on community management of global geopark)
WATANABE, Yasuko	(Watanabe-tette,CEO,Design development of traditional hand-craft "Karawang" in Gorontalo province)
KOIZUMI, Hatsue	(Soshisha, the Minamata Disease Museum,Staff,Sociology of community in ASGM area)
ABBAS, Habo Hasriwiani	(Universitas Islam Indonesia,Lecturer and Researcher,Medical geology of traditional smelters in Sulawesi)
BASRI	(College of Health Sciences Makassar,Lecturer and Researcher,Environmental science in ASGM area in Bombana Regency, Southeast Sulawesi Province, Indonesia)
PRASETIA, Hendra	(Lampung University,Lecturer and Researcher,Development of bioindicator using dendrochemistry)
GAFUR, Abdul Nurfitri	(BAPPEDA-LITBANG of Bone Bolango regency,Expert of Researcher,Environmental science in ASGM area in Bone Bolango Regency)
PATEDA, Sri Manovita	(Ehime University,Graduate student,Development of bioindicator on mercury exposure)
BASIR	(Ehime University,Graduate student,Case study in Bombana Regency, Southeast Sulawesi Province, Indonesia)
BADARU, Arifia Warapsari	(Ehime University,Graduate student,Survey of geosites in Gorontalo Geopark Concept)
RACHAMAN, Agus Bahar	(Ehime University,Graduate student,Practical research of value-added composite agriculture in non-polluted area)
ISA, Ishak	(State University of Gorontalo,Professor,Study on bioethanol)
MOHAMAD, Jahja	(State University of Gorontalo,Associate Professor,Physical analytical study on natural products)
ARIFIN, Indriati Yayu	(State University of Gorontalo,Lecturer and Researcher,Analysis of total mercury concentration on natural samples, Study on medical geology)
LAHINTA, Agus	(State University of Gorontalo,Lecturer,Study on Karawo management)
OLILINGO, Fachruddin	(State University of Gorontalo,Lecturer,Social-economical evaluation on transdisciplinary practical researches)
PONGOLIU, D. Isyana Yayu	(State University of Gorontalo,Lecturer,Social-economical evaluation on transdisciplinary practical researches)
MANYOE, Noviantari Intan	(State University of Gorontalo,Lecturer,Study on Geopark)
ZAENAL, Abidin	(Bogor Agricultural University,Lecturer and Researcher,Development of environmental remediation materials)
KARDENA, Edwan	(Institut Teknology Bandung,Associate Professor,Study of environmental governance in Indonesia)
ABDURRACHMAN, Mirzam	(Institut Teknology Bandung,Lecturer,Basic study of Geopark, Case study of ASGM site in Southern Bandung area, Indonesia)
KURNUAWAN, Andri Idham	(Institut Teknology Bandung,Lecturer and Researcher,Basic study of Geopark, Case study of ASGM site in Southern Bandung area, Indonesia)
ARIFIN, Bustanul	(University of Lampung,Professor,Socioeconomic evaluation of agricultural areas in Gorontalo province)
ISOMONO, Hanung	(University of Lampung,Lecturer,Socioeconomic evaluation of agricultural areas in Gorontalo province)
BOBBY	(Network Activities Groups,Chief Executive Officer,Practice of action program and its management in Myanmar)
MUHAMMAD, Gobel	(Bogor Agricultural University,Graduate student,Local communicator)
MOHAD, Lamanasa	(Bone Bolango Regency,Prefecture staff,Local communicator)
JOMAE, Kyoko	(Ehime University,Clerical Assistant,Project management)

MYO HAN HTUN	(Research Institute for Humanity and Nature,Research Associate,Management on websites and Supporting FR researchers)
TAKEHARA, Mari	(Research Institute for Humanity and Nature,Research Associate,Project management)

○ **Future Themes**

a) Case studies of reduction of Hg pollution using a future scenario of ASGM

We will conduct the analytical and theoretical research, and practical research in Gorontalo area, Southern Bandung area and Bombana area in Indonesia, as well as Tha Beik Kyin township and Yamethin township in Mandalay Region, Myanmar in the case studies.

For Myanmar: Due to the revised plan of FR, the basic research will be conducted with the following procedures during FR2 in Myanmar.

In the first step of the analytical and theoretical research, FR members will study, (1) environmental and human health impact assessment of Hg pollution by ASGM in Mandalay, (2) social economic investigation in Mandalay, (3) culture, history, and behavioural investigation in Mandalay, (4) social relationship among actors in ASGM in Mandalay, and (5) starting the evaluation of social capital and resilience on the socio-ecological system in the ASGM.

For Indonesia: FR members and key SHs will practically co-create and utilize the TBO for the transformation of SHs and activation of their dialog, find useful local knowledge by "Kikigaki" for the co-creation of TBO, Co-create the future scenario for Hg-free society. We will cultivate or organize TDCOPs used by TBO, co-create future scenarios, and co-design and co-production of transdisciplinary practical research. The transdisciplinary practical research includes "introduction of resource recycling type combined agriculture", "co-creation of New Industry by using traditional local knowledge", "environmental issues of Limboto lake", "development of eco-tourism", and "co-creation of new technology for reduction of Hg-emission into the atmosphere".

The Natural Science Group will develop the environmental indicators to comprehensively assess the impact of mercury pollution. This will enable us to evaluate the effects of the transdisciplinary practice research.

For quantitative and qualitative examination of livelihoods in mining-dependent villages for the next 4 years, socio-economic groups will conduct following research activities in FR2;

1) Research theme 1: Transdisciplinary approaches: heavy metal contamination and intergenerational health outcome

・Conduct extensive baseline survey for 1,000 households in Bone Bolango Regency to identify basic household characteristics of each member, maternal and child health, degree of affluence, job preferences.

・Examine exposure to heavy metal contamination through environmental assessment.

・Inhabitants, especially pregnant mothers and children, undergo medical health checks to examine health status that are potentially hampered by heavy metal contaminations.

・Quantitative examination of action researches initiatives (e.g. nets of sugar palm)

・Mutual discussion among researchers/practitioners of State University of Gorontalo and Bone Bolango Regency.

2) Research theme 2: Case study: role of composite agricultural systems for regional innovation

・Pilot examinations of rural livelihoods that have adopted organic agriculture, and examine effectiveness to conserve Lake Limboto.

・Field observations among researchers from University of Lampung and State University of Gorontalo.

b) A study of interregional networks that aim to generate Hg-free societies in Indonesia

The aim of this study is for the construction and the establishment of interregional networks to aim for Hg-free societies in Indonesia and Myanmar. FR members will conduct the analytical and theoretical research, and each research is divided into three steps: 1) study on social informatics, 2) study on the design, practical use & evaluation of information technologies, and 3) study on the expansion of platforms & networks. We are currently developing the websites including the contents and expected to launch a homepage (English language) by early February 2020 and other two languages: Indonesia (Bahasa) and Myanmar by early March and April 2020 respectively.

For Indonesia: In the first step of theoretical research, FR members will study of the information (RESEARCH PLAN, CONTINUED 2)

and communication tools in cultural & institutional contexts, and also interdisciplinary study of the design, uses, and consequences of information technologies.

In the first step of practical research, FR members will step up the platforms in each region for communication among SHs and researchers for creating of a new dialogue opportunity among SHs, young scientists and funders, and sharing the information and experience between platform members to get mutual understanding between them.

Our study will also include the second step of research such as study of social behaviourism among platform members, and the effectiveness of information and communication tools as theoretical research, and also FR members and base universities will develop a website and multiple SNSs for members of different TDCOPs, will apply various theories, models, philosophies, will expand the platforms, and then link each other for sharing among platform members as our practical research. such as TDCOPs, the researchers and base universities will establish regional networks to expand the residents' networks further. When a regional

network working towards a Hg-free society is formed, they will establish a collaboration between the members of various TDCOPs and carry it out.

For Myanmar: Although Myanmar research plan is two years behind and similar processes with Indonesia's research plan which is based on the involvement of base universities in Indonesia, FR members will start the processes by collaboration with local NGO and SHs, including government officials instead of based universities. The involvement of SHs from academic institutions to collaborate with FR members for the case studies and processes of the full research is highly expected.

c) A study of improvements in environmental governance in ASEAN countries

FR members will conduct both analytical and theoretical research, and transdisciplinary practical research in three steps during the establishment of UNEP council in each ASEAN country with the support of J-UNEP and collaboration with SRIREP members for solving the problem of Hg pollution. FR members will study on the current conditions and challenge of environmental governance and its policy in each ASEAN country and environmental governance for sustainable development as the first step of analytical and theoretical research. Then the members will setup workshops or seminars among SRIREP members, J-UNEP and each country's SHs to share and discuss the knowledge and experience on environmental governance and policy, and also will design an international forum for creating environmental governance as our first step of practical research.

For Indonesia: The tentative schedule for the international seminar among SRIREP members, J-UNEP members, and Indonesia counterparts will be in May, 2020.

For Myanmar: We expect to make an international workshop or seminar between SRIREP members, J-UNEP members, and central government officials in 2020.

We will continue the other steps base on the results of the first step.

d) Theoretical and practical studies of the design, practical use, and evaluation of TBO, and cultivation, development process, and roles of TDCOP

Theoretical research and practical research will be conducted, and each research has three steps: 1) basic research of TBO and TDCOP, 2) study on the design of TBO and TDCOP, and 3) study on the practical design of TBO and TDCOPs for the regional innovation.

For Indonesia: FR members will study on theoretical research of TBO and TDCOP, and develop a new evaluation index of TBO and TDCOP as the first step of theoretical research. FR members, communicators, and key SHs will design and create various TBOs based on the evaluation of the elements of the future scenarios, analysis on the present conditions and issues of the developed TBOs and construct a platform for cultivating TDCOPs as the first step of practical research.

For Myanmar: FR members will study only basic and theoretical research as the first step in 2020 due to two years behind schedule of Indonesia processes. Practical research processes will follow in next year.

●Achievements

○Papers

【Original Articles】

- Ito. Y., Mikami. S., Jang. H., Taheri. A.,Tanaka. K and Kawamura. Y. 2020,03 University Students' Preferences for Labour Conditions at a Mining Site: Evidence from Two Australian Universities. *Recouces* 9(3):29-29. DOI:10.3390/resources9030029 (reviewed).
- Basri, Sakakibara. M., SERA. K. 2020,02 Mercury in Soil and Forage Plants from Artisanal and Small-Scale Gold Mining in the Bombana Area, Indonesia. *Toxics 2020* 8. DOI:10.3390/toxics8010015 (reviewed).
- Komatsu, S., Yamamoto, Y., Ito, Y., Kaneko, S., Dhital, R. P. 2019,12 Water for life: ceaseless routine efforts for collecting drinking water in remote mountainous villages of Nepal. *Environment, Development and Sustainability*. DOI:DOI:10.1007/s10668-019-00552-9 (reviewed).
- Yamamoto, Y., Matsumoto, K., Kawata, K., and Kaneko, S. 2019,10 Gender-based differences in employment opportunities and wage distribution in Nepal. *Journal of Asian Economics* 64(101131). DOI:DOI:10.1016/j.asieco.2019.07.004 (reviewed).
- Yamamoto, Y., Takeuchi, K., and Köling, G. 2019,10 Preventing peatland fires in Central Kalimantan, Indonesia: The role of economic incentives and social norms. *Journal of Forest Economics*. DOI:DOI:10.1561/112.00000509 (reviewed).

○Research Presentations

【Oral Presentation】

- Pateda, S. M. Impact of Artisanal and Small-scale Gold Mining Activity on Human Health in Gorontalo Province, Indonesia: A Perspective in Geomedical-science. The 2nd ASEAN-Japan Meeting point of Collaboration by Stakeholders and Researchers for Reducing Environmental Problems in ASEAN Countries (TRPNEP2019), 2019.12.11-2019.12.11, Hilton Nay Pyi Taw, Naypyidaw, Myanmar.
- Sakakibara, M. Bio-Eco-Geo-Medi-Socio (BEGMES)-Science Study of Environmental Pollution in Artisanal and Small-Scale Gold Mining Area in Indonesia. The 2nd ASEAN-Japan Meeting point of Collaboration by Stakeholders and Researchers for Reducing Environmental Problems in ASEAN Countries (TRPNEP2019), 2019.12.11-2019.12.11, Hilton Nay Pyi Taw, Naypyidaw, Myanmar.
- Kuruniawan, I. A. Preliminary Studies of Environmental Assessment in Artisanal Small Gold Mining in Bunikasih Area, West Java Indonesia. The 2nd ASEAN-Japan Meeting point of Collaboration by Stakeholders and Researchers for Reducing Environmental Problems in ASEAN Countries (TRPNEP2019), 2019.12.11-2019.12.11, Hilton Nay Pyi Taw, Naypyidaw, Myanmar.
- Kuang, X. Sustainable approach for recycling crushed stone powder for the removal of hazardous Ions (F, B, As, Cr(VI)) from solid wastes. 2019 Korea-Japan-Taiwan Joint Geoscience Symposium, 2019.10.14-2019.10.18, Pukyong National University, Busan, Korea.
- Komatsu, S. Effect of Grid−based Electrif ication on the Solar Electrif ied Rural Villages: Case Study of Bangladesh. 24th Annual conference, The Society for Environmental Economics and Policy Studies, 2019.09.27-2019.09.29, Fukushima University, Fukushima.
- Matsumoto, Y. Boundary crossing and collaborative learning in communities of practise: Using SAIDO Learning in Japanese nursing homes. European Group for Organizational Studies 35th EGOS Colloquium, 2019.07.04-2019.07.06, University of Edinburgh Business School, Edinburgh, United Kingdom.
- Kimijima, S. An opportunity of Positioning Technology for Monitoring Socioeconomic Impacts resulting from a Rapid Development in Myanmar. 2019 Korea-Japan-Taiwan Joint Geoscience Symposium, 2019.10.14-2019.10.18, Pukyong National University, Busan, Korea.
- Matsuda. H. Transdisciplinary approaches for the reactivation of Japanese biosphere reserves. 4th International Sympoisum of Decision Science for Future Earth, 2019.08.01-2019.08.01, Kyushu University, Fukuoka.
- Sakakibara, M. Establishment of multi-layered environmental governance in collaboration with private sectors. The 7th Joint seminar with Hokkaido University and RIHN/The 28th RIHN Regional Community Seminars, 2019.07.18-2019.07.18, Hokkaido University, Sapporo. (in Japanese)
- Yamamoto, Y. Forest ecosystem service and agriculture in Indonesia. 29th Annual meeting, the Japan Society of Tropical Ecology, 2019.06.14-2019.06.16, Hokkaido University, Sapporo.
- Yamamoto. Y. The effects of forest ecosystem services on agriculture: Evidence form Indonesian Farmers. Three society meeting in Nagasaki, 2019.06.01-2019.06.01, Nagasaki University, Nagasaki.

【Invited Lecture / Honorary Lecture / Panelist】

- Sakakibara, M. Role of geosciences in transdisciplinary approach to solve complex problems in society. International journal writing training, 2020.03.04-2020.03.04, State University of Gorontalo, Gorontalo state, Indonesia.
- Sakakibara, M Mercury-Contaminated Whitening Cosmetics in Indonesia. The seminar for Master's course students of Public health for University Muslim Indonesia, 2019.11.17-2019.11.17, University Muslim Indonesia, Makassar, Indonesia. (Invitation lecture)
- Sakakibara, M. Studies of Environmental Pollutions and Health Problems in Indonesia for Remediating Polluted Environments. The seminar for the under graduate students of Public health for University Muslim Indonesia, 2019.11.17-2019.11.17, University Muslim Indonesia, Makassar, Indonesia. (Invitation lecture)
- Sakakibara, M. Bio-Eco-Geo-Medi-Socio (BEGMES)-science study of environmental pollution in artisanal and small-scale gold mining area in Indonesia. 1st INTERNATIONAL CONFERENCE ON HEALTH SCIENCES IN DEVELOPING COUNTRY, 2019.11.16-2019.11.17, The Four Point Hotel Makassar, Indonesia.
- Sakakibara, M. Transdisciplinary approach for solving complex society problems. Transdisciplinary research on legal studies, 2020.03.02-2020.03.02, State University of Gorontalo, Gorontalo state, Indonesia.

- Sakakibara, M. Reduction of Environmental Problems and Future Business by Introducing Sustainable Finance, The Issue of Chinese versus America Trade War. International Class at University Bosowa, 2019.10.22-2019.10.22, University Bosowa, Makassar, Indonesia.
- Sakakibara, M. Waste and its Environmental Problem -How do we manage the waste?. International Class in School of Public Health of Makassar University, 2019.10.21-2019.10.21, Hasanuddin University, Makassar, Indonesia. (Invitation lecture)
- Sakakibara, M. Heavy Metal Pollution and its Toxity. International Class at Indonesia Timur University, 2019.10.21-2019.10.21, Indonesia Timur University, Makassar, Indonesia. (Invitation lecture)
- Sakakibara, M. Studies of Environmental Pollutions and Health Problems in Indonesia for Remediating Polluted Environments. International Class at University Muslim Indonesia, 2019.10.20-2019.10.20, University Muslim Indonesia, Makassar, Indonesia. (Invitation lecture)
- Sakakibara, M. Co-creation of sustainable regional innovation for reducing risk of high-impact environmental pollution. ISeNREM 2019, 2019.08.15-9209.08.15, Bogor Agricultural University (IPB), Bogor, Indonesia.
- Tanaka, K. Could payment by results (PbR) be future of PES in agriculture?. International Conference of the 50 Years PERHEPI, 2019.07.24-2019.07.26, Bogor Agricultural University (IPB), Bogor, Indonesia.
- Sakakibara, M. Medical Geology and its Challenges. 2nd Japan - ASEAN Medical Seminar on Human Health Impact of Heavy Metals, 2019.05.05-2019.05.05, Indonesia, Gorontalo.
- Sakakibara, M. Medical Geology and its Challenges. 1st Japan - ASEAN Medical Seminar on Human Health Impact of Heavy Metals, 2019.05.03-2019.05.03, Indonesia, Makassar.
- Sakakibara, M., Tanaka, K., Kasamatsu, K., Shimagami, M., Komatsu, S. Co-creation of sustainable regional innovation for reducing risk of high-impact environmental pollution. International Conference on Environmental Sustainability and Climate Change, 2019.04.22-2019.04.23, ANA Crowne Plaza Osaka, Osaka.

Core Program

Program Director: TANIGUCHI Makoto

○ Research Subject and Objectives

Mission

Based on the mission of RIHN and in order to execute the strategies and policies formulated by the Council for Research Strategy, the Core Program undertakes research on an ongoing basis. During Phase III (2016-2021) of RIHN, the Core Program will develop concepts and methodologies to solve global environmental problems in collaboration with society.

The Core Program develops comprehensive and systematic concepts and methodologies for transdisciplinary and interdisciplinary research. Core Projects produce conceptual and methodological frameworks together with RIHN Research Projects based on individual methods, techniques, and tools from the divisions in the RIHN Center. Core Projects collaborate with Research Projects, building on the case studies developed by these projects, and develop comprehensive and systematic methodologies beyond an individual Research Program or Project. Core Projects also deliver completed concepts and methodology to Research Programs and Projects, the RIHN Center, and related stakeholders.

○ Progress and Results in 2019

The Core Program affiliates two Core Projects, “Environmental traceability project (FR3-PI: Ichiro Tayasu)”and “Information Asymmetry Reduction in Open Team Science for Socio-environmental Cases (FR2-PL: Yasuhisa Kondo)”, and two Core FSs, “Synthesis, Analysis, and Typology of TD case studies aiming at solving the global environmental problems (FS-leader: Yuko Onishi)” and "Development of the Methodology for the Integrated Future Scenario Building with Trans-disciplinary Approach(FS-leader: Kenji Baba)". The Core Program develops comprehensive and systematic concepts and methodologies for interdisciplinary and transdisciplinary research to solve global environmental problems in collaboration with society, which will be widely applicable to global environmental issues, and accessible to related stakeholders. One of the cities collaborating with the Core Projects is Ohno City and RIHN reached an agreement to establish the RIHN Liaison Office in Ohno City. This new office will become a shared-use facility for joint research.

The Core Projects produce conceptual-methodological frameworks together with Research Projects, based on individual methods/techniques/tools from the divisions in the RIHN Center. In the case of the “Traceability Core Project (PI: Tayasu)”, the conceptual framework of “trust” has been developing between scientists and non-scientists (governors and citizens) as well as between consumers and producers, based on stable isotope techniques from the RIHN Center. The Core Projects collaborate with Research Projects, building on case studies of these Projects, and developing comprehensive and systematic methodologies beyond Research Programs-Projects. The “Traceability Core Project (PI: Tayasu)” has been studying this framework of “trust” in the Research Projects “FEAST (program 3, PI: McGreevy)” for consumers and producers and “Nutrient Cycling (program 2, PI: Okuda)” for scientists and non-scientists. Core Projects will deliver completed concepts/methodology to Research Programs-Projects, RIHN Center, and related stakeholders at the end of project. The Traceability Core Project is now in the FR3 stage, therefore the final results of this Core Project are currently in progress.

“Open team Science Core Project (PI: Kondo)” has been studying this of “trust” in the Research Projects “Historical Climate Adaptation (program 1, PI: Nakatsuka)” and “Nutrient Cycling (program 2, PI: Okuda)”. Core Projects will deliver completed concepts/methodology to Research Programs- Projects, RIHN Center, and related stakeholders at the end of project. The Traceability Core Project is now in the FR2 stage, therefore the final results of this Core Project are currently in progress.

Other activities of the Core Program are research developments, including Core FSs developments. The Core Program organized two core program seminars for research developments through discussion of comprehensive and systematic concepts and methodologies. Seminars, including collaboration with RIHN Research Projects as well as with the RIHN Center, featured speakers with the potential to further RIHN’s innovation. In addition, international alliances such as with SRC (Stockholm Resilience Center), opened the possibility for disseminating and sharing the fruits of research results.

We have made the following 2 Core Program seminar:

18th（June 3, 2019)

Core program seminar "Recent trend of scenario research: Integration of RIHN project with scenario methods." Kenji Baba (FS-leader)

17th（May 21, 2019)

Core program seminar ""Our TD Reearch - What's about RIHN's TD? Yuko Onishi (FS-leader)

16th (Dec. 26, 2018):

"Core FS workshop: Co-design and stakeholder engagement according to geographical scales" Yuko Onishi (FS-leader)

15th (Dec. 19, 2018):

"Discussion for the workshop in EREC 2019" Core program all member

We discussed how to make synergy of core program/projects with research projects and RIHN center.

14th (Oct. 16, 2018):

"Progress report from Environmental traceability Project" IchiroTayasu (FR2-PI)

"Progress report from Target of Open team science Project" Ysuhisa Kondo (FR1-PI)

"Research Strategy for Core Program and Future plans for core program research" MakotoTaniguchi (Core program director)

"Correspondence of Core program to SDGs workshop" MakotoTaniguchi (Core program director)

13th (Apr. 25, 2018):

"Core program seminar procedures in 2018" MakotoTaniguchi (Core program director)

"Target of Environmental traceability Project and collaboration with research programs and RIHN center" IchiroTayasu (FR2-PI)

"Target of Open team science Project and collaboration with research programs and RIHN center" Ysuhisa Kondo (FR1-PI)

○Project Members

Makoto TANIGUCHI	(RIHN,Professor)
Ichiro TAYASU	(RIHN,Professor)
Yasuhisa KONDO	(RIHN,Associate Professor)
Yuko ONISHI	(RIHN,Assistant Professor)
Kenshi BABA	(Tokyo City University,Professor)

○ Future Themes

Future Plan

1) The Core Program will synthesize the Core Projects and Core FSs to create synergy in the program, and to identify gaps within the existing Core Projects and FSs.

2) The Core Program will work more closely with the strategies and policies formulated by the Council for Research Strategy of RIHN.

3) The Core Program will seek opportunities to apply the developing concepts and methodologies to other Research Projects with relevant stakeholders.

4) The Core Program will work more closely with international alliances related to “Humanity and Nature” such as the Future Earth alliance, Resilience alliance, and Sustainability alliance to disseminate the results of Core Projects.

5) The Core Program will provide a survey of RIHN's research mapping with a wide lens perspective that includes SDGS/JSRA/ Global Environmental Research frames.

●Achievements

○Papers

【Original Articles】

・Taniguchi M., Lee S. 2020,02 Identifying Social Responses to Inundation Disasters: A Humanity-Nature Interaction Perspective. *Global Sustainability* 3. (reviewed).

・Dalin, C., Taniguchi, M., Green, T.R. 2019,07 Unsustainable groundwater use for global food production and related international trade. *Global Sustainability 2,*(e12):1-11. DOI:10.1017/sus.2019.7 (reviewed).

・Fujita, K., Shoji, J., Sugimoto, R., Nakajima, T., Honda, H., Takeuchi, M., Tominaga, O., Taniguchi, M. 2019,06 Increase in Fish Production through Bottom-Up Trophic Linkage in Coastal Waters Induced by Nutrients Supplied via Submarine Groundwater. *Frontiers in Environmental Science* 18. DOI:doi.org/10.3389/fenvs.2019.00082. (reviewed).

・Miyakoshi, A., Taniguchi, M., Ide, K., Kagabu, M., Hosono, T., and Shimada, J. 2019 Identification of changes in subsurface temperature and groundwater flow after the 2016 Kumamoto earthquake using long-term well temperature-depth profiles. *J. Hydrol* 582. DOI:doi.org/10.1016/j.jhydrol.2019.124530 (reviewed).

・Taniguchi M., Dulai, H., Burnett, K.M., Santos, I.R., Sugimoto, R., Stieglitz, T., Kim, G., Nils, M., Burnett, W.C. 2019 Submarine Groundwater Discharge: Updates on its Measurement, Magnitude and Effects. *Frontiers in Envirnmental Science*. DOI:doi.org/10.3389/fenvs.2019.00141 (reviewed).

○Research Presentations

【Oral Presentation】

・Taniguchi, M., Lee, S., Masuhara, N. Water centric nexus on multi-scale water. 46th IAH, (International Association of Hydrogeologists) Congress, 2019.09.21-2019.09.28, The Trade Fairs and Congress Center of Malaga, Malaga, Spain.

・Taniguchi, M., Miyakoshi, A., Hamamoto, H. Subsurface warming revealed from repeated measurements of temperature-depth profiles in the world, JV04-IUGG2019-0929 2019.7.15. 27th IUGG General Assembly, 2019.07.08-2019.07.18, Montreal International Convention Center, Montreal, Canada.

・Taniguchi, M., Lee, S., Masuhara, N. Water centric nexus on multi-scale water-energy-food. 27th IUGG General Assembly, 2019.07.08-2019.07.18, Montreal International Convention Center, Montreal, Canada.

・Taniguchi, M. Tradeoff and synergy among climate-land-water. Water Resilience Workshop, 2019.04.03, Stockholm Resilience Center, Stockholm, Sweden.

【Poster Presentation】

・Lee, S. H., Taniguchi, M., and Masuhara, N. Development of the multi-local system dynamics modeling for regional Water-Energy-Food Nexus based on resource-sheds management. 2019 Fall meeting AGU, 2019.12.09-2019.12.13, San Francisco, US.

・Lee, S. H., Taniguchi, M., and Masuhara, N. Implication of multi-scale WEF Nexus on integrated natural resource management, with a focus on holistic impacts of food security and economic growth in Japan. 2019 INWEPF-PAWEES International Conference, 2019.11.05-2019.11.07, Seoul, Korea.

・Lee, S. H., Taniguchi, M., and Masuhara, N. Analysis of regional sustainability forSDGs in Japan from the perspective onWater-Energy-Food Nexus. EGU General Assembly 2019, 2019.04.07-2019.04.12, Vienna, Austria.

【Invited Lecture / Honorary Lecture / Panelist】

・Taniguchi, M. Multi-scale Water-Energy-Food Nexus. Australasian Groundwater Conference, 2019.11.24-2019.11.27, Brisbane, Australia.

・Taniguchi, M. Submarine groundwater discharge in an era of unprecedented change. 27th IUGG General Assembly, 2019.07.08-2019.07.18, Montreal International Convention Center, Montreal, Canada.

・Taniguchi, M. Groundwater management for global sustainability. JpGU, 2019, 2019.05.26-2019.05.30, 幕張メッセ, 千葉市美浜区.

・Taniguchi, M. Integrated Management of Water-Energy-Food Nexus in Asia-Pacific Region. APEC Workshop on Integrated Energy-Water Planning and Policy Formulation, 2019.05.06-2019.05.08, Hyatt Place Waikiki Beach, Honolulu Hawaii.

・Taniguchi, M. Multi-scale Water-Energy-Food Nexus under the industrialization and urbanization. APEC Workshop on Integrated Energy-Water Planning and Policy Formulation, 2019.05.06-2019.05.08, Hyatt Place Waikiki Beach, Honolulu Hawaii.

Stage: Full Research

Project Name: Proposal and verification of the validity of isotope environmental traceability method in environmental studies

Project Leader: TAYASU Ichiro

Core Program

○ Research Subject and Objectives

We consider that water security, food security and environmental security are fundamental to the sustainability of human society in a changing world. In this project, we hypothesize that environmental traceability is a key concept in solving environmental issues for various stakeholders. For example, one certainly refuses to drink well water if it is obvious that the water comes from polluted drainage. Environmental traceability is an extension of the metaphor. However, it is usual that cause-and-effect relationships or even correlations are unclear. Stable isotope ratios of elements, together with the concentrations of elements, can trace a matter flow, the environmental condition of sites, ecosystem structure and food products. Spatio-temporal variation of multiple isotope ratios can be used for studying the earth systems from local to global point of view. The information may serve as a key for local people to consider water security, food security and environmental security, which are fundamental for the sustainability of human society, in terms of global viewpoint. Multi-isotope approach has successfully been applied to many previous projects in RIHN. Furthermore, the fact that RIHN is equipped with advanced isotope ratio mass spectrometers and elemental analysis systems confirms the advantage of adopting the approach and developing a new type of application of isotope tools for transdisciplinary approach.

How to use the environmental traceability concept is a methodology that we seek to establish in this study. However, how to use the methodology in the transdisciplinary point of view is not well studied so far, and we hypothesize the process should be different among the stakeholders, especially “who” considered the approach is applicable to the environmental issue. “Multi-Isoscapes” (use of multiple elements and multiple isotope ratios, and GIS based mapping technique), interview, workshop and questionnaire are methods for adopting environmental traceability in a given environmental issue.

In this project, we test if the environmental traceability methodology is valid in environmental studies, by conducting the two researches, I) effectiveness of the environmental traceability concept, and II) applicability to the food traceability. For the research I), we ask what are effective points of the methodology to solve environmental problems using a survey by questionnaire and a workshop among stakeholders. For the research II), we test if the “environmental traceability” authentication by multi-isotope methods are more effective in communicating production conditions and building trust.

○ Progress and Results in 2019

I) effectiveness of the environmental traceability concept

・The Lake Biwa and the watershed, Shiga. Researches in the Yasu River watershed and local areas (e.g. Kosaji) are being conducted in collaboration with the e-REC project. We have identified the origin of phosphate in Yasu river using oxygen isotope analysis of phosphate in river. We held a symposium in December 2019 and conducted survey by questionnaire to clarify the residents’ validity of the environmental traceability methodology.

・RHIN has collaborated with Ono City for groundwater survey since 2013, and the research results have already been included in the current “Basic Plan for groundwater management” and will be included in the next “Basic Plan for watershed management” in 2021. Based on this collaboration, Ono City opened the research museum and laboratory on 22 March 2020 to share scientific knowledge with the society.

Results of questionnaire survey

・The findings obtained from questionnaire surveys in Oshino Village in Yamanashi, Chikusa river watershed in Hyogo, Otsuchi Town in Iwate, and Saijo City in Ehime are:

1) The information obtained from environmental traceability methodology was highly evaluated by the residents and this result suggests the requirement of scientific investigation using the methodology by the residents.

2) The information obtained from environmental traceability methodology was highly required for solving environmental issues, although the degree of necessity differed among various environmental information at each study site.

3) The type of stakeholder which highly evaluated the information obtained from environmental traceability methodology were: 1) people who are generally involved in the object of conservation (groundwater or river depending on the study site), 2) people who have high concern about the information obtained from environmental traceability methodology, and 3) people who showed high level of understanding about the explanation of environmental traceability methodology in the symposium at each study site.

Workshops

To know the validity of the environmental traceability methodology for the municipal officers and project-related researchers other than isotope scientist, we held several workshops to hear the “strengths” of the methodology.

II) applicability to the food traceability

Food labels provide information to consumers. How do consumers evaluate different sources of providing information on labels? We 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, which were previously detected false labeling by isotopic method. We set the sources of label information assured by farmer’s face, by government, by the producer association, by the experts (here, we include isotopic method), or by consumers’ reputation. Results showed that the expert labels based on scientific analysis were highly trusted regardless of food type or country, and the higher trust of expert labels was partly explained by trust in expert as food information source. This result suggests that expert labels might play an important role as trusted sources of information in the global food system. This study got the “Best Poster Award” in ISO-FOOD symposium held in Slovenia, and the study was published in the journal “Food and Chemical Toxicology” (Rupprecht et al. 2020).

III) Establish an internet website to serve as a platform that shares and develops the environmental traceability methodology

With the cooperation of Open Team Science Core-project, we are establishing 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 the questionnaire and workshops, and all the finding of Laboratory and Analysis Division, including the cooperative research on “Environmental Isotope Study”. The website will continue to connect providers of the environmental traceability methodology with potential users. The web site is shown below.

https://www.environmentalisotope.jp

○Project Members

◎ TAYASU Ichiro	(Research Institute for Humanity and Nature,Professor,Developing environmental traceability methodology)
FUJIYOSHI Lei	(Research Institute for Humanity and Nature,Project Researcher)
TANIGUCHI Makoto	(Research Institute for Humanity and Nature,Professor)
YABUSAKI Shiho	(Research Institute for Humanity and Nature,Center Researcher)
NAKANO Takanori	(Research Institute for Humanity and Nature / Faculty of Science and Engineering, Waseda University,Professor Emeritus / Visiting Professor,Developing environmental traceability methodology)
SHIN Ki-Cheol	(Research Institute for Humanity and Nature,Assistant Professor,Developing environmental traceability methodology)
KONDO Yasuhisa	(Research Institute for Humanity and Nature,Associate Professor,Developing GIS platform for environmental traceability methodology)
ENDO Aiko	(Research Institute for Humanity and Nature,Associate Professor)
MASUHARA Naoki	(Research Institute for Humanity and Nature,Project Researcher)
OKUDA Noboru	(Research Institute for Humanity and Nature,Professor)
UEHARA Yoshitoshi	(Research Institute for Humanity and Nature,Researcher)
LAMBINO Ria Adoracion	(Research Institute for Humanity and Nature,Specially Appointed Associate Professor,Collaborating with the e-REC project as well as Future Earth)
MCGREEVY Steven R	(Research Institute for Humanity and Nature,Associate Professor)
RUPPRECHT Christoph DD	(Research Institute for Humanity and Nature,Project Researcher)
NAKATSUKA Takeshi	(Research Institute for Humanity and Nature,Professor)
MORI Seiichi	(Gifu-Keizai University,Professor)
YOKOO Yoriko	(Doshisha University,Professor)
YAMADA Yoshihiro	(Kagawa University,Professor)
AKIMICHI Tomoya	(Fujisan World Heritage Center/ Research Institute for Humanity and Nature,Director/ Emeritus Professor)
NISHIMURA Takeshi	(Sanyo Gakuen University,Lecturer)
KATO Takaaki	(The University of Kitakyushu,Professor)
FUKUSHIMA Shintaro	(Aoyama Gakuen University,Assistant Professor)

KAERIYAMA Toshiaki	(Ono City Office,Manager)
SAKAI Motoya	(Ono City Office,Section Chief)
TOKUMASU Minoru	(Saijo City Office,Senior Official Staff)
OOMORI Noboru	(Oshino village Office,Section Chief)
OSADA Hisamaru	(Oshino village Office,Senior Manager)
WATANABE Soichiro	(Oshino village Office,Senior Staff)
YOKOYAMA Tadashi	(Hyogo prefectural Ako School for Students with Special Needs,Teacher)
MITSUHASHI Hiromune	(University of Hyogo / Museum of Nature and Human Activities, Hyogo,Lecturer)
OHKUSHI Ken'ich	(Kobe University,Associate professor)
ITOH Masayuki	(Kobe University,Professor)
BOWEN Gabriel J	(University of Utah,Professor)
OHTE Nobuhito	(Kyoto University,Professor)
NAKAGIRI Takao	(Osaka Prefecture University,Associate professor)
SAKURAI Shinji	(Osaka Prefecture University,Lecture)
YOSHIOKA Yumi	(Shimane University,Assistant Professor)

○ Future Themes

The purpose of the Post-Core Project "Applied research platform based on environmental traceability", which is the follow-up to this core project, is to improve and reconstruct environmental traceability methodology together with new users by using the website as a platform. The website connects researchers who can provide technologies related to environmental traceability methodology with researchers who want to use the methodology, and stakeholders including the government and citizens. We hope to build a new function of the inter-university research institutions and propose a core method of utilizing the environmental traceability methodology.

●Achievements

○Books

【Authored/Co-authored】

- Tayasu, I., Shin, K.-C., Fujiyoshi, L. 2020,03 A world drawn by Environmental Isotope Study: 2020 edition. Research Institute for Humanity and Nature, 100pp. ISBN 978-4-906888-76-4
- Okuda N, Takeyama T, Komiya T, Kato Y, Okuzaki Y, Karube Z, Sakai Y, Hori M, Tayasu T, Nagata T (in press) 2020,02 A food web and its long-term dynamics in Lake Biwa: a stable isotope approach. In: Lake Biwa: Interactions between Nature and People (2nd Edition). Springer Academic, Amsterdam

○Papers

【Original Articles】

- Fujiyoshi L, Nishimura T, Kato T, Tayasu I 2019,12 Residents' understanding of and interest in isotope techniques for groundwater conservation: a study of symposium participants in Oshino Village, Yamanashi Prefecture. *Papers on Environmental Information Science* 33:133-138. (in Japanese)
- Hosoki T, Mori S, Nishida S, Kume M, Sumi T, Kitano J 2019,12 Diversity of gill raker number and diets among stickleback populations in novel habitats created by the 2011 Tohoku earthquake and tsunami. *Evolutionary Ecology Research* 20:213-230. (reviewed).
- Gotou, Y., Koiwa, T., Shin, K.-C. and Tayasu, I. 2019,12 Development of the method for discriminating the geographical origin of okra using elemental analysis and strontium isotope ratio. *Research Report of Food Products* 43:20-26. (in Japanese)
- Ishida T, UeharaY, Iwata T, Cid-Andres AP, Asano S, Ikeya T, Osaka K, Ide J, Privaldos OLA, De Jesus IBB, Peralta EM. Triño EMC, Ko C-Y, Paytan A, Tayasu I, Okuda N 2019,12 Identification of phosphorus sources in a watershed using a phosphate oxygen isoscape approach. *Environmental Science and Technology* 53:4707-4716. (reviewed).
- Nitzsche, K.N., Kato Y., Shin, K.-C. and Tayasu, I. 2019,12 Magnesium isotopes reveal bedrock impacts on stream organisms. *Science of the Total Environment* 688:243-252. (reviewed).

・Sase, H., Takahashi, M., Matsuda, K., Sato, K., Tanikawa, T., Yamashita, N., Ohizumi, T., Ishida, T., Kamisako, M., Kobayashi, R., Uchiyama, S., Saito, T., Morohashi, M., Fukuhara, H., Kaneko, S., Inoue, T., Yamada, T., Takenaka, C., Tayasu, I., Nakano, T., Hakamata, T. and Ohta, S. 2019,12 Response of river water chemistry to changing atmospheric environment and sulfur dynamics in a forested catchment in central Japan. *Biogeochemistry* 142:357-374. (reviewed).

・Ko C-Y, Iwata T, Lee J-Y, Murakami A, Okano J, Ishikawa NF, Sakai Y, Tayasu I, Itoh M, Song U, Togashi H, Nakano S, Ohte N, Okuda N 2019 Assessing alpha and beta diversities of benthic macroinvertebrates and their environmental drivers between watersheds with different levels of habitat transformation in Japan. *Marine and Freshwater Research* 70:504-512. DOI:doi:10.1071/MF18031 (reviewed).

・Matsubayashi J, Umezawa Y, Matsuyama M, Kawabe R, Mei W, Wan X, Shimomae A, Tayasu I 2019 Using segmental isotope analysis of teleost fish vertebrae to estimate trophic discrimination factors of bone collagen. *Limnology and Oceanography Methods* 17:87-96. DOI:DOI:10.1002/lom3.10298 (reviewed).

○Research Presentations

【Oral Presentation】

・Noboru Okuda, Zin’ichi Karube, Yoichiro Sakai, Tomohiro Takeyama, Ichiro Tayasu, Chikage Yoshimizu, Toshi Nagata ” “Biodiversity increases integrated trophic position of macroinvertebrate communities in coastal food webs: Testing the vertical diversity hypothesis. JpGU meeting 2019, 2019.05.26-2019.05.30, Chiba-city Mihama-ward.

・Shinji Sakurai, Takao Nakagiri, Kosuke Tanaka, Haruhiko Horino, Ki-Cheol Shin, Ichiro Tayasu, Shiho Yabusaki Investigation on possibility of the identification of air pollutant source Makuhari-Messe, Makuhari, Chiba,s using ratios of stable lead and strontium isotopes. JpGU meeting, 2019, 2019.05.26-2019.05.30, Chiba-city, Mihama-ward.

・Lei Fujiyoshi, lchiro Tayasu, Shiho Yabusaki, Takashi F Haraguchi, Chikage Yoshimizu, Ken'ichi Ohkushi, Fumiko Furukawa, Masayuki ltoh, Yudai Yamamoto Dynamics of sulfate and nitrate inferred from stable isotope techniques in Chikusa river watershed, Hyogo Prefecture. JpGU meeting, 2019, 2019.05.26-2019.05.30, Chiba-city, Mihama-ward.

・Ken'ichi Ohkushi, Shiho Yabusaki, lchiro Tayasu, Lei Fujiyoshi, Takanori Nakano, Ki-Cheol Shin, Tadashi Yokoyama, Hiromune Mitsuhashi, Masayuki ltoh, Kazuki Yasugi The hydrogen and oxygen isotopic compositions of water in the Chikusa River. JpGU meeting 2019, 2019.05.26-2019.05.30, Chiba-city, Mihama-ward.

・Shiho Yabusaki, Makoto Taniguchi, lchiro Tayasu, Tomoya Akimichi, Noboru Ohomori, Ken Gotou, Souichirou Watanabe, Hitoshi Watanabe Study on groundwater flow system at Oshino Village in Yamanashi Prefecture - Report 5. Estimation of the residence time in spring water and groundwater at Oshino Village. JpGU meeting, 2019, 2019.05.26-2019.05.30, Chiba-city, Mihama-ward.

・lchiro Tayasu, Lei Fujiyoshi, Shiho Yabusaki, Ki-Cheol Shin, Takanori Nakano, Makoto Taniguchi Environmental traceability methodology by multi-isoscapes. JpGU meeting, 2019, 2019.05.26-2019.05.30, Chiba-city, Mihama-ward.

・Tohru Ikeya, Takuya Ishida, Yoshitoshi Uehara, Satoshi Asano, Ichiro Tayasu, Noboru Okuda, Masayuki Ushio, Shohei Fujinaga, Chia-Ying Ko, Elfritzson Martin Peralta, Naoto F. Ishikawa, Tomoya Iwata The analysis of the community composition of riverine bacteria and microalgae in relation to nutrient status and diversity: the case in irrigation season in the Yasu River, Japan. JpGU meeting 2019, 2019.05.26-2019.05.30, Chiba, Mihama.

【Poster Presentation】

・Christoph Rupprecht, Lei Fujiyoshi, Steven McGreevy, Ichiro Tayasu Trust me? Consumer trust in expert information on food product labels. 1st Iso-Food International Symposium on Isotopic and Other Techniquws in Food Safety and Quality, 2019.04.01-2019.04.03, Grand Hotel Bernardin, Piran, Slovenia. Best Poster Award in ISO-FOOD symposium

Stage: Full Research

Project Name: Information Asymmetry Reduction in Open Team Science for Socio-environmental Cases

Project Leader: KONDO Yasuhisa

Core Program

URL: https://openteamscience.jp/en/

○ Research Subject and Objectives

a) Problem, background, and objectives

Social issues caused by environmental deterioration present complex and multidimensional problems for science. To address such wicked problems, solution-oriented research has involved research experts from different domains (interdisciplinarity) [1] and also practitioners such as governments, funders, industries, non-profit organizations, and civil members (transdisciplinarity) [2,3]. However, such team science is often disrupted by asymmetric information [4], knowledge, wisdom [5], value, socio-economic status [6,7], and power among above-mentioned actors. This Core Project, also called the Open Team Science (hereafter OpenTS) Project, develops a methodology to reduce (rather than dissolve) such socio-psychological asymmetry for the sake of more efficient transdisciplinary (TD) collaboration.

b) Methodology, structure, and schedule

To develop the methodology, this project interlinks the concept of open science, as an open scientific knowledge production system, with a TD approach to boundary spanning [8,9] by transforming in-between spaces [10,11] into “our” epistemic living spaces. Technically, boundary spanning can be achieved by a combination of (1) considering ethical equity [12] with special attention to empowering marginalized (or “small voice”) actors; (2) building trust by securing transparency in the research process, (3) developing fair visualization of data based on the FAIR (findable, accessible, interoperable, and reusable) Principles [13] as well as information; (4) facilitating dialogue; and (5) discovering and sharing the goals that actors with different interests can tackle together (transcend) [14] where necessary. Civic Tech [15] can be applied as a holistic approach, in which civic engineers develop a solution to local issues by using disclosed data and information and communication technologies. This proposed methodology is cyclically assessed and improved through practical case studies [16], with special interest in developing a method to measure participants’ perceptual transformation through interventions.

This project lasts three years. During the first half of this period, we reviewed case studies to develop the methodology and measurements, which are being tested by practical case studies during the second half.

c) Expected results At the completion of the project, we expect to establish the OpenTS methodology by successfully interlinking open science and TD theories, with new knowledge about effective (and ineffective) combinations of visualization and dialogue tools, and with qualitative and quantitative methods to measure the effect of boundary spanning.

d) Project organization, membership, and collaboration with RIHN Research Projects The organization of this Core Project is loosely divided into the Theory Group and the Practice Group, although boundary between (sub-)groups is loosely set in order to promote synergistic collaboration. The project consists of one project leader, six core members, eighteen regular members, four advisory members, two advisors, and two supporting staff members. Another five associate members will eventually participate in meetings and online discussions.

The Research Group is developing the OpenTS theory through an interdisciplinary review of member’s case studies from the multifaceted viewpoints of philosophy, ethics, anthropology, social psychology, ecology, sustainability science, science and technology for society, open science theory, the science of team science (SciTS), and science communication, in an ad-hoc collaboration with the Historical Climate Adaptation (completed in 2019), Sanitation, and FEAST Projects. The Practice Group focuses on waterweed recycling in the catchment of Lake Biwa, Japan, in a regular collaboration with the Ecological Recycling (e-Rec) Project, and on community-based built heritage management in Oman.

e) Contribution to the Core Program The OpenTS Project contributes to the Core Program by developing the above-mentioned hypothesis-practice-assessment cycle as a common methodology of the Program, in collaboration with the Environmental Traceability Project. Moreover, the conceptual importance of openness, fairness, and equity in the TD process has been recognized through the methodological development.

f) Application of the theory and methodology after Core Project As an academic output, this Core Project will publish a mini book on OpenTS methodology and a self-checklist for applied projects, targeting early career researchers and practitioners, as well as international journal articles [A].

The project has two major interfaces of social outputs. The Research Group will make suggestions for national and international open science policies, while the Practice Group will contribute to community-based policymaking and social startups for the sustainable waterweed recycling in Lake Biwa and built heritage management in Oman.

At the RIHN, the OpenTS methodology developed by this Core Project will be inherited by upcoming research projects through the Post-Core Collaborative Research based at the RIHN Center, which will disseminate OpenTS as a new research paradigm for transformative social-issue-oriented research.

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○ Progress and Results in 2019

1)Project Progress during the FR Period to Date

Test applicability of the OpenTS methodology to ongoing and upcoming TD projects

In the second general meeting of this project held in August 2019, the following cases were reviewed to test the applicability of the OpenTS methodology: (1) Waterweed overgrowth and community-based solution at the Lake Biwa catchment, Shiga prefecture [a,b]; (2) Invasive species removal and open data solution in Kokonoe Town, Oita prefecture [a,h]; (3) Community-based water supply in the Ishikari region, Hokkaido [a]; (4) Urban planning in Takashima, Shiga; (4) Digital archive of memories of nuclear refugees in Marshall Islands; and (5) community-based restoration of built heritage in southern Oman [i]. An intensive discussion concluded that inclusiveness should be more focused than openness/closedness, and the conceptual framework of OpenTS was revised as described in the Executive Summary (b).

Test applicability of the OpenTS methodology to interdisciplinary projects

Regarding the applicability to interdisciplinary (i.e., non-TD collaborative) projects, semi-structured interviews with Takeshi Nakatsuka, PL of the Historical Climate Adaptation project, revealed an asymmetry in intellectual reciprocity between climatologists (i.e., natural scientists) and archaeologists and historians (i.e., humanities researchers). Based on this experience, dialogic questionnaire surveys to visualize the participants' understanding of key concepts such as culture, technology, and environment, and views for co-authorship in the JSPS KAKENHI PaleoAsia Project were designed and conducted with the participation of 60 project members at the biannual meeting in May 2019. The results indicated that (1) the understanding of concepts differs at the individual level and (2) cultural anthropologists prefer single authorship in comparison to archaeologists and natural scientists.

Develop a method to measure the psychological effects of graphic recording

To test the working hypothesis that graphic recording transforms the self-closed epistemic living spaces (shell mode) to intersecting those of others (reborder mode) [c], a socio-psychological experiment using questionnaire survey for participants of meetings with (and without) graphic recording was designed, based on the modified grounded theory approach. The pilot study was conducted at the focus group discussion on "waterweed and ICT" in the 9th Mother Lake Forum Biwakomi-kaigi in August 2019 to improve the survey items.

Develop a sustainable enterprise in addressing waterweed overgrowth in Lake Biwa

FY2019 was the final year of the Mitsui & Co. Environmental Fund titled "Developing a community to recycle waterweed resources in the catchment of Lake Biwa through a joint open science and social collaboration approach," a joint research conducted with the e-Rec Project. Practical activities were conducted in collaboration with "Suihouzan," a civic volunteer group addressing the waterweed issue in Otsu City, Shiga. Based on the results of four citizen participatory workshops in 2018, (1) "Biwa Point", a fintech-based point system with which coordinators, participants, and supporters acknowledge voluntary environmental activities in Lake Biwa to circulate good will and (2) a portal website to disseminate environmental information in the Lake Biwa area to strengthen the solidarity of highly-motivated people are being developed (Figure 1) [b]. To operate the point system and portal website as a sustainable enterprise, a non-profit organization was founded in January 2020. Nakahara conducted semi-structured interviews with local practitioners engaged in the production and use of waterweed compost.

Disseminate the output to the international community and follow-up

A conceptual paper on the OpenTS methodology was presented at the 10th Annual International Science of Team Science Conference [m] and published in a "Network and Networking" open issue of Current Opinion in Environmental Sustainability [a]. It is noted that this paper was co-authored with members of e-REC, FEAST, and Sanitation projects. A brief introduction was posted on https://i2insights.org/, an international portal website on TD research. The project team also coordinated the "Synergy of civic collaboration and open science" session at the Japan Open Science Summit 2019, and disseminated the methodology through opinion papers [e,g,j,k] and webinar series.

2)Most Notable Outputs to Date

Note: This list includes selected publications since January 2019 (after the last report submitted). Project members are underlined. The project leader is marked by asterisk.

Publications

a. Yasuhisa Kondo*, Akihiro Miyata, Ui Ikeuchi, Satoe Nakahara, Ken'ichiro Nakashima, Hideyuki Ōnishi, Takeshi Osawa, Kazuhiko Ota, Kenichi Sato, Ken Ushijima, Bianca Vienni Baptista, Terukazu Kumazawa, Kazuhiro Hayashi, Yasuhiro Murayama, Noboru Okuda, Hisae Nakanishi, 2019.10. Interlinking open science and community-based participatory research for socio-environmental issues. Current Opinion in Environmental Sustainability 39: 54-61. https://doi.org/10.1016/j.cosust.2019.07.001

b. Yasuhisa Kondo*, 2019.10. Waterweed in Lake Biwa: As a researcher accompanying local communities (琵琶湖の水草：研究者として地域に寄り添う). The Kyoto Shimbun (京都新聞連載「上賀茂発地球研フィールドノート」第 7 回), Evening, 9 October 2019, in Japanese.

c. Junko Shimizu, 2019.9. What is a Graphic Recorder? (グラレコって何だ!?) Psychiatric Mental Health Nursing (精神看護)　22(5): 447-465. (in Japanese)

d. Ui Ikeuchi, 2019.9. Reliability of open research data: Data selection methods and improving quality (研究データの信頼性：データの選択方法と質の向上). The Journal of Information Science and Technology Association (情報の科学と技術) 69(9): 435-437, in Japanese. https://doi.org/10.18919/jkg.69.9_435

e. Yasuhisa Kondo*, 2019.9. Ethical issues in open science and open governance (オープンサイエンスとオープンガバナンスの倫理的諸問題). Advances in Social Research (社会と調査) 23: 43-51, in Japanese.

f. Hideyuki Ōnishi, 2019.8. The historical site of the Ainu culture as a common resource: The case of narrative by residents in Shibetsu region　(共有資源としてのアイヌ文化史跡 : 北海道標津町における地域住民の語りを事例として). The Society for Ecological Anthropology Newsletter (生態人類学会ニュースレター) 25: 32-28. http://ecoanth.main.jp/nl/25.pdf (in Japanese)

g. Sayoko Shimoyama, 2019.7. The knowledge and case study to introduce data analysis into policy making process (行政プロセスにデータ分析を取り入れるために知っておきたい知識と事例). Evaluation Quarterly (評価クォータリー) 50: 18-39, in Japanese.

h. Takeshi Osawa, Satomi Kawano, 2019.5. Establishing a management plan for the invasive alien species Rudbeckia laciniata L. on multiple spatial scales: Large-scale map for strategy and small-scale map for specific action. Japanese Journal of Conservation Ecology 24(1): 125-134. https://doi.org/10.18960/hozen.24.1_125 (in Japanese with English abstract)

i. Kengo Hayashi, 2019.4. Inverted modernity: Conservation of traditional buildings in Oman (近代化のねじれ：オマーンの伝統的家屋の行方). Senken-soui-no-kai (先見創意の会), in Japanese. http://senkensoi.net/about/

j. Kazuhiro Hayashi, 2019.3. Progress of open science and transforming citizen science to co-creative research. Trends in the Sciences 23(11): 12-29, in Japanese with English abstract. https://doi.org/10.5363/tits.23.11_12

k. Yasuhisa Kondo*, Kazuhiro Hayashi, 2019.3. Open science to social issue solution: Foresight from a multi-stakeholder workshop. STI Horizon 5(1): 35-40, in Japanese with English abstract. https://doi.org//10.15108/stih.00167

Conference Presentations

i. Yasuhisa Kondo*, Hideyuki Ōnishi, Ui Ikeuchi, Ken'ichiro Nakashima, 2019.12. Results of an on-site survey of the research mind-set of the PaleoAsia project and its interdisciplinarity. Poster presented at the 8th Conference on Cultural History of PaleoAsia, held at the National Museum of Ethnology, Suita, on 14-15 December 2019, in Japanese with English abstract.

m. Yasuhisa Kondo*, Akihiro Miyata, Ui Ikeuchi, Satoe Nakahara, Ken'ichiro Nakashima, Hideyuki Onishi, Takeshi Osawa, Kazuhiko Ota, Kenichi Sato, Ken Ushijima, Bianca Vienni Baptista, Terukazu Kumazawa, Kazuhiro Hayashi, Yasuhiro Murayama, Noboru Okuda, Hisae Nakanishi, 2019.5. Interlinking open science to team-based action research for socio-environmental cases. Paper presented at the 10th Annual International Science of Team Science Conference (INSciTS), held at Lansing Center, Lansing, MI, USA, on 20-23 May 2019 https://www.inscits.org/index.php?option=com_content&view=article&id=227

Third Party Funding

n. Belmont Forum Collaborative Research Action (CRA) for Science-driven e-Infrastructures Innovation "Building New Tools for Data Sharing and Reuse through a Transnational Investigation of the Socioeconomic Impacts of Protected Areas (PARSEC)", in collaboration with the World Data System (WDS), France's Center for the Synthesis and Analysis of Biodiversity (CESAB), the American Geophysical Union (AGU), and other institutes in Brazil, Australia, and the United Kingdom. The Japan Team is coordinated by Yasuhiro Murayama (advisory member), January 2019 to December 2023.

o. Inter-University Research Institute Corporation (I-URIC) Feasibility Study "Transcending Structurization Gap in Humanities Big Data", coordinated by Asanobu Kitamoto (advisory member), December 2018 to March 2019.

○Project Members

◎ KONDO, Yasuhisa	(Research Institute for Humanity and Nature,Associate Professor,Coordination & Synthesis)
○ KUMAZAWA, Terukazu	(Research Institute for Humanity and Nature,Associate Professor,Meta-analysis (satoyama conservation in Kizugawa))
○ OSAWA, Tsuyoshi	(Graduate School of Urban Environmental Sciences, Tokyo Metropolitan University,Associate professor,Meta-analysis (open data in natural resorvoir))

○	KANO, Kei	(Faculty of Education, Shiga University/ Social Dialogue Skills Laboratory,Associate Professor/ Representative Director,Theory (science & policy communication))
○	NAKASHIMA, Ken'ichiro	(Graduate School of Education, Hiroshima University,Associate Professor,Theory (social psychology))
○	ONISHI, Hideyuki	(Faculty of Contemporary Social Studies, Doshisha Women's College of Liberal Arts,Associate professor,Meta-analysis (heritage conservation & tourism))
○	NAKAHARA,Satoe	(Research Institute for Humanity and Nature,Researcher,Meta-analysis (waterweed in Lake Biwa))
	ABE, Hiroshi	(Graduate School of Human and Environmental Studies, Kyoto University,Professor,Theory (philosophy))
	ASANO, Satoshi	(The Graduate School of Global Environmental Studies, Kyoto University,Assistant Professor,Meta-analysis (waterweed in Lake Biwa))
	IKEUCHI, Ui	(Faculty of Language and Literature, Bunkyo University,Assistant Professor,Policy communication (open science))
	OHTA Kazuhiko	(Research Institute for Humanity and Nature,Researcher,Theory (environmental ethics))
	OKUDA,Noboru	(Research Institute for Humanity and Nature,Associate Professor,Meta-analysis (waterweed in Lake Biwa))
	KAMATANI, Kaoru	(College of Gastronomy Management, Ritsumeikan University,Associate Professor,Meta-analysis (waterweed in Lake Biwa))
	KITAMOTO, Asanobu	(National Institute of Infirmatics,Associate Professor,Theory (information & society))
	KOSHIHARA,Mikio	(Institute of Industrial Science, the University of Tokyo,Professor,Meta-analysis (built heritage in Oman))
	SATO Ken`ichi	(Faculity of Life Science, Kyoto Sangyo University/ NPO Hatenathon co-creative lab,Professor President/ President,Visualization (Hatenathon))
	SHIMOYAMA Sayoko	(LinkDate.org,Representb ative director,Meta-analysis (civic tech))
	SEKINO, Tasuki	(International Research Center for Japanese Studies,Professor,Visualization (object-activity diagram))
	TAYASU, Ichiro	(Research Institute for Humanity and Nature,Professor,Meta-analysis (isotope knowledge for society))
	NAKATSUKA Takeshi	(Graduate School of Environmental Studies, Nagoya University,Professor,Meta-analysis (environmental change and society))
	HAYASHI Kengo	(Institute of Industrial Science, the University of Tokyo,Lecturer,Meta-analysis (built heritage in Oman))
	HAYASHI Koji	(Research Institute for Humanity and Nature,Researcher,Meta-analysis (small-scale water supply in Furano))
	HAYASHI, Kazuhiro	(National Institute of Science and Technology Policy,Senior Research Fellow,Policy communication (open science))
	FUKUNAGA Mayumi	(Graduate School of Frontier Sciences, the University of Tokyo,Associate professor,Theory (environmental ethics))
	FUJISAWA Eiichi	(Ohmi DI Corporation/ Code for Shiga/ Biwako,CEO/ President Representative,Meta-analysis (waterweed in Lake Biwa))
	MIYATA,Akihiro	(Graduate School of Arts and Sciences, the University of Tokyo,PhD student,Theory (philosophy))
	MURAYAMA, Yasuhiro	(Big Data Integration Research Center, National Institute of Information and Communications Technology,Research Executive Director,Policy communication (open science))
	YAMAUCHI,Taro	(Research Institute for Humanity and Nature,Professor,Meta-analysis (sanitation in Zambia))
	BENKARI, Naima	(College of Engineering, Sultan Qaboos University,Assistant Professor,Meta-analysis (built heritage in Oman))
	Vienni Baptista,Bianca	(The Transdisciplinarity Lab, ETH Zürich,Postdoctoral Researcher,Theory (transdisciplinarity))
	SHIMIZU, Junko	(Department of Information Design, Tama Art University,Lecturer,Theory (vilualization))
	TOYA, Akihiro	(Graduate School of Education, Hiroshima University,Doctoral student,Theory (social psychology))
	SHIMIZU, Haruka	(Graduate School of Education, Hiroshima University,JSPS Research Fellow,Theory (social psychology))
	UCHIYAMA, Yoshimasa	(Graduate School of Urban Environmental Sciences, Tokyo Metropolitan University,Doctoral student,Meta-analysis (open data in natural resorvoir))

○ Future Themes

Psychological Study of Graphic Recording

Graphic recording (also called graphic facilitation) is a technique of visualization, with which a speech or conversation are converted into manga-like graphics with text in real time. Nakashima, Kano, J. Shimizu, H. Shimizu, and Kondo will conduct a psychological study of its effects through a semi-structured interview and questionnaire survey among graphic recorders and

workshop participants. This study will contribute towards developing a method to measure the perceptual transformation of participants, including moderators, through visualization and dialogue of focused issues in a multi-actor workshop.

Outsider's Look: Vienni Interviews on RIHN Research Projects

Vienni's stay at the RIHN as a Research Fellow was postponed to June and July 2020. She will conduct a series of interview with PLs and in-house members of the Research Projects, including FEAST and Sanitation to identify the similarities and differences in TD study between the RIHN (Japan) and relevant institutes in Europe (e.g., ETH Zürich, Switzerland). She will apply a qualitative strategy and will use the concepts of Epistemic Living Spaces and interculturality as cross-cutting axes of the study.

Follow-up of the Waterweed Recycling Community in the Catchment of Lake Biwa

Nakahara continues a participant observation of the waterweed recycling in the catchment of Lake Biwa to document the process of community development after the e-Rec Project and the Mitsui & Co. Environment Fund end.

Ainu Indigenous Heritage and Students' Visit to Shibetsu, Hokkaido

Kondo continues a participant observation of Onishi's students interviewing aged Ainu indigenous people on their memories of traditional life to analyze how the interviewers and interviewees changed in their understanding of the issues through the interviews.

Community-based Built Heritage Management in Salalah, Oman

Benkari, Hayashi, Koshihara, and Kondo continue developing a TD project to restore the House of Judge in the old city center of Salalah, capital of the Dhofar Governorate, southern Oman. In this case study, the difference in consensus building and transcend in the context of Arabic society will be examined in comparison with case studies in Japan.

Building an International Community of Open Data for Environmental Sustainability

Murayama, Kondo, Osawa, and Ikeuchi are participating in an international consortium of open research data for environmental sustainability and biodiversity in the Belmont Forum Collaborative Research Action (CRA) for Science-driven e-Infrastructures Innovation (see Section 8). Osawa continues his activities for promoting open data for biodiversity as Biodiversity Open Data Ambassador of the Global Biodiversity Information Facility (GBIF; https://www.gbif.org/article/6dNF1d0tgcI4cmqeoS2sQ4/biodiversity-open-data-ambassadors).

OpenTS Webinar Series

A webinar (online seminar) is held once a month to share updates on the project with a wider audience. The main portion of the webinar is a short presentation of a guest speaker (usually one of the project members), presided over Nakahara. The archive is available online at https://www.youtube.com/channel/UCEALdBMv4MxuURE328Q4y3w/ (in Japanese), and will be used as primary drafts for publication. The lineup for the first half of FY2020 is Ushijima (April), T.B.D. (May), Kengo Hayashi (June), Vienni (July), Nakashima (August), and T.B.D (September).

Enrichment of Project Website and Social Media

In collaboration with Onishi's students, Suetsugu enriches the contents of the project's website (https://openteamsciece.jp/en/) and social media, such as Twitter and Facebook.

Closing and Follow-up

Project's major publications, including a mini book and self-checklist, are prepared to demonstrate the methodology and the case studies, as well as bequeathing the methodology to the RIHN Center and upcoming research projects through a Post-Core Collaborative Research.

●Achievements

○Papers

【Original Articles】

- Aiko Endo, Makoto Yamada, Yuji Miyashita, Ryo Sugimoto, Akira Ishii, Jun Nishijima, Masahiko Fujii, Takaaki Kato, Hideki Hamamoto, Michinori Kimura, Terukazu Kumazawa, Jiaguo 2020,02 Dynamics of Water–Energy–Food Nexus Methodology, Methods, and Tools. *Current Opinion in Environmental Science & Health* 13:46-60. DOI:10.1016/j.coesh.2019.10.004 (reviewed).
- Fukushima, S., K. Takemura, Y. Uchida, S. Asano & N. Okuda 2019,12 Trust within a community is a double-edged sword: trust has a positive individual-level effect and a negative contextual effect on subjective well-being. *Psycologia* 61(2):113-123. DOI:10.2117/psysoc.2019-B011 (reviewed).
- Shimizu, H., Abe, K., & Nakashima, K 2019,12 Effects of cognitive strategies on behavioral intentions towards strangers: A conceptual replication of Shimizu, Nakashima, and Morinaga (2016). *Japanese Journal of Experimental Social Psychology*. DOI:10.2130/jjesp.1904 (reviewed).
- Lee, S. & Nakashima, K. 2019,12 Do shift-and-persist strategies predict the mental health of low-socioeconomic status individuals?. *Japanese Journal of Experimental Social Psychology*. DOI:10.2130/jjesp.1811 (reviewed).
- Ishida, T., Y. Uehara, T. Iwata, A. P. Cid-Andres, S. Asano, T. Ikeya, K. Osaka, J. Ide, O. L. A. Privaldos, I. B. B. De Jesus, E. M. Peralta, E. M. C. Triño, C.-Y. Ko, A. Paytan, I. Tayasu & N. Okuda 2019,04 Identification of phosphorus sources in a watershed using a phosphate oxygen isoscape approach. *Environmental Science & Technology* 53(9):4707-4716. DOI:10.1021/acs.est.8b05837. (reviewed).
- Kei Kano, Mitsuru Kudo, Go Yoshizawa, Eri Mizumachi, Makiko Suga, Naonori Akiya, Kuniyoshi Ebina, Takayuki Goto, Masayuki Itoh, Ayami Joh, Haruhiko Maenami, Toshifumi Minamoto, Mikihiko Mori, Yoshitaka Morimura, TAMAKI Motoki, Akie Nakayama and Katsuya Takanashi 2019,06 How science, technology and innovation can be placed in broader visions — Public opinions from inclusive public engagement activities/Journal of Science Communication. *Journal of Science Communication*:1-19. DOI:https://doi.org/10.22323/2.18030202 (reviewed).

【Review Articles】

- Yasuhisa Kondo, Akihiro Miyata, Ui Ikeuchi, Satoe Nakahara, Ken'ichiro Nakashima, Hideyuki Ōnishi, Takeshi Osawa, Kazuhiko Ota, Kenichi Sato, Ken Ushijima, Bianca Vienni Baptista, Terukazu Kumazawa, Kazuhiro Hayashi, Yasuhiro Murayama, Noboru Okuda, Hisae Nakanishi 2019,08 Interlinking Open Science and Community-based Participatory Research for Socio-environmental Issues. *Current Opinion in Environmental Sustainability* 39:54-61. DOI:https://doi.org/10.1016/j.cosust.2019.07.001 (reviewed).

○Research Presentations

【Oral Presentation】

- Sumin Lee & Ken’ichiro Nakashima The parent-child similarity for the Shift-and-Persist strategy: An examination using the actor-partner interdependence model (APIM) with parent-child paired data. The 66th Annual Meeting of the Japanese Group Dynamics Association, 2019.10.19, Toyama City, Toyama.
- Takahashi, T., Y. Uchida, H. Ishibashi & N. Okuda How does forest ownership influence forest-related subjective well-being? A case study in the upper Yasu River watershed, Shiga Prefecture, Japan. SEEPS2019, 2019.09.28-2019.09.29, Fukushima City.
- Takahashi, T., Y. Uchida, H. Ishibashi & N. Okuda How does forest ownership influence forest-related subjective well-being? A case study in the upper Yasu River watershed, Shiga Prefecture, Japan. SEEPS2019, 2019.09.28-2019.09.29, Fukushima City.
- Satoe Nakahara A study of the perceptions of nuclear disaster evacuees from Okuma in Fukushima. 18th International Union of Anthropological and Ethnological Sciences (IUAES) World Congress, 2019.08.27-2019.08.31, Poznan, Poland. Panel Organizer, Panel Title: Technology + Pollution + Damage + Uncertainty = Ethnography

・Nakano, S., K.-H. Chang, H. Doi, Y. Hodoki, N. Ishii, Z. Kawabata, Y. Kobayashi, P. M. Manage, Y. Nishibe, K. Ohbayashi & N. Okuda Planktonic processes and food web structure/dynamics in shallow ponds, with special reference to cyanobacterial bloom. Society of Wetland Scientists-Asia Chapter and Korean Wetlands Society Joint Meeting, 2019.08.19-2019.08.22, Suncheon City, Korea.

・Okuda, N Watershed governance: a case in the Lake Biwa Watershed. RIHN International Symposium 2019: Fair use of multiple resources in cross-scale context. 2019.07.11-2019.07.12, Kyoto City, Kyoto.

・Okuda, N., Z. Karube, Y. Sakai, T. Takeyama, I. Tayasu, C. Yoshimizu & T. Nagata Biodiversity increases integrated trophic position of macroinvertebrate communities in coastal food webs: Testing the vertical diversity hypothesis. JpGU-AGU Joint Meeting 2019, 2019.05.30, Chiba City, Chiba.

・Ikeya, T., T. Ishida, Y. Uehara, S. Asano, I. Tayasu, N. Okuda, M. Ushio, S. Fujinaga, C.-Y. Ko, E. M. Peralta, N. F. Ishikawa & T. Iwata The analysis of the community composition of riverine bacteria and microalgae in relation to nutrient status and diversity: the case in irrigation season in the Yasu River, Japan. JpGU-AGU Joint Meeting 2019, 2019.05.29, Chiba City, Chiba.

・Onodera, S., M. Saito, G. Jin, A. F. Rusydi, Y. Tomozawa, K. Wang, S. Ban & N. Okuda Phosphorus discharge via groundwater into the lake, based on lacustrine groundwater discharge (LGD) and alluvial plain sediment. JpGU-AGU Joint Meeting 2019, 2019.05.29, Chiba City, Chiba.

・Yasuhisa Kondo Ethical issues in open science. 日本地球惑星科学連合 2019 年大会, 2019.05.26-2019.05.30, Chiba City, Chiba.

・Masahito Nose, Yasuhiro Murayama Recent activity of data publication and data citation in the international community of geomagnetism. Japan Geoscience Union 2019 Meeting, 2019.05.26, Chiba City, Chiba.

・Yasuhisa Kondo, Akihiro Miyata, Ui Ikeuchi, Satoe Nakahara, Ken'ichiro Nakashima, Hideyuki Onishi, Takeshi Osawa, Kazuhiko Ota, Kenichi Sato, Ken Ushijima, Bianca Vienni Baptista, Terukazu Kumazawa, Kazuhiro Hayashi, Yasuhiro Murayama, Noboru Okuda, Hisae Nakanishi Interlinking open science to team-based action research for socio-environmental cases. INSciTS 2019, 2019.05.20-2019.05.23, Michigan State, USA.

・Yasuhisa Kondo, Yoko Iwamoto Network analysis of an archaeological research project: A graphical monitoring of the developing interdisciplinary co-authorship of the PaleoAsia project. 47th annual conference of Computer Application and Quantitative Methods in Archaeology, 2019.04.23-2019.04.27, Krakow, Poland.

【Poster Presentation】

・Abe, N., Koike, M., Loughnan, S., & Nakashima, K The Process of Alexithymia to Over-adaptation in Japan and the United Kingdom. The 21th Annual Meeting of the Society for Personality and Social Psychology, 2020.02.29, Louisiana, United States of America.

・Teragauchi, M., Imakawa, S., & Nakashima, K Relationship between Characteristics of Recreation Behavior and Self-affirmation. The 21th Annual Meeting of the Society for Personality and Social Psychology, 2020.02.29, Louisiana, United States of America.

・Kane, S. & Nakashima, K Influence of Motivation to Conform: Using Conversation Situation Experiments. The 21th Annual Meeting of the Society for Personality and Social Psychology, 2020.02.29, Louisiana, United States of America.

・Lee, S. & Nakashima, K An Examination of the Effectiveness of the Shift-and-Persist Strategy Psychoeducation Intervention Program to Nurture the Power Not Lost to Poverty. The 21th Annual Meeting of the Society for Personality and Social Psychology, 2020.02.29, Louisiana, United States of America.

・Yazawa, A., Furukawa, Y., & Nakashima, K The Effect of Critical Thinking Ability and Orientation on Empathic Accuracy. The 21th Annual Meeting of the Society for Personality and Social Psychology, 2020.02.29, Louisiana, United States of America.

・Toya, A. & Nakashima, K Examination of the death anxiety buffer that Australian people relatively prefer against mortality salience: Focusing on the moderating effect of attachment style. The 21th Annual Meeting of the Society for Personality and Social Psychology, 2020.02.29, Louisiana, United States of America.

・Hirabe, A., Kazuaki, A., & Nakashima, K Effect of one's family relationships on emotion regulation strategies focusing on gender differences. The 21th Annual Meeting of the Society for Personality and Social Psychology, 2020.02.29, Louisiana, United States of America.

・Shimizu, H., Fukui, K., & Nakashima, K How Do Cognitive Strategies Affect Changes in Considerate Behavior of University Freshmen? An Examination Using Latent Growth Model. The 21th annual convention of Society for Personality and Social Psychology, 2020.02.29, Louisiana, United States of America.

・Ikeuchi, Ui; Abe, Manabu; Hayashi, Kazuhiro; Nomura, Norimasa; Okayama, Nobuya; Owashi, Mizuho; Sumimoto, Kenichi; Takahashi, Nanako; Toda, Yuko; Nosé, Masahito Journal Research Data Policy Across Disciplines: Comparison Between 2014 and 2019. Research Data Alliance (RDA) 14th Plenary, 2019.10.23-2019.10.24, Helsinki, Finlanf.

・Saito, M., S. Onodera, Y. Tomozawa, K. Wang, S. Ban & N. Okuda Evaluation for temporal variation in groundwater inflow to the lagoons connected to Lake Biwa by radon (222Rn) tracer analysis. JpGU-AGU Joint Meeting 2019, 2019.05.30, Chiba City, Chiba.

・Wang, K., S. Onodera, M. Saito, N. Okuda & T. Okubo Estimation of groundwater recharge and phosphorus transport under different precipitation conditions in a suburban catchment, using SWAT model. JpGU-AGU Joint Meeting 2019, 2019.05.30, Chiba City, Chiba.

・Tomozawa, Y., K. Wang, M. Saito, S. Ban, N. Okuda & S. Onodera Altitude effect of water stable isotopic ratio of ravine water and its contribution to groundwater in alluvial plains: Comparison in east and west side catchments of Lake Biwa. JpGU-AGU Joint Meeting 2019, 2019.05.30, Chiba City, Chiba.

【Invited Lecture / Honorary Lecture / Panelist】

・Yasuhiro Murayama (Invited Panelist) Open Science and Scientists' well-being: cases in Japan and of the global. American Geophysical Union Fall Meeting 2019, 2019.12.09, San Francisco, USA.

・Benkari, N The local community involvement in the adaptive reuse of vernacular settlements in Oman. ICOMOS - CIAV & ISCEAH Joint Annual Meeting & International Conference-, 2019.09.06-2019.09.08, Pingyao, China.

・VIENNI BAPTISTA, Bianca La investigación interdisciplinaria y su evaluación. Maestría en Política y Gestión de la Ciencia y la Tecnología, 2019.07.29, Universidad de Buenos Aires, Argentina.

・Benkari, N (Invited speaker) On the formation and influences of the Islamic architecture: The case of Oman in Al Ya'ariba period (1624-1742). "Imperial Architecture in the Ancient Mediterranean and Middle East" - Centre of Excellence in Ancient Near Eastern Empires –, 2019.04.29-2019.04.30, Helsinki, Finland.

Stage: Pre-Research

Project Name: An Interdisciplinary Study toward Clean Air, Public Health and Sustainable Agriculture: The Case of Crop Residue Burning in North India

Project Leader: HAYASHIDA Sachiko

URL: https://aakash-rihn.org/

○ Research Subject and Objectives

Problem

"Stubble burning in North India and its effects on air pollution"

Large-scale burning of rice straw (mostly stubble; "stubble burning" hereafter) from October to November in the Indian states of Punjab and Haryana is attracting worldwide attention as a contributor to air pollution in the city of Delhi1 as well as the wider region of the Indo-Gangetic Plain (IGP)2,3,4, which threatens residents' health1,5-7. Furthermore, black carbon emitted from the stubble burning is possibly being deposited in the snow and ice of the Himalayas, promoting melting snow and ice8-13, which would affect climate change on a non-negligible scale.

Background

The Indian Punjab region, situated in a semi-arid zone with insufficient precipitation, was originally not suitable for intensive cultivation14. Traditional agriculture in the Punjab region originally consisted of mixed farming: a combination of cultivating wheat and raising livestock (cattle). Development of irrigation canals changed the region into a granary under the British government in India. Since the 1960s, after the so-called "Green Revolution" developed, high grain production came to be highlighted as the key to support India's explosive population growth14. Currently, cropping systems dominantly focus on growing two crops a year: wheat and rice15,16. However, excess cultivation in the region has caused serious problems such as a decline in groundwater reserves16-18, air pollution due to the burning of rice straw1,2-7, and deterioration of the soil's fertility16. Recently, the stubble burning has been linked with the worsening air quality in the densely populated National Capital Region of Delhi (Delhi-NCR)19. This issue is an example of how the changing agricultural system can threaten our public health and human well-being by polluting the air which is essentially important for our life.

Historically, most of the rice seedlings were transplanted before the onset of monsoon. The Punjab Preservation of Subsoil Water Act and the Haryana Preservation of Subsoil Water Act were promulgated in March 2009 and transplanting before June 20 was prohibited. These groundwater conservation policies exacerbated the air pollution in Delhi by concentrating agricultural burning in the late fall when weather condition becomes more stagnated in Delhi. Farmers have to manage rice straw in the narrow window period between rice-harvest and wheat-seeding, which can be a factor to increase stubble burning20.

Objectives

The final goal of this study is to reduce stubble burning in North India. We pursue a pathway of social transformation toward clean air, public health and sustainable agriculture to achieve the goal.

Project Structure and Methodology of Research

To tackle this problem, three working groups are organized (Figure 1 in section 4). All working groups will examine various measures to change farmers behavior, and community, stakeholders and government as well.

The members of Working Group 1 cover agro-economics, soil science, human geography, and cultural anthropology. Their task is to examine incentives promoting farmers' behavioral changes and various options of alternative straw uses. Both technical and socioeconomic advantages/disadvantages are investigated for technologies such as a "Happy Seeder" or various types of balers through experimental work with local universities, and alternative options of straw use such as fodder for livestock or composting are examined considering the cultural background. Our research achievements will help to create new business models that fit to sustainable agriculture in this region.

Working Group 2 consists of members of atmospheric science and remote sensing, and they will challenge to quantify the effects of stubble burning in Punjab on air quality in Delhi utilizing observation data and model simulations. This work is essentially important because the arguments on the effects of stubble burning on Delhi's air pollution still lacks scientific foundation, which is causing a confusion among communities. Especially, lack of the monitoring data for pollutants in the Punjab and neighboring states is a bottleneck in this problem, and therefore we'll set up a few hundred compact instruments to monitor ambient PM2.5 and determine pollutants emissions from stubble burning by using model simulations coupled with satellite and in-situ measurements. It is possible to separate the effects of stubble burning from other various pollution sources near Delhi by a combined use of atmospheric models and satellite information on burning places. The obtained results will be visualized on smartphones and shared with local people via internet to promote people's awareness.

Working Group 3 consists of members of epidemiology and public health. The WG3 members will conduct health education class “Air and Health” in Punjab villages for the residents to increase awareness of their own health. We’ll also collect individual health data by a smartphone applications and members of medical doctors will consult and examine children and women to test their pulmonary function, using a peak flow meter, for example. We will follow up how the residents’ perception and awareness of air pollution and their own health will change after the health surveys and the health education classes. The advantage of our research plan is that we can take individual data of PM2.5 exposure called “PM2.5 diary”, which can be used to evaluate the total exposure to PM2.5 of the residents.

Schedule

In the first year of the project, we will conduct a wide-scale questionnaire survey across the entire state of Punjab based on the list of voters. The questionnaire includes questions on basic livelihood information, agricultural practices, stubble burning (and reasons for the same), incentives required to stop stubble burning, and some more questions to clarify the cultural and economic background and health conditions of the farmers in Punjab. In particular, the simultaneous survey on health, including respiratory diseases and medical treatment, is important. Based on the survey result, we will select some villages/areas to conduct more intensive surveys. The results of these surveys will be utilized in the research subjects in later years.

Expected Results

1) Evaluation of possible options and incentives for farmers to reduce the burning of rice straw.

2) Quantification of the effect of stubble burning in Punjab and Haryana on air quality in Delhi-NCR. Encourage public awareness on air pollution through scientific basis.

3) Clarification of the overall risk of PM2.5 and possible factors affecting health risk.

Contribution to the program

This study, pursuing a pathway of social modification toward sustainable societie, meets the goal of the Program 1. The study also contributes to the aim of the Program 1 by conducting transdisciplinary research in cooperation with various stakeholders.

○ Progress and Results in 2019

Progress during FS period (April to July, 2019) & PR period (August 2019 to date)

1. Each working group had meetings on literature reviewpromoting mutual understanding among project members from different academic disciplines. As one of the achievements of such activities, Haruhisa Asada **published a book chapter**on the topic of stubble burning and air pollution (in Japanese).

2. Three task teams were organized to cope with many different subjects flexibly. Each team had skype/e-mail meetings and proceeded with work as below.

ü **Questionnaire Team**: Create questionnaire items, Prepared for the survey.

⇨ Questionnaire items were completed. Questionnaire survey is ready to be held in all Punjab districts in spring 2020.

ü **PM2.5 Team**: Install CUPIs (Compact and Useful PM2.5 Instruments), and Manage monitoring data obtained by CUPIs

⇨Installed about ten CUPIs in Delhi city and the states of Punjab and Haryana. In Delhi, data have been accumulated for the past three years, and were analyzed systematically (paper in preparation). Another several ten CUPIs were fabricated and prepared for installation in the fields. All data monitored in Delhi-NCR and in the state of Punjab by the center or local government were collected and visualized, and shared among members on the google drive.

*(Note that **CUPI was well validated by comparison with a standard instrument BAM**21, which shows a decisive superiority to other compact sensors.)*

ü **Indoor Pollution Team**: Planning of investigation of Indoor pollution.

3. Survey of the stubble burning in Punjab in October to November 2019

This year, stubble burning events in the states of Punjab and Haryana were more severe than the last year. From the articles of local newspaper in Punjab, *Tribune,*we learned air pollution worsened badlyin rural villages in Punjab as in urban cities. It was reported that many farmers were booked for burning stubbles and some of them were arrested, and they protested to the local government furiously. We can easily perceive serious conflict between farmers and local government. Subsidies from Indian government for promoting introduction of new agricultural machines (Happy Seeder and others) did not work efficiently. On Nov. 7, the Supreme Court decided to pay bounty to the farmers who stopped stubble burning. Local farmers seem to accept this decision positively.

In late October and early November 2019, six project members explored some villages in the Punjab state to investigate farmers’ behavior on stubble burning. At Latala Village, Ludhiana, farmers complained that cultivation with a Happy Seeder decreased the yield of wheat, as roots of rice hinder the wheat buds from coming up. To avoid stubble burning without using a Happy Seeder, farmers spend time and effort; farmers use a cutter first, then a mulcher followed by a rotavator to seed the fields with wheat. At another village (Jaladiwal), farmers also complained that Happy Seeders reduced the wheat yield. They were very

frustrated with the government because they impose the policies on farmers without considering the effects on the yield. In particular, they are protesting the groundwater conservation act by Punjab state government because they don't have enough time to manage rice straw before seeding wheat. On the other hand, some other farmers were claiming that a Happy Seeder does not reduce the yield when used properly.

As described above, there are opinions on the pros and cons of the Happy Seeder. We are planning to experiment on non-tillage cultivation of wheat using a Happy Seeder in the field at Lovely Professional University (LPU) and Punjab Agricultural University (PAU). Four members (K. Inubushi, S. Sudo, E. Nishihara, and S. Hayashida) are going to visit LPU and PAU to discuss a specific experiment plan on February 19-21.

4. Promotion of research partnership agreements

On Nov. 1stand 2nd, 2019, "Indo- Japan ColloquiumonAir Pollution in Indo-Gangetic Plains and Human Health: Future Directions" was heldby the research teams of Department of Community Medicine and School of Public Health (PGIMER), Chandigarh in collaboration with Department of Environment Studies, Panjab University, Chandigarh. Four Japanese members (K. Ueda, T. Umemura, Y. Matsumi, and T. Nakayama) attended the colloquium and agreed to collaborate under the Aakash project. A national newspaper, Times of India (Chandigarh) reported our collaborative work (**Figure 2** in section 9).

5. Progress on the work on separation of the effect of stubble burning on Delhi air pollution from other sources

Transport pathways and the mean transit time from the fire hotspots were evaluated using the FLEXPART （FLEXible PARTicle dispersion model）. The results revealed **the air pollution in Delhi was definitely influenced by the stubble burning in Punjab region** (including the state of Punjab and part of the state of Haryana, and Punjab in Pakistan) (*Takigawa et al., SOLA, 2020. accepted in April, 2020*). This result shows our potential to separate the effects of stubble burning on air pollution from the effects from other sources.

Future Prospect

In November 2019, S. Hayashida and Y. Matsumi met **Mr. Suresh Kumar, the Chief Principal Secretary to Chief Minister, Punjab**at his official residencein Chandigarh. He suggested us to organize an India-Japan joint conference as early as possible.

According to his suggestion, we prepared an India-Japan conference on March 28, 2020 in Delhi, which was unfortunately cancelled due to COVID-19 outbreak.

Most Notable Output to Date

1) Haruhisa Asada has published a book on stubble burning and air pollution based on his literature survey under the project. 1: Haruhisa Asada（2020）「Yoyu suru shizen to shakai: Indo no taikiosen wo jirei ni (溶融する自然と社会—インドの大気汚染を事例に)」. (In Japanese).

2) Yutaka Matsumi and his collaborators installed considerable numbers of CUPI into the areas and those sensors revealed significant air pollution in those areas. (Othman, M., M. T. Latif, Y. Matsumi 2019, The exposure of children to PM2.5 and dust in indoor and outdoor school classrooms in Kuala Lumpur City Centre, Ecotoxicology and Environmental Safety, 170, 2019, 739-749, https://doi.org/10.1016/j.ecoenv.2018.12.042.)

3) Mizuo Kajino, Sachiko Hayashida have been challenging to apply satellite data to ozone pollution detection. Their innovative paper was published in Scientific Report. (Kajino, M., Hayashida, S., Sekiyama, T.T. et al. Detectability assessment of a satellite sensor for lower tropospheric ozone responses to its precursors emission changes in East Asian summer. Sci Rep 9, 19629 (2019) doi:10.1038/s41598-019-55759-7)

4) The activity of WG3 was reported in the newspaper in Punjab.

5) Members of working 2 revealed the pathway of air pollutants from fires in Punjab toward Delhi. (Takigawa et al., Can Delhi's pollution be affected by crop fires in the Punjab region?, SOLA, 2020, Vol. 16, 77-80, doi: 10.2151/sola.2020-015:)

○Project Members

◎	HAYASHIDA Sachiko	(The Research Institute for Humanity and Nature,Professor,All)
○	SUDO Shigeto	(National Agriculture and Food Research Organization Institute for Agro- Environmental Sciences,Principal Researcher,Study of soil degradation and non-tillage cultivation)
	SATO Takahiro	(Hirosaki University Faculty of Agriculture and Life Science,Associate Professor)
	INUBUSHI Kazuyuki	(Chiba University Graduate School of Horticulture,Professor,Study of soil degradation and non-tillage cultivation)
	MASUKI Yui	(Daito Bunka University Institute of Contemporary Asian Studies, Department of International Relations,Visiting Researcher,Survey of Villages' livelihood)
	AKAHOSHI Kaoru	(Institute for Global Environmental Strategies Sustainability Governance Centre,Reseacher)
	BASALIRWA Daniel	(Tottori University The GraduateSchool of Agricultural Sciences,Graduate Student)

	NISHIHARA Eiji	(Tottori University Faculty of Agriculture,Professor)
	TOSHIKAZU Seto	(The University of Tokyo Center for Spatial Information Science,Specially Appointed Associate Professor,Survey of behavioral modification of farmers)
○	ASADA Haruhisa	(Nara Women's University Faculty Division of Humanities and Social Sciences,Associate Professor,Survey of cultural background of farmers)
	NISHIMURA Yuichiro	(Nara Women's University Faculty Division of Humanities and Social Sciences,Associate Professor,Survey of behavioral modification of farmers)
	TAKADA Masashi	(Nara Women's University Faculty Division of Humanities and Social Sciences,Professor,Survey of behavioral modification of farmers)
○	PATRA Prabir	(Japan Agency for Marine-Earth Science and Technology Research and Development Center for Global Change,Senior Scientist,Analysis of controlling factors for pollution/haze over Delhi and surrounding states using Atmospheric Chemistry Transport Models)
	TAKIGAWA Masayuki	(Japan Agency for Marine-Earth Science and Technology Institute of Arctic Climate and Environment Research,Senior Research Scientist,Simulation of aerosols using a regional scale model)
	KAJINO Mizuo	(Meteorological Research Institute Department of Atmosphere, Ocean, and Earth System Modeling Research Third Laboratory,Senior Researcher,Simulation of aerosols using a regional scale model)
	YAMAJI Kazuyo	(Kobe University Graduate School of Maritime Sciences,Associate Professor,Development of emission inventory of straw burning with high resolution)
	ARBAIN Ardhi Adhary	(The University of Tokyo Atmosphere and Ocean Research Institute,Graduate Student)
	IMASU Ryouichi	(The University of Tokyo Atmosphere and Ocean Research Institute,Professor,Simulation of aerosols using a regional scale model (WARF-Chem))
	MISRA Prakhar	(The Research Institute for Humanity and Nature,Appointed Researcher,Land-cover Classification: Cropland Identification)
	WATARU Takeuchi	(The University of Tokyo Institute of Industrial Science,Professor,Land-cover Classification: Cropland Identification)
	KHATRI Pradeep	(Tohoku University Center for Atmospheric and Oceanic Studies,Lecturer,Derivation of PM2.5 from satellite observation)
	KUJI Makoto	(Nara Women's University Faculty Division of Natural Sciences,Associate Professor,Derivation of PM2.5 from satellite observation)
○	MURAMATSU Kanako	(Nara Women's University Faculty Division of Natural Sciences,Professor,Land-cover Classification:Cropland Identification)
	NGUYEN Thuy Huong	(Nara Women's University Faculty of Science and Graduate School of Science,Graduate Student,Study of PM2.5 transport)
○	UEDA Kayo	(Kyoto University Graduate School of Global Environmental Studies,Associate Professor,Epidemiological study and Public health education)
○	UMEMURA Tomohiro	(Aichi Medical University Department of Health and Psychosocial Medicine,Lecturer,Epidemiological study and Public health education)
	ONISHI Kazunari	(St. Luke's International University Graduate School of Public Health,Associate Professor,Epidemiological study and Public Health)
	NAKAYAMA Tomoki	(Nagasaki University Graduate School of Fisheries and Environmental Sciences,Associate Professor,PM2.5 monitoring by compact instruments (CUPI and others))
	TERASAKI Hiroaki	(University of Fukui Architecture and Civil Engineering,Assistant Professor,Epidemiological study and Public Health: Development of health survey tools)
○	MATSUMI Yutaka	(Nagoya University Institute for Space-Earth Environmental Research,Reseacher/Emeritus Professor,PM2.5 monitoring by compact instruments (CUPI and others))
	ARAKI Hikaru	(The Research Institute for Humanity and Nature)
	MATSUURA Eri	(Ibaraki University Center for International Field Agriculture Research & Education,Assistant Professor,Experimental study on a new farming system to reduce stubble burning)
	SAMADDAR Arindam	(International Rice Research Institute Social Science Division,Lead Specialist,Socioeconomical analysis of options of straw managements)
	VEETTIL Chellattan Prakashan	(International Rice Research Institute Agri-Food Policy Platform,Lead Specialist,Socioeconomical analysis of options of straw managements)
	SHARMA Sheetal	(International Rice Research Institute Sustainable Impact Platform,Lead Specialist,Technical Support: Mitication options. Study on benefit to Soil Health)
	VATTA Kamal	(Punjab Agricultural University Department of Economics and Sociology,Professor,Socioeconomical analysis of options of straw managements)
	SIDDIQUE Anaytullah	(Lovely Professional University School of Agriculture,Assistant Professor,Practice of no-tillage cultivation)
	MEHTA Mohan Chandra	(Lovely Professional University School of Agriculture,Assistant Professor,Practice of no-tillage cultivation)

MISAL Baban Nitin	(Lovely Professional University School of Agriculture,Assistant Professor,Practice of no-tillage cultivation)
KUMAR Raj	(Lovely Professional University School of Agriculture,Professor,Practice of no-tillage cultivation)
SINGH Narendra	(Aryabhatta Research Institute of observational sciences Atmospheric Science Division,Deputy Project Manager, ST Radar,Monitoring PM2.5 and other air pollutants)
SINHA Baerbel	(Indian Institutes of Science Education and Research Mohali,Assistant Professor,Monitoring PM2.5 and other air pollutants in Chandigarh)
PANDEY Nandan Hemwati	(Gurukul Kangri University Department of Physics,Assistant Professor,Monitoring PM2.5 and other air pollutants)
DIMRI P. A.	(Jawaharlal Nehru University School of Environmental Sciences,Professor,Monitoring PM2.5 and other air pollutants in Delhi)
KAWSER Ahmed	(University of Dhaka Department of Oceanography, Earth & Environmental Sciences Faculty,Professor)
SINGH P. Ramesh	(Schmid College of Science and Technology, Chapman University Earth System Science and Remote Sensing,Professor,Data analysis of PM2.5 over Indian IGP)
DHAKA Kumar Surendra	(Rajdhani College, University of Delhi Department of Physics and Electronics,Associate Professor,Monitoring PM2.5 and other air pollutants in Delhi)
PANWAR Vivek	(Rajdhani College, University of Delhi Department of Physics,Assistant Professor,Monitoring PM2.5 and other air pollutants in Delhi)
RAM Kirpa	(Banaras Hindu University Institute of Environmental and Sustainable Development,Assistant Professor,Monitoring PM2.5 and other air pollutants)
THONGBOONCHOO Narisara	(King Mongkut's Institute of Technology Ladkrabang Dept of Chemical Engineering,Faculty of Engineering)
KHAIWAL Ravindra	(Postgraduate Institute of Medical Education and Research Department of Community Medicine, School of Public Health,Additional Professor,Respiratory health survey and public health education)
JINDAL K. Surinder	(Postgraduate Institute of Medical Education and Research Department of Pulmonary Medicine,Emeritus-Professor,Epidemiological study and public health education)
SHARMA Kumar Arun	(University College of Medical Sciences (UCMS), University of Delhi Dept. Of Community Medicine,Professor,Assessment of PM2.5 Risk on Health)

○ Future Themes

The 2019-2020 coronavirus pandemic will affect on our project progress.

In November 2019, S. Hayashida and Y. Matsumi met Mr. Suresh Kumar, the Chief Principal Secretary to Chief Minister, Punjab at his official residencein Chandigarh. He encouraged our project plan and suggested us to organize a conference to promote mutual understanding. According to his suggestion, we planned an India-Japan conference on March 28, 2020 in Delhi with Indian stakeholders of this issue. This conference was expected to become a good opportunity starting “transdisciplinary” study. Unfortunately, however, the conference was cancelled because India suspended most visas to halt coronavirus spread. In 2020, we may be faced with more difficulty to visit each other, and consequently some of our research plan may be delayed.

On the other hand, the coronavirus outbreak also brought a different aspect. On 24 March, 2020, Indian Prime Minister Narendra Modi announced a 21-day nationwide lockdown to stop the spread of the coronavirus, starting 00 IST on March 25.As of March 31, all Indian people are ordered to stay at their homes. Because of the lockdown, trains, automobiles and factories came to a halt, and garbage burning on roadsides ceased. As the result, the air pollution in some of the most polluted cities, including Delhi, was considerably improved by the reduction of anthropogenic emissions.Under this unexpected situation, atmosphere group (WG2) started a new mission “Detection of Emission change due to Lockdown: Human Impact Study (DELHIS).”We arranged on-line meetings several times and assigned necessary tasks to the members. For the present, the air pollutants data over Delhi, both in-situ and satellite, are being collected and analyzed. We will compare those data with the simulation results by the models with different emission scenarios in order to quantify the anthropogenic emissions in near future.

●Achievements

○Research Presentations

【Oral Presentation】

・Hayashida, S. Keynote Speech ; Aakash Project : Challenge toward Clean Air, Public Health and Sustainable Agriculture. the 4th World Association of Soil and Water Conservation (WASWAC) Conference, 2019.11.05-2019.11.09, Delhi, India.

【Poster Presentation】

・Hayashida, S., Y. Matsumi, K. Yamaji, M. Kajino, P. K. Patra, and Aakash project members New project “Aakash” aiming at reduction of crop-residue burning in North India: interdisciplinary approach toward clean air, public health and sustainable agriculture. 4th Atmospheric Composition and the Asian Monsoon(ACAM) Workshop, 2019.06.26-2019.06.28, Malaysia.

【Invited Lecture / Honorary Lecture / Panelist】

・Nakayama, T. and Iq Mead Low-cost sensors : Principle, assessment, advancement, and applications. IGAC-MANGO (International Global Atmospheric Chemistry - Monsoon Asia and Oceania Networking Group) Meeting, Science Workshop, and Training Course, 2019.11.28-2019.11.30, Nainital, India.

Incubation Studies

An Ecology of Care Approach to Onchocerciasis-Associated Epilepsy

NISHI Makoto (Kyoto University)

In this study, we propose "ecology of care" as a framework for research and practice to solve health and welfare problems that are closely related to various ecological and social environments on the earth. The ecology of care comprehensively describes knowledge, technology, sociality, and values as factors that determine the quality of life of people living in an ecology-social environment. It is also a framework for interdisciplinary research to understand how they relate to each other. The aim of this research is to transform into a society that can flexibly deal with the suffering of diseases and disorders that occur in an ever-changing ecological-social environment and provide a protection framework to people. At the stage of IS research, epilepsy in Africa was taken up as a concrete example of health and welfare issues closely related to ecological-social environment. Epilepsy affects approximately 1% of the world's population and is one of the most serious diseases that affects human quality of life. In the future, we would like to expand the scope to cranial nerve diseases such as dementia, establish a research base in Asia, and build a research framework to elucidate "ecology of care" as a global issue.

Promoting ecosystem health in the context of a healthy society

OKABE Kimiko (Forestry and Forest Products Research Institute)

Prevention was most effective to reduce the infectious disease risk based on the fact that control measures after spread of zoonotic infection rarely worked. For mental illness, although therapeutic effects from natural ecosystems were not significant, urban green spaces reduced risks of mental stress, air pollution, noise and urban heat. Thus, relevant ecosystem management is expected to prevent human health risks. It may also be possible that prevention-oriented ecosystem management can solve tradeoffs between a generation who took benefits from development and the other who would suffer later. However, it is necessary to consider trade-offs such as between urban residents taking benefits from development and countryside residents paying cost for such management, and between stakeholders working with different management purposes. It is essential to show the path to solve such problems by fair uses of natural resources and options of ecosystem management, participation and institutions.

Adaptive governance of multi-resource based on land-sea linkage of water cycle: application to coral reef island system

SHINJO Ryuichi (Ryukyu University)

People in tropical-subtropical small islands have lived with limited resources of the environment. On small islands, the scale of water cycle connecting land and sea is small, while the residence time of groundwater is as short as several years to several tens of years. The recent increase in island population, tourists, and changes in land-use and industrial structure have modified the state of the water resources and environment, thereby affected coastal ecosystems (namely coral reefs) through the water cycle. Islands are also vulnerable to global climate changes. For sustainable development on islands, water resource management is necessary based on an understanding of the water cycle connecting land and sea. In this project, we addressed the following: 1) conduct an action research with various stakeholders, 2) analyze (visualize) water circulation systems of islands using various tracers, 3) study about culture and norms on water resource use and management, and 4) investigate adaptive governance for multi-resource based on land-sea linkage of water cycle in coral reef island system.

Living in the bioregion: decentralizing the primary industries

TAMURA Norie (RIHN)

Rural areas in Japan and other countries in East Asia are suffering from depopulation and aging, as well as low food self-sufficiency. A major transition in the agricultural sector is inevitable, but what direction it will take is unclear. This presents a key opportunity for reconsidering rural development models.

Industrialization of agriculture, forestry, and fishery promotes the commodification of natural resources and disconnects the relationship between humanity and nature. To survive in the globalized market, the primary sectors are pushed to adapt to competition and therefore large-scale operations, efficiency and mechanization have become core beliefs surrounding these sectors. This kind of "modernization" of agriculture has triggered multiple socio-environmental crises. There is a need to reorganize agriculture for reconciling human-nature relationships, and to envision alternative rural development pathways to reinhabit people within the surrounding ecosystems.

This research aims to investigate how to foster a sustainable transition in the primary sector and rural society, in terms of socio-technical components, regional economies, and the role of human agency. By using the concept of bioregion as a lens, we develop a pathway to create a regional socio-economical network based on a watershed. We also analyze the relationship between the urban and rural sectors to find out how the bioregional notion affects human well-being.

Metacognitive interventions to enable the transition toward a sustainable society

NAKAGAWA Yoshinori (Kochi University of Technology)

In Japan, it is known that taking the perspective of future generations significantly strengthen people's empathy toward future generations. The present study conducted an experiment to verify if this holds true in the context of waste management in developing countries. A total of approximately 200 people participated in the experiment in Kathmandu City, Nepal. They were presented with a list of options to be adopted by the city of 2019, some of them were more beneficial for the future generations than others. It was found that those who were exposed to the intervention of taking the future generations' perspective were more significantly likely to prefer sustainable options. It was concluded that the effect of the intervention was reproduced in Nepal.

Multispecies Cities: Co-designing more-than-human well-being in the Asia-Pacific

CHRISTOPH Rupprecht (RIHN)

How cities develop in the 21st century will shape human-nature relationships (SDG 11). The physical and mental wellbeing of urban residents depends on nature in cities, but nature outside of cities depends on urban residents' support for environmental policies. Cities currently lack sufficient opportunities for low-footprint nature-based activities, reducing people's wellbeing and their regard for nature, while promoting high-consumption lifestyles.

This project seeks to promote sustainable urban lifestyles of multispecies wellbeing by designing cities built with people and non-human inhabitants in mind. For this purpose, the project aims to enhance cities' multispecies capacity, defined as a function of the theory behind, tools to implement, and public support for policies that enable human coexistence with diverse and autonomous nature. Combining social science, humanities, and landscape health research, it thus takes up insights and environmental issues identified in the RIHN MEGACITIES and ECOHEALTH projects. The geographic focus is on urban regions in the Asia-Pacific, home to diverse more-than-human practices & histories, as well as world-leading examples of multispecies policies.

IS achievements include: 1) the proposal of a new concept for multispecies sustainability, 2) the development of a Multispecies Capacity Framework, 3) a speculative fiction anthology re-envisioning multispecies cities, and 4) experiments with multispecies stakeholder representation methods in urban planning at universities in Australia and commencement of multispecies planning policy assessment in Indonesia.

RIHN Center

The RIHN Center provides foundations and platforms for RIHN's research activities and promotes engagement in interactive collaborations with academic and societal stakeholders. The Center also promotes capacity building activities related to global environmental studies.

The RIHN Center consists of five divisions. The Laboratory and Analysis Division develops and maintains the laboratory facilities necessary for research and fieldwork. The Information Resources Division maintains RIHN research databases and archive. The Communication Division develops a variety of communication strategies linking RIHN research to academic, public and user-specific communities. The Collaboration Division facilitates internal and external research networking. The Future Earth Division organizes RIHN engagement with the international Future Earth initiative and manages activities of Future Earth in Asia.

Division Name: Laboratory and Analysis Division

Head of Division: TAYASU Ichiro

○ Subject and Objectives

The Laboratory and Analysis Division organizes three types of collaborative study in the Phase III Medium-Term Plan.

(1) Research collaboration with research projects: The division manages eighteen basement laboratories dedicated to various analytical needs. The division is responsible for maintaining state-of-the-art facilities, especially stable isotope mass spectrometers, and collaborates with research projects.

(2) Research collaboration with core projects: A core project FR entitled "Proposal and verification of the validity of isotope environmental traceability methodology in environmental studies (FY2017-2019)" seeks to establish a methodology for how to use the concept of environmental traceability using multiple isotope ratios. The division collaborates with the project in an analytical viewpoint.

(3) Research collaboration with universities via "Environmental Isotope Study": The division provides "Joint Research Grant for the Environmental Isotope Study" for universities and affiliated institutions throughout Japan, allowing them to use the facilities and exchanging research information. From the FY2016, the division has started the two types of collaborations, "Collaborative research with the Division" or "General collaborative research".

○ Progress and Results in 2019

The division installed or maintained various analytical instruments in the laboratories.

The division accepted 56 proposals of "(A) General collaborative research", 11proposals of "(B) Collaborative research with the Division", 4 proposals of "(C) Collaborative research with Environmental Traceability Project" and 10 proposals of "(D) Collaborative research with Ecosystem Traceability Project" in FY2019, under "Joint Research Grant for the Environmental Isotope Study".

The division organized a session in JpGU2019 entitled "H-TT18: Development and application of environmental traceability methods" on 28 May 2019. 17 oral and 11 poster papers were presented in the session. We invited Prof. Gabriel J. Bowen（University of Utah） to our session and asked him to present a talk "Establishing, quantifying and monitoring connectivity in hydrological systems using stable isotopes" in RIHN on 30 May, 2019.

The division organized a short course of Environmental Isotope Study: Course 1 for light elements (27 - 30 August) and Course 2 for heavy elements (3-6 September). 13 researchers and students attended the course.

The division organized the sixth annual symposium of Environmental Isotope Study on 20 December. 102 researchers and students attended the symposium.

○Members

Laboratory and Analysis Division

◎ TAYASU, Ichiro (RIHN Center,Professor)
SHIN, Kicheol (RIHN Center,Associate Professor)
YABUSAKI, Shiho (RIHN Center,Researcher)
YOSHIMIZU, Chikage (RIHN Center,Researcher)
MATSUMOTO, Takuya(RIHN Center,JSPS Research Fellow)
NITZCHE, Kai (RIHN Center,JSPS Research Fellow)
UEDA, Sachiko (RIHN Center,Research Associate)

KURATA, Junko (RIHN Center,Research Associate)
YASUDA, Akiko (RIHN Center,Research Associate)
YUZEN, Natsuko (RIHN Center,Research Associate)
FUCHIGAMI, Yuriko (RIHN Center,Clerical Assistant)

FY2019 members of Joint Research Grant for the Environmental Isotope Study

UCHIDA, Etsuo (Waseda University)
ISHII, Hiroshi (University of ToyamaGraduate School of Science and Engineering for Research Environmental and Energy Sciences Earth and Environmental Systems)
CHIBA, Hitoshi (Graduate School of Natural science and Technology Okayama University)
OHTE,Nobuhito (Department of Social Informatics Graduate School of Informatics Kyoto University)
SUGITANI, Kenichiro (Graduate School of Environmental Studies Nagoya University)
SHODA, Shinya (Nara National Research Institute for Cultural Properties)
AZUMA, Wakana (Kobe University)
TAKIGAMI, Mai (National Museum of Japanese History)
OHTA, Tamihisa (University of TOYAMA)
KOSHIKAWA, Masami (Center for Regional Environmental Research, National Institute for Environmental Studies)
YOSHIOKA,Yumi (Shimane University Faculty of Life and Environmental Sciences)
ITO, Takashi (Ibaraki University College of Education)
MIZUNO, Kazuharu (Graduate School of Letters, Kyoto University)
HANBA, Yuko (Kyoto Institute of Technology)
HANYA, Goro (Kyoto University)
TAKEUCHI, Nozomu (Chiba University)
OKADA, Naoki (Kyoto University Graduate School of Global Environmental Studies)
ISHIMARU, Eriko (Hiroshima University Museum)
KAWAGOE, seiki (Faculty of Symbiotic Systems Science Fukushima University)
KODA, Ryosuke (Research Institute of Environment, Agriculture and Fisheries, Osaka Prefecture)
YAMANAKA, Masaru (Department of Earth and Environnental Sciences, College of Humanities and Sciences, Nihon University)
TOMINAGA, Osamu (Fukui Prefectural University)
MORIMOTO, Maki (Faculty of Education Gifu University)
MATSUBAYASHI, Hisashi (Tokyo University of Agriculture Faculty of Agriculture)
NAGAO, Seiya (Institute of Nature and Environmental Technology Kanazawa University)
TAMURA, Tomomi (Nara National Research Institute for Cultural Properties)
YONEDA, Minoru (The University of Tokyo)
KATSUYAMA, Masanori (Graduate School of Agriculture, Kyoto University)
SOMEDA, Hidetoshi (National Defense Medical College)
ISHIYAMA, Daizo (Graduate School of International Resource Sciences Akita University)
KUSAKA, Soichiro (Tokai University School of Marine Science and Technology)
KATSUTA, Nagayoshi (Faculty of Education Gifu University)
SAITO, Yu (Department of Resources and Environmental Engineering, Waseda University)
KAMAUCHI, Hiromitsu (Nagoya University Graduate School of Environmental Studies)
OTAKE, Tsubasa (Graduate School of Engineering Hokkaido University)
ABE, Yutaka (Kanagawa Prefecture Natural Environment Conservation Center)
OKA, Tomoya (Shisuoka Prefectural Institute of Public Health and Environmental Science)
MATSUBAYASHI, Jun (Japan Agency for Marine-Earth Science and Technology)
GAKUHARI, Takashi (Institute of Human and Social Sciences,Kanazawa University)
SAITOH, Takeshi (Graduate School of Science and Engineering,Saitama University)
KASHIWAYA, Koki (Graduate School of Engineering, Kyoto University)
NAGATSUKA, Naoko (National Institute of Polar Research)
TSUSHIMA, Akane (Meteorological Research Institute)
OISHI, Yoshitaka (Center for Arts and Sciences,Fukui Prefectural University)

AKASAKA, Takumi	(Obihiro University of Agriculture and Veterinary Medicine)
YAMASHITA, Katsuyuki	(Graduate School of Natural science and Technology Okayama University)
TASHIRO, Takashi	(Nagoya University Disaster Mitigation Resarch Center)
OKANO, Osamu	(Okayama University)
HORIKAWA, Keiji	(University of TOYAMA)
HASEGAWA, Motohiro	(Doshisha University Faculty of Science and Engineering)
CHO, Kei	(Graduate School of University of TOYAMA)
OTUKA, Akira	(Institute of Crop Science, National Agriculture and Food Research Organization)
TAKANO, Shotaro	(Kyoto University)
SASE, Hiroyuki	(Asia Center for Air Pollution Research, Japan Environmental Sanitation Center)
URAKAWA, Rieko	(Japan Environmental Sanitation Center)
SOHRIN, Yoshiki	(Kyoto University Institute for Chemical Research)
YOKOO, Yoriko	(Faculty of Science and Engineering Doshisha University)
NONOSE, Naoko	(National Metrology Institue of Japan National Insutitute of Advanced Industrial Science and Technology)
ABE, Osamu	(Nagoya University)
TANIMIZU, Masaharu	(School of Science and Technology Kwansei Gakuin University)
OKUSHI, Kenichi	(Graduate school of HUMAN Development and Environment Kobe University)
NAKAGIRI, Takao	(Graduate School of Life and Environmental Sciences Osaka Prefecture University)
YAMADA, Yoshiriro	(Facultry of Agriculture,Kagawa University)
SUETSUGU, Kenji	(Kobe University)
Raman Sukumar	(Centre for Ecological Sciences Indian Institute of Science)
ICHIE, Tomoaki	(Research and Education Faculty, Natural Sciences Cluster, Agriculture Unit, Kochi university)
NAOE, Shoji	(Senior Scientist, Forest Ecology Group, Tohoku Research Center, Forestry and Forest Products Research Institute)
UMEZAWA, Yu	(Tokyo University of Agriculture and Technology)
TAKAHASHI, Kazuaki	(Faculty of Tourism and Environmental Studies, Nagano University,)
FUJII, Saori	(Department of Forest Entomology, Forestry and Forest Products Research Institute)
UNO, Hiromi	(Kyoto University)
HYODO, Fujio	(Research core for interdisciplinary sciences, Okayama University)
YAMAGUCHI, Yasuhiko	(Lake Biwa Environmental Research Institute, Japan Systems Analysis Division)

○ Future Themes

The division considers that “Environmental Isotope Study” is one of the most important function of RIHN as an Inter-University Research Institute Corporation. Toward the Phase IV Medium-Term Plan of the institute, the division continuously develops analytical techniques to collect various environmental information in order to solve environmental issues.

●Achievements

○Papers

【Original Articles】

・Kai NilsNitzsche, YoshikazuKato, Ki-CheolShin, IchiroTayasu 2019,10 Magnesium isotopes reveal bedrock impacts on stream organisms. *Science of The Total Environment* 688:243-252. DOI:10.1016/j.scitotenv.2019.06.209 (reviewed).

・Takuya Matsumoto 2019,08 Opportunistic feeding strategy in wild immature chimpanzees: Implications for children as active foragers in human evolution. *Journal of Human Evolution* 133:13-22. DOI:10.1016/j.jhevol.2019.05.009 (reviewed).

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・Suetsugu, K., Matsubayashi, J. and Tayasu, I. 2020,01 Some mycoheterotrophic orchids depend on carbon from dead wood: Novel evidence from a radiocarbon approach. *New Phytologist*. DOI:10.1111/nph.16409 (reviewed).

・Katsuta, N., Matsumoto, G.I., Hase, Y., Tayasu, I., Haraguchi, T.F., Tani, E., Shichi, K., Murakami, T., Naito, S., Nakagawa, M., Hasegawa, H. and Kawakami, S.-i. 2019,11 Siberian permafrost thawing accelerated at the Bølling/Allerød and Preboreal warm periods during the last deglaciation. *Geophysical Research Letters* 46:13961-13971. DOI:10.1029/2019GL084726 (reviewed).

・Fujiyoshi, L., Nishimura, T., Kato, T. and Tayasu, I. 2019,11 Residents' understanding of and interest in isotope techniques for groundwater conservation. *Papers on Environmental Information Science* 33:133-138. DOI:10.11492/ceispapers.ceis33.0_133 (in Japanese) (reviewed).

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・Ishida, T., Uehara,Y., Iwata, T., Cid-Andres, A.P., Asano, S., Ikeya, T., Osaka, K., Ide, J., Privaldos, O.L.A, De Jesus, I.B.B., Peralta, E.M. Triño, E.M.C., Ko, C.-Y., Paytan, A., Tayasu, I. and Okuda, N. 2019,04 Identification of phosphorus sources in a watershed using a phosphate oxygen isoscape approach. *Environmental Science and Technology* 53(9):4707-4716. DOI:10.1021/acs.est.8b05837 (reviewed).

・Nakano, T., Yamashita, K., Ando, A., Kusaka, S., Saitoh, Y. 2020,02 Geographic variation of Sr and S isotope ratios in bottled waters in Japan and sources of Sr and S. *Science of Total Environment* 704. DOI:10.1016/j.scitotenv.2019.135449 (reviewed). 135449

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- Tohru Ikeya, Takuya Ishida, Yoshitoshi Uehara, Satoshi Asano, Ichiro Tayasu, Noboru Okuda, Masayuki Ushio, Shohei Fujinaga, Chia-Ying Ko, Elfritzson Martin Peralta, Naoto F. Ishikawa, Tomoya Iwata The analysis of the community composition of riverine bacteria and microalgae in relation to nutrient status and diversity: the case in irrigation season in the Yasu River, Japan. JpGU meeting, 2019.05.30, Makuhari-Messe, Makuhari, Chiba.
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- *Masami Koshikawa1, Mirai Watanabe1, Tomoyoshi Murata1, Takejiro Takamatsu1, Shingo Miura1, Ki-Cheol Shin2, Takanori Nakano2 1. National Institute for Environmental Studies, 2. Research Institute for Humanity and Nature Using Sr isotopes to determine the contribution of volcanic ash to Sr and Ca in stream waters in a chert watershed. Japan Geoscience Union Meeting 2019, 2019.05.28, Makuhari Messe, Chiba, Japan.
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- Yasuhiko T. Yamaguchi, Chikage Yoshimizu, Ichiro Tayasu, Keisuke Koba, Kazuhide Hayakawa Bacterial contribution to dissolved organic matter in a large monomictic lake (Lake Biwa) indicated by amino acids enantiomers. JpGU meeting, 2019.05.27, Makuhari-Messe, Makuhari, Chiba.
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・Lei FUJIYOSHI, Kenichi OHKUSHI, Yudai YAMAMOTO, Ichiro TAYASU, Tadashi YOKOYAMA, Hiromune MITSUHASHI, Fumiko FURUKAWA, Masayuki ITOH Dynamics of dissolved ions inferred from sulfur isotope ratio of sulfate, nitrogen and oxygen isotope ratios of nitrate in Chikusa river watershed, Hyogo. Japan Geoscience Union Meeting, 2019.05.20, Makuhari Messe, Chiba, Japan. (in Japanese)

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・Lei Fujiyoshi, Ichiro Tayasu, Shiho Yabusaki, Takashi F. Haraguchi, Chikage Yoshimizu, Kenichi Ohkushi, Fumiko Furukawa, Masayuki Itoh, Yudai Yamamoto, Tadashi Yokoyama, Hiromune Mitsuhashi Dynamics of sulfate and nitrate inferred from stable isotope techniquesin Chikusa river watershed, Hyogo Prefecture. Japan Geoscience Union Meeting, 2019.05.26-2019.05.30, Makuhari Messe, Chiba, Japan.

【Poster Presentation】

・Kamauchi, H., Ohta, T., Ishida, T., Haraguchi, T.F., Tayasu, I. Contribution of oceanic sulfur to coastal ecosystem using isotope ratio in lichens: formulating distance-decay and applying model selection approach. AGU fall meeting, 2019.12.11, San Francisco, CA. A072(Session ID#: 83376)-631638 A33N-2910

・○ Katazakai S., Zhang J., Suzuki M., Asai K., Nojima K. The change of material flux via SGD and its impact on coastal ocean, Biogeochemistry of trace elements and isotopes in the ocean. GEOTRACES (SCOR-GEOTRACES Joint Session), September 2019, Toyama.

・Mao Tsuchiya, Shotaro Takano, Makoto Tsujisaka, Shoji Imai, Yuhei Yamamoto, Yoshiki Sohrin Improved Isotopic Analysis for Ni, Cu, and Zn and its Application to Natural Water Samples. Goldschmidt 2019, 2019.08.21, Barcelona Congress Centre. Poster Number 381

・*IKESHIMA TAKURO1, Tsubasa Otake1, Tsutomu Sato1, Akane Ito1, Shuji Ono1, Jun-ichiro Ishibashi2, Tatsuo Nozaki3, Hidenori Kumagai3, Lena Maeda3 (1.Hokkaido University, 2.Kyushu University, 3.Japan Agency for Marine-Earth Science and Technology (JAMSTEC)) Transformation of ore minerals and their geochemical signatures in submarine hydrothermal ore deposits in Izena Hole, Okinawa Trough. JpGU meeting 2019, 2019.05.29, Makuhari Messe. (in Japanese)

・Shiho Yabusaki, Kazuyoshi Asai(2019): Relationship between residence time, water quality, and stable isotopes of spring water and groundwater in coastal area of Fukushima prefecture. JpGU meeting 2019, 2019.05.28, Chiba. HTT18-P02

・Yusuke Hataya, SEIKI KAWAGOE, Shiho Yabusaki, KEN Suzuki Applicability evaluation of CIA due to river and lake. JpGU meeting 2019, 2019.05.28, Chiba. HTT18-P03

・Suzuki hiromichi, SEIKI KAWAGOE, SHO ADACHI, Shiho Yabusaki Chemical property analysis of short time scale to determine snowfallsource. JpGU meeting 2019, 2019.05.28, Chiba. HTT18-P04

・Etsuo Uchida, Rathborith Cheng, Masato Katayose, Kosei Yarimizu, Ki-Cheol Shin, Sitha Kong, Takanori Nakano Petrogenesis and tectonic setting of intrusive rocks in Cambodia. MAESA Second International Conference on Applied Earth Sciences in Myanmar and Neighboring Regions., 2019.11.30, Novotel Max Yangon, Yangon, Myanmar.

・Yuta Fijiwara, Makoto Tsujisaka, Shotaro Takano, and Yoshiki Sohrin Determination of Stable Isotope Ratio of Tungsten in Seawater Using Chelate Resin Column Extraction. Goldschmidt 2019, 2019.08.21, Barcelona.

・Tayasu, I., Kato, Y., Kamauchi, H., Yoshimizu, C., Matsubayashi, J., Osada, Y., Saitoh, Y., Shin, K., Nakano, T., Togashi, H. and Kurita, Y. Combining isoscapes and segmental isotope analysis of vertebrae to study the movement of fishes. Goldschimidt 2019, 2019.08.20, Barcelona International Convention Centre(CCIB), Barcelona. 11b- Isotope Tools in Aquatic Biogeochemistry

・Christoph Rupprecht, Lei Fujiyoshi, Steven McGreevy, Ichiro Tayasu Trust me? Consumer trust in expert information on food product labels. 1st Iso-Food International Symposium on Isotopic and Other Techniquws in Food Safety and Quality, 2019.04.01-2019.04.03, Grand Hotel Bernardin, Piran, Slovenia. Best Poster Award in ISO-FOOD symposium

Division Name: Information Resources Division

Head of Division: KUMAZAWA Terukazu

○ Subject and Objectives

The information resources division is aiming to constructing an information hub associated with RIHN's activities.

(1) Collecting and accumulating research resources (data and information etc.) and promoting usage of them.

Printed matters and the other achievements associated with activities of projects or the institute are collected, and release from RIHN Archives and institutional repository.

(2) Researches about information technology to promote RIHN's activities

Novel information techniques or theories to contribute to activities of the institute are developed.

(3) Development of applications to use RIHN's resources

Developing of a web application RIHN Portal (named Visual Keyword Map for Global Environmental Studies (Global Environmental Studies VKM)) is in progress. It will provide function to retrieve and to show the resources accumulated in the RIHN Archives and the database of metadata related to the global environmental studies.

○ Progress and Results in 2019

Collection and accumulation of research resources

(Number of the registered into RIHN Archives in FY 2019)

bibliographic records: 323

objects: 52

electric data: 180

images: 0

(Activities about Institutional Repository in FY 2019)

Register count: 854

Download count: 41,258

View count: 17,860

(Total number of the registered into RIHN Archives as of 1st April)

bibliographic records: 9,100

objects: 3,276

electric data: 4,590

(Total count about Institutional Repository as of 1st April)

Registered items: 3,602

(including 2,753 items released for public)

Researches about information technology

The following seminars and lectures were held in FY 2019.

GIS Seminar for the Global Environment Studies 2019
Date: 26th August 2019

8th Seminar
Serious Game and Model Design on Social-Environmental Systems
Date: 4th September 2019

Development of applications
In collaboration with the NIHU project the portal site as an entrance to access Web information resources and databases inside of RIHN including RIHN Archives was developed through designing and constructing the user interface (UI), the Web API and the ontology. This portal site was named "Visual Keyword Map for Global Environmental Studies (Global Environmental Studies VKM)" and released as a trial (http://gesvkm.chikyu.ac.jp). In FY 2019, the keywords characterizing the project of Lifeworlds of Sustainable Food Consumption and Production: Agrifood Systems in Transition, the project of the Sanitation Value Chain: Designing Sanitation Systems as Eco-Community-Value System and the project of Information Asymmetry Reduction in Open Team Science for Socio-environmental Cases were extracted, and icons about the keywords were created for the Global Environmental Studies VKM.

○ Future Themes

(1) Collecting and accumulating research resources

The achievements associated with activities of projects or the institute will be collected and accumulated continuously. The titles of the achievements will be translated into English or Japanese and the DOI will be added to the achievements.

(2) Researches about information technology to promote RIHN's activities

Research outcomes will be shared in the seminars, and applied to the RIHN Portal (named Visual Keyword Map for Global Environmental Studies (Global Environmental Studies VKM)) and the databases in RIHN.

(3) Development of applications to use RIHN's resources

The contents of the Global Environmental Studies VKM will be updated, and icons representing the characteristics of the current projects are newly designed.

●Achievements

○Papers

【Original Articles】

・Yasuhisa Kondo, Akihiro Miyata, Ui Ikeuchi, Satoe Nakahara, Ken'ichiro Nakashima, Hideyuki Ōnishi, Takeshi Osawa, Kazuhiko Ota, Kenichi Sato, Ken Ushijima, Bianca Vienni Baptista, Terukazu Kumazawa, Kazuhiro Hayashi, Yasuhiro Murayama, Noboru Okuda, Hisae Nakanishi 2019,10 Interlinking open science and community-based participatory research for socio-environmental issues. *Current Opinion in Environmental Sustainability* 39:54-61. DOI:10.1016/j.cosust.2019.07.001 (reviewed).

・Takehiro Miki, Taichi Kuronuma, Yasuhisa Kondo 2019,09 Burial landscape of Bāt during the Um An Nar Period: Reconsideration through spatial statistics. *The Journal of Oman Studies* 20:48-77. (reviewed).

○**Research Presentations**

【Oral Presentation】

- Yasuhisa Kondo, Akihiro Miyata, Ui Ikeuchi, Satoe Nakahara, Ken'ichiro Nakashima, Hideyuki Onishi, Takeshi Osawa, Kazuhiko Ota, Kenichi Sato, Ken Ushijima, Bianca Vienni Baptista, Terukazu Kumazawa, Kazuhiro Hayashi, Yasuhiro Murayama, Noboru Okuda, Hisae Nakanishi Interlinking open science to team-based action research for socio-environmental cases. INSciTS 2019, 2019.05.20-2019.05.23, Lansing Center, Lansing, MI, USA.
- Yasuhisa Kondo Ethical issues in open science. Japan Geoscience Union Annual Meeting 2019, 2019.05.20-2019.05.26, Makuhari Messe Chiba, Japan.
- Yasuhisa Kondo, Yoko Iwamoto Network analysis of an archaeological research project: A graphical monitoring of the developing interdisciplinary co-authorship of the PaleoAsia project. 47th annual conference of Computer Application and Quantitative Methods in Archaeology, 2019.04.23-2019.04.27, Jegiellonian University, Krakow, Poland.

Division Name: Communication Division

Head of Division: ABE Ken-ichi

○ Subject and Objectives

In Communication and Production Division, knowledge networking is the basis of activities. It reedits discrete knowledge and information. Then, they are presented as new knowledge/concept.

For the purpose, the following three pillars were set up.

The first pillar is exploring new methods of outreach of research results in the transdisciplinary era through the development of visual contents.

It aims to construct a platform for networking of knowledge and information

The second pillar is implementation of environmental education.

It is an opportunity to exchange knowledge and information with the next generation, then will explore "environmental education": RIHN Method through integration of research results of RIHN by this exchange.

The last pillar is to create new wisdom and value.

By summarizing the results of RIHN research activities and linking the knowledge and information of research projects to higher levels, aiming to construct a methodology that creates new value.

○ Progress and Results in 2019

【Developing methods of outreach of research results in the transdisciplinary era】

The purpose is to construct methods of public relations/outreach of research results utilizing visual contents.

Research Plan❶ Created a videos to awake "Civic Pride". Ex) A video about “Globally Important Agricultural Heritage Systems: GIAHS” by collaboration with NHK Educational Corporation. A video of Senior high school students from East Timor, Philippines and Japan.

Research Plan❷ As a novel outreach method, held Workshop and Exhibition of virtual reality utilized Pieces of "Global Painting Contest on Environment” by United Nations Environment Programme: UNEP.

Research Plan❸ Held "MANGA x ACADEMIC Research Association” cosponsored by Kyoto Seika University and RIHN based on MOU.

【Developing "environmental education": RIHN Method, for connect generations】

The purpose is to elaborate on the concept of "Environmental Education": RIHN Method.

Research Plan❶ Supported for classes of “Environment” in two senior high schools, collaboration between elementary school and senior high school and attempt of "Community School" based on MOU. Published field reports of research results.

Research Plan❷ Held "Climate Action Summit by Senior high school students in Kyoto" as side event of "The 11th Earth Hall of Kyoto" as part of citizenship education.

Research Plan❸ Held Poster Sessions with Aichi Prefectural University and senior high schools for enhancement of knowledge network.

【Creating new wisdom and value through “GIAHS” by Food and Agriculture Organization of United Nations: FAO】

The purpose is to construct a methodology that creates new value. Focused that Globally important agricultural heritage systems are "variable" heritages. Implemented research activities based on design science worked with local governments.

Research Plan❶ Implemented as Research Advisor for both sites of designated and proposed. Advised for making action plan in Miyazaki, Japan as entrusted research, and making proposal plan in Chiang Mai, Thailand.

Research Plan❷ Implemented research activities related "Globally Important Agricultural Heritage System" with local community. Ex) Research activities about Public transportation systems in Hinokage Town, Miyazaki. Held the conference "Regional Revitalization through GIAHS: Dialogue between generations" at Morotsuka Village as the 29th RIHN Regional Community Seminar.

Research Plan❸ Constructed Global network of GIAHS. Attended the 2nd World Conference on the Revitalization of the Mediterranean Diet(Italy), Session16: Sustainable Diets: Linking Nutrition and Food Systems. Held the 2nd forum for officials in Japan of GIHAS at RIHN.

Implemented research activities not in original plan

【Developing "environmental education": RIHN Method, for connect generations】

Held the "RIHN SDGs Serious" in Mukogawa Women's University Senior High school and made lectures by researchers in RIHN.

【Creating new wisdom and value through “GIAHS” by Food and Agriculture Organization of United Nations: FAO】

Inaugurated Regional Collaboration program advisor in Ifugao, Philippines as entrusted research of Miyazaki Prefectural Gokase Secondary school.

Inaugurated Promotion advisor of "eco-school" in Shibukawa elementary school, Kusatsu, Shiga

○Members

◎ ABE Ken-ichi (Research Institute for Humanity and Nature,Professor,Ecological Anthropology)
○ NILES,Daniel (Research Institute for Humanity and Nature,Associate Professor,Geography)
○ MIMURA Yutaka (Research Institute for Humanity and Nature,Researcher,Architectural History, Urban History, Historical GIS)
○ SHIMADA Nahoko (Research Institute for Humanity and Nature,Researcher,Study of Ecological thought)
○ SODA Katsuya (Research Institute for Humanity and Nature,Researcher,Forced Migration Studies)

○ Future Themes

Three pillars of research activities started to harmonize each other. ex) Mixed GIAHS and Environmental education, Environmental education utilized visual contents.

It shows research activities of Division are progressing smoothly. Will focus on integrating the three independent research and development activities to highly theoretically in the next fiscal year.

Division Name: Collaboration Division

Head of Division: ISHII Reiichiro

○ Subject and Objectives

The Collaboration Division fosters research collaborations between RIHN and research institutions and organizations in Japan and abroad and also provides the organizational infrastructure for capacity building. It facilitates the conclusion of collaborative agreements with research institutions and local governments in Japan and abroad, the planning of collaborative research, and the development of proposals for new RIHN projects. While providing a forum for broad information exchange and discussion of research on global environmental problems, the Division also undertakes the development, maintenance and organization of advances personal, financial and institutional networks.

Based on the results of RIHN research projects, the Division further fosters active engagement with international research agenda setting and helps to enhance the presence of RIHN in the international research community.

Furthermore, in order to promote global environmental research and capacity building in Japan and the Asia region, together with the other Divisions it provides the necessary organizational and financial basis and supports the development and mobilization of capacity for inter- and trans-disciplinary research with researchers and societal stakeholders in Japan and Asia.

○ Progress and Results in 2019

1. Information Collection: Organizing seminars and workshops (with participation of research institutions and governments from Japan and abroad)

Held RIHN Seminars No. 159 to 180.

2. Building Collaborations: Supporting the conclusion and renewal of MoUs and Comprehensive Agreements with research and government institutions in Japan and abroad and collaborations for university education.

The Division supported the conclusion and renewal of 30 MoUs and Comprehensive Agreements with research and government institutions in Japan and abroad.

3. Management

◇Participation in meetings and committees

・Reports and information were collected at the EGU 2019（7 April - 12 April in Vienna).

・Participated in GLP, the SCJ's Subcommittee, exchanged and collected information.

・Participated in the "Committee on Promotion and Collaboration of Future Earth" of the SCJ and collected information.

・AOGEO (Group on Earth Observations for Asia-Oceania)Reported and collected information at the 12th Symposium (2-11-4 November in Canberra).

4. Obtaining external funds (Organizing meetings/workshops and writing proposals)

◇NIHU project: New Development in Ecohealth Research in Asia （Director：Hein Mallee）

The Project organized lectures and presentations on multiple occasions including the 1st Asia Forum on Ecohealth Research（November 2018, Haikou, China） and conducted field studies on “Health in daily life and conception of health by the local people”(January 2019, Hainan, China). The Project also published the Special Issue about Ecohealth Research of the Japanese Journal of Health and Human Ecology (Vol. 85(2019)). The Project disseminated research results and enhanced its network through those occasions.

◇SCJapan Master Plan 2020: "人類世（人新世）のダイナミクスと地球人間圏の未来可能性の追求 －Future Earth アジアの推進－" Hearing on Sept. 16, 2020

◇MEXST Roadmap 2020: Applied for the creation of the "大型プロジェクトの推進に関する基本構想－ロードマップ" from the Master Plan 2020 Hearing Target

5. Outreach : Organization of poster displays, presentations, lectures and seminars at academic meetings and publication of papers, books and pamphlets

◇JpGU-AGU Joint Meeting 2019（2019/5/26-5/30 Chiba）

Set up and maintained a booth for RIHN to present its research and results.

◇Lecture series for Doshisha University Science and Engineering Department（2019/5/24-7/5, Doshisha University）

Organized an 7-session lecture series on Environmental System to be conducted by RIHN early-career researchers for the freshmen of the Department of Science and Engineering of the Doshisha University.

○**Members**

◎ ISHII Reiichiro (Research Institute for Humanity and Nature,Associate Professors, Heads of Divisions)
JIANG, Hong-wei (Research Institute for Humanity and Nature,Specially Appointed Assistant Professors,EcoHealth)

Division Name: Future Earth Division

Head of Division: MALLEE Hein

URL: http://www.chikyu.ac.jp/future_earth/

○ Subject and Objectives

Future Earth Division hosts and operates the Regional Centre of Future Earth in Asia. Its main role is to provide secretariat functions and coordination for the network of Future Earth in the region while facilitating linkages between RIHN and Future Earth. It provides a forum for broad information exchange and discussion of research on global environmental problems. Based on the results of RIHN research projects, FE Bumon further fosters active engagement with the international research agenda setting. Furthermore, in order to promote global environmental research and capacity building in Japan and the Asia region, it supports the development and mobilization of capacity for inter- and trans-disciplinary research with researchers and societal stakeholders in Japan and Asia with a focus on early career researchers.

○ Progress and Results in 2019

1. Research Enabling

Our division aims to promote, facilitate and enable transdisciplinary research addressing global environmental sustainability through hosting of symposia, workshops, writeshops and convening on imperative research themes with a focus on Asia.

◇ This year, we supported the launch and establishment of a new regional research initiative called Health Investigation and Air Sensing for Asian Pollution (HI-ASAP). This is a new initiative developed under the umbrella of the International Global Atmospheric Chemistry project-Moonsoon Asia and Oceania Networking Group (IGAC-MANGO).

◇ The division continues to support the Knowledge-Action Network on Systems of Sustainable Consumption and Production (SSCP KAN). A governance structure for the network comprising of a Management Team, Steering Committee and working groups has been functional; and a research and engagement plan was developed. The SSCP KAN has been active and delivered various research outputs such as journal articles, research proposals, white papers etc.

◇ FE Division is supporting and rolling out Future Earth's Science Based Pathways Initiative to the Asian region. This Future Earth initiative is aimed at knowledge-based decision making that supports achievement of the SDGs. The FE Division led the development of a national workshop in the Philippines intended for March 2020 (this has been postponed due to covid19). The workshop was intended to also build capacity to implement the Initiative in India and Mongolia.

◇ Organized symposia, seminars and workshops

○ Seminar: "Why Systems of Sustainable Consumption and Production is essential to achieving the SDGs", (RIHN, February 20, 2020) 30 participants including virtual participants from Germany and Denmark

○ Online Open Forum: "COVID-19 Can Help Prepare for a Sustainability Transition" March 26, 2020 (online, via zoom webinar) over 300 participants ― The following events were planned but cancelled/postpoined due to coronavirus

○ Symposium: Approaching Planetary Boundaries: An Urgent Agenda for Asia, Science Innovation Building, Kyoto University organized by Future Earth, RIHN, Kyoto University and NIES (scheduled for March 5, 2020)

○ "National Workshop on Futures-Informed Knowledge-into-Action Innovations and Initiatives" a Science-Based Pathways for SDGs workshop in Manila, Philippines (Scheduled for March 25-26, 2020)

2. Regional Networking :

Another objective of the Division is to contribute to the enhancement and progress of global environmental and sustainability research in the Asian region through the formation of community networks in Asia.

The Regional Advisory Committee for Future Earth in Asia held its 5th meeting last July 3-4, 2019. The incumbent members will end their terms by December 31, 2019 to make way for the establishment of a Regional Committee. An open call for nominations has been undertaken and selection of new Regional Committee members will be done in the next fiscal year.

FE Division members also participated in various conferences and committee meetings related to Future Earth as the representatives of the Regional Centre for Future Earth in Asia to collect relevant information and to enhance collaboration in Japan and abroad:

· Future Earth Governing Council/Advisory Committee meetings and Future Earth Regional meeting (2-4 April, Stockholm, Sweden)

· Moonsoon Asia Integrated Research for Sustainability Scientific Steering Committee Meeting in Nanjing, China (May 21-22, 2019)

· Science Council of Japan Future Earth Promotion and Collaboration Committee meeting (February 27, 2019 and December 26, 2019, Science Council of Japan）

· Future Earth National Committee for Japan meeting (Science Council of Japan, 2 February 2019, The University of Tokyo)

· Future Earth Japan Summit (Fuji Soft Akiba Plaza Tokyo, December 19, 2019)

The following planned activities were cancelled or postponed in the light of the coronavirus epidemic:

· Future Earth Advisory Committee and Governing Council Meeting for 50 members to be hosted at RIHN, Kyoto (scheduled for March 4-6, 2020).

3. Communications and Outreach

As host of the Regional Center for Future Earth in Asia, maintains the Future Earth Asia website, social media facebook page and the publication of regular newsletters. Various content for these publications such as research synthesis, updates and feature articles are regularly being developed and posted.

The FE Division also manages the mailing lists and social media accounts for the SSCP KAN and TERRA School.

4. Capacity Building

This year, the Future Earth Division spearheaded an introductory course on transdisciplinary research for young researchers and practitioners in the Asian region under the title TERRA SCHOOL (Transdisciplinarity for Early careeR Researchers in Asia School). The objective of this initiative is to build capacity for transdisciplinary research. It is envisioned to be a cultivation encounter, aimed at creating awareness of what transdisciplinarity can offer and the challenges involved in its implementation leveraging on RIHN research experience, results and methods.

Sixteen (16) early career researchers from various natural and social backgrounds from 11 countries all over Asia attended the 5-day course on December 9-13, 2020. The course provided theoretical and practical advice and planted seeds for development of transdisciplinary project proposals. The aim is to build a network of young researchers and stakeholders in the region and linking them to the RIHN and Future Earth community.

○**Members**

◎	Hein Mallee	(Research Institute for Humanity and Nature,Professor, Head of Division)
	Ria Lambino	(Research Institute for Humanity and Nature,Specially Appointed Associate Professor)
	Yuko Onishi	(Research Institute for Humanity and Nature,Assistant Professor)
	Masami Oka	(Research Institute for Humanity and Nature,Research Associate)
	Takako Okamoto	(Research Institute for Humanity and Nature,Research Associate)

●Achievements

○Papers

【Original Articles】

・Gordon, I. J., K. Bawa, G. Bammer, C. Boone, J. Dunne, D. Hart, J. Hellmann, A. Miller, M. New, J. Ometto, S. Pickett, G. Wendorf, A. Agrawal, P. Bertsch, C. D. Campbell, P. Dodd, A. Janetos, H. Mallee and
K. Taylor 2019,08 Forging future organizational leaders for sustainability science. *Nature Sustainability* 2:647-649. (reviewed).

・Pihl, E., Martin, M.A., Blome, T., Hebden, S., Jarzebski, M.P., Lambino, R.A., Köhler, C., Canadell, J.G., Ebi, K.L., Edenhofer, O., Gaffney, O., Rockström, J., Roy, J., Srivastava, L., Payne, D.R., Adler, C., Watts, S., Jacobsson, L., Sonntag, S 2019 10 New Insights in Climate Science 2019, Future Earth & The Earth League, Stockholm.

○Research Presentations

【Oral Presentation】

・Ria Lambino Co-designing TD Projects, Lessons from Japan and Philippines. Procedure of transdisciplinarity for solution-oriented science – diagnosis to practice Workshop, 2020.02.21, Chiba, Tokyo. Zoom 参加

・Ria Lambino, Future Earth Philippines Program and Science Based Pathways. Future Earth Summit, Blue Carbon Project Meeting, 2019.12.19, Tokyo, Japan.

・Ria Lambino, Stakeholder Engagement in Environmental Governance: Case of Sta. Rosa Watershed, Philippines. International Workshop on Fair Use of Multiple Resources in Cross-scale context, 2019.07.11-2019.07.12, Kyoto, Japan.

・Ria Lambino Future Earth in Asia. Scientific Steering Committee Meeting of Monsoon Asia Integrated Research for Sustainability (MAIRS), 2019.05.22, Nanjing, China.

Outreach Programs and Events

1. RIHN International Symposium

In order to diffuse the findings of FR projects, the RIHN 14th International Symposium "Fair Use of Multiple Resources in Cross-Scale Context" was held on 11-12 July 2019 at the Lecture Hall, RIHN. The details of the symposium are as follows.

RIHN 14th International Symposium

<Thursday, July 11>

Plenary Session

Chair: Tohru NAKASHIZAKA (RIHN)

Welcome and Opening Remarks: YASUNARI Tetsuzo (Director-General, RIHN)

Introduction to Plenary Session: Tohru NAKASHIZAKA

Keynote Address: Steering toward Sustainability: Cross-scale Interactions, Behavioral Mechanisms, and the Idea of Optimality

Oran R. YOUNG (Bren School of Environmental Science & Management, University of California, Santa Barbara, USA)

Session 1: Adaptive Governance of Social-Ecological Systems

Chair: Ria A. LAMBINO (RIHN) and Shigeo YACHI (Center for Ecological Research, Kyoto University, Japan)

Introduction to Session 1: Ria A. LAMBINO and Shigeo YACHI

Adaptive Governance: Community-level Management and Multi-level Linkages

Fikret BERKES (Natural Resources Institute, University of Manitoba, Canada)

Watershed Governance: A Case in the Lake Biwa Watershed

Noboru OKUDA (RIHN)

Stakeholder Engagement in Environmental Governance: Case of Sta. Rosa Watershed, Philippines

Ria A. LAMBINO

Discussion

Discussants

R. Bin WONG (Department of History, University of California, Los Angeles, USA)

Kenichi WAKITA (Department of Sociology, Ryukoku University, Japan)

<Friday, July 12>

Session 2: Approaches to Bridging Temporal-Spatial Scales

Chair: Ichiro TAYASU (RIHN) and Keiichiro KANEMOTO (RIHN)

Introduction to Session 2: Ichiro TAYASU and Keiichiro KANEMOTO

Visualization of Supply Chain Risks behind Phosphorus Resource Consumption

Kazuyo MATSUBAE (Graduate School of Environmental Studies, Tohoku University, Japan)

Traceability and Authentication of Premium Products Using Stable Isotope Ratios Analysis

Federica CAMIN (Research and Innovation Centre, Fondazione Edmund Mach, Italy)

Tracking Products and the Environment

Keiichiro KANEMOTO

Discussion

Discussant:

Fumikazu AKAMATSU (National Research Institute of Brewing, Japan)

Session 3: Multi-Scalar and Multi-Actor Equity and Fairness

Chair: Kunihiko KOBAYASHI (RIHN) and Yasuhisa KONDO (RIHN)

Introduction to Session 3: Kunihiko KOBAYASHI and Yasuhisa KONDO

Do Markets with Capital Accumulation Engender Distributive Justice and Sustainability?
Naoki YOSHIHARA (Department of Economics, The University of Massachusetts Amherst, USA)

A Global Environmental Law Perspective on Fairness and Equity
Elisa MORGERA (Law School, University of Strathclyde, UK)

Intergenerational Ethics Based on the Ongoing Reality
Tsuyoshi TERAMOTO (Faculty of Science and Engineering, Chuo University, Japan)

Discussion

General Discussion

Chair: Tohru NAKASHIZUKA

Discussion across All Sessions

Closing Remarks: Hein MALLEE

2. Symposium of Environmental Isotope Study

Joint research grant for Environmental Isotope Study has conducted multidisciplinary joint researches using various isotope analysis facilities RIHN has maintained. To exchange research information and promote the Environmental Isotope Study network, "Symposium of Environmental Isotope Study" has been held once a year since 2011.

The 9th Annual Symposium of Environmental Isotope Study

Date: 20 December 2019

Venue: RIHN

Opening Remarks: YASUNARI Tetsuzo (Director-General, RIHN)

Current topics of Environmental Isotope Study in RIHN: TAYASU Ichiro (RIHN)

Poster flash talks (1)

Poster session (1)

Phosphate oxygen isotopes as a tool to trace P dynamics: perspectives in environmental sciences
OKUDA Noboru (RIHN)

High precision analysis of stable Sr isotopes by DS-TIMS and its application to geochemical and archaeological sciences
WAKAKI Shigeyuki (Kochi Institute for Core Sample Research, JAMSTEC)

Poster flash talks (2)

Poster session (2)

Summary

3. RIHN Public Seminars

In order to present RIHN research activity in a manner that accessible to the general public, since November 2004, RIHN has offered public lectures. One seminar was held in 2019 at the Heart Pier Kyoto.

RIHN staff offer accessible explanations of global environmental problems, and the Public Seminars have stimulated engrossing discussions of contemporary environmental concerns.

The 80th Public Seminar 21 June 2019
Bon Apetit, Afrique! Life/gastronomic worlds of Mali and Burkina Faso make us think about future of our region and globe
SACO Oussouby (Kyoto Seika University)
SHIMIZU Takao (RIHN/Kyoto Seika University)
TERADA Masahiro (RIHN)

4. "CHO School" RIHN x Knowledge Capital

Since 2017, RIHN has participated in the "Knowledge Capital CHO School Series", a program designed to bring together researchers from universities, research institutes, and other fields with the public for thoughtful dialogue. In fiscal 2019, RIHN held the following two lectures for the third in this series at Café Labo in Grand Front Osaka (Kita-ku, Osaka).

Series: Board games make environmental problems interesting

The 1st Workshop 24 January 2020
"Learn about sustainable development while playing board games"
OH Tomohiro (Visiting Researcher, RIHN)

The 2nd Workshop 31 January 2020
"How researchers stopped worrying and started holding game jams"
OHTA Kazuhiko (Researcher, RIHN)

5. Kyoto Municipal Science Center For Youth "Future Scientist Training Course"

RIHN has concluded an agreement on collaboration with Kyoto Municipal Science Center For Youth since 2011. In the fiscal year 2019, RIHN cooperated with Future Scientist Training Course as below. The whole course has organized by the Center, for junior high school students in Kyoto.

(Summer Seminar)
Date: 29 July 2019
Venue: RIHN
Lecturer: SHINAKI Rika (RIHN)
SPIEGELBERG Maximilian (RIHN)
RUPPRECHT Christoph D.D. (RIHN)

6. RIHN Open House

In order to introduce RIHN's research projects and facilities to the surrounding community, RIHN has opened our buildings to the public once a year since 2011. Several interesting events such as joint experiments, public talks, exhibitions, and games were conducted in order to deepen our interaction with local citizens in fiscal 2019.

Date: 26 July 2019
Venue: RIHN

7. RIHN Area Seminars

The RIHN Area Seminars offer an opportunity for RIHN research staff to gather with regional intellectuals and local citizens to consider problems related to the environment and culture of each area of Japan. The first seminar was held in 2005. The fiscal year 2019, five seminars were held as below.

The 28th RIHN Area Seminar (Hokkaido)
"How to Develop Business Models for Sustainable Society"
Date: 18 July 2019
Venue: Graduate School / Faculty of Engineering, Hokkaido University

The 29th RIHN Area Seminar (Morotsuka)
"Regional Revitalization through GIAHS: Dialogue between generations"
Date: 12 November 2019
Venue: Morotsuka Junior High School

The 30th RIHN Area Seminar (Shiga)
"Linking ecosystem networks with fun for nature conservation and social bonding"
Date: 22 December 2019
Venue: Lake Biwa Museum

The 31st RIHN Area Seminar (Kameoka)
"Sustainable food and agriculture can open a new future for Kameoka City"
Date: 19 January 2020
Venue: Galleria KAMEOKA

The 32nd RIHN Area Seminar (Shiga)
"Waterweed in Lake Biwa: Towards a Civic Participatory Environmental Governance"
Date: 8 February 2020
Venue: Collabo Shiga 21

8. RIHN Tokyo Seminar

In order to gain the attention of researchers and the general public and to promote research cooperation and development, RIHN periodically holds seminars in Tokyo. We invite renowned Japanese researchers as well as public officials to discuss RIHN research project objectives and findings. In fiscal 2019, we held an RIHN Tokyo Ex-Seminar as a graduate seminar and provided topics that show the direction of dialogue.

RIHN Tokyo Ex-Seminar

"Asking the relationship between humans and nature in the age of artificial intelligence"
Date: 3 February 2020
Venue: University of Tokyo

Topic
"Asking the relationship between humans and nature in the age of artificial intelligence"
KUMAZAWA Terukazu (Associate Professor, RIHN)
Comment to Dialogue
NAKAO Seiji (Specially Appointed Assistant Professor, RIHN)
Discussion
Dialogue 1 (Technology)
Dialogue 2 (Future)

9. The Earth Forum Kyoto; Special Session and International Symposium

RIHN, Kyoto Prefecture, Kyoto City, Kyoto University, and Kyoto Prefectural University co-host this forum in order to clearly convey our message of the importance of environmental issues to the world. The symposium was held in fiscal year 2019 as below.

The Earth Forum Kyoto; International Symposium

Date: 11 February 2020
Venue: Kyoto International Conference Center

10. The Earth Hall of Fame KYOTO

The Earth Forum Kyoto invites world-renowned experts and activists to discuss the environmental and cultural bases of more responsible human societies. The Earth Hall of Fame Kyoto Award is given to those who have made exemplary contributions to the protection of the global environment. Organizers of the event are the International Institute for Advanced Studies, the Kyoto International Conference Centre, and RIHN.

The 11th Inductees:

IPCC: Intergovernmental Panel on Climate Change (International Governmental Organization based on UNEP and WMO)
Mary Robinson (The seventh President of Ireland/ Former United Nations High Commissioner for Human Rights)

11. RIHN Seminars

RIHN Seminars are invited talks by esteemed Japanese or foreign researchers. The seminars provide opportunities for RIHN scientists to learn of the latest topics and research directions in a variety of fields; they also often are a first step toward future research collaborations between RIHN researchers and those of other institutions. Seminars are held several times a year.

169th 8 May 2019 at RIHN Lecture Hall
Agroecology and the transition to sustainable, resilient food systems
Prof. Miguel Altieri (Invited Scholar, RIHN /Emeritus Professor, University of California, Berkeley)
Pathways for the amplification of agroecology
Dr. Clara Nicholls (Visiting Research Fellow, RIHN /Lecturer, University of California, Berkeley)

170th 30 May 2019 at RIHN Lecture Hall
Establishing, quantifying and monitoring connectivity in hydrological systems using stable isotope
Gabriel J Bowen (Professor, University of Utah)

171st 5 June 2019 at RIHN Lecture Hall
Traditional agricultural systems and 'agroecological lighthouses': testing two strategies in Japan
Dr. Clara Nicholls (Visiting Research Fellow, RIHN /Lecturer, University of California, Berkeley)
Agroecology: a systemic perspective on the links between agriculture, biodiversity, and health
Prof. Miguel Altieri (Invited Scholar, RIHN /Emeritus Professor, University of California, Berkeley)

172nd 17 July 2019 at RIHN Seminar Rooms 3 & 4
Digital foodscapes and the cultural politics of healthy eating
Christine Barnes (RIHN Visiting Research Fellow / Teaching Fellow, King's College London)

173rd 22 August 2019 at RIHN Lecture Hall
What contributes to growing body size in rural China? -- A preliminary result
Lin Lin (RIHN Visiting Research Fellow / Senior Lecturer Department of Urban Planning and Design, Xi'an Jiaotong)

174th 10 September 2019 at RIHN Lecture Hall
Socio-Environmental Dynamics in the Prehispanic Pueblo Southwest: Climate Change, Conflict, and Inequality
Timothy A. Kohler (RIHN Invited Scholar / Professor, Department of Anthropology, Washington State University)

175th 18 September 2019 at RIHN Seminar Rooms 3 & 4
Historical and Global Perspectives on Multi-level Water Governance in China
Roy Bin Wong (RIHN Invited Scholar / Distinguished Professor, UCLA)

176th 23 October 2019 at RIHN Seminar Rooms 3 & 4
Highlights and Future Directives from Inter- and Transdisciplinary Research on Terrestrial and Aquatic Ecosystems across the Americas
Thomas Harmon (RIHN Invited Scholar / Professor, Department of Civil & Engineering, UC Merced)

177th 13 November 2019 at RIHN Seminar Rooms 3 & 4
Using plurisecular trajectories of the hydrosystems to improve river management
David ESCHBACH (JSPS Postdoctoral Fellowships for Research in Japan / Sorbonne University, METIS Laboratory, Paris)

178th 19 November 2019 at RIHN Lecture Hall
Making Archaeology Relevant Today: Three Strategies
Timothy Kohler (RIHN Invited Scholar / Professor, Department of Anthropology, Washington State

University)

179th 21 November 2019 at RIHN Seminar Rooms 3 & 4
Large Lakes & Livelihoods: Proposing a Global Experiment on Participatory Research as a Foundation for Shared Governance
Thomas Harmon (RIHN Invited Scholar / Professor, Department of Civil & Engineering, UCMerced)

180th 25 February 2020 at RIHN Seminar Rooms 3 & 4
A study of public policies on peatland management and its limits in the process of implementation
Rafiani Hasyim (Visiting Research Fellow/Head Division Environmental Governance･Environmental Agency of Bengkalis Regency, Riau Province, Indonesia)

12. Lunch Seminars (Danwakai)

Lunch Seminars allow all RIHN research staff, including visiting professors, part-time researchers, foreign researchers and so on, to freely present their individual research to their colleagues in an informal and supportive forum. As these seminars promote creative thinking and constructive debates, they are held on a biweekly basis.

302nd 16 July 2019
Sustainable resource management through Multi-scale Water-Energy-Food Nexus
Sanghyun Lee (Researcher, Research Department)

303th 6 August 2019
What I've gained from the experience of working with refugees
SOUDA Katsuya (Researcher, RIHN Center)

304th 20 August 2019
The Biwa Lake canal and local residents
ODA Kimisato (Researcher, Research Department)

305th 1 October 2019
Construction of the stable transaction network by using graphs with positive Ricci curvature
YAMADA Taiki (Researcher, Research Department)

306th 29 October 2019
Downscaling in remote sensing: Recent developments
Nguyen Tien Hoang (Senior Researcher, Research Department)

307th 19 November 2019
Regional informatics: Numbers and local societies
Jemyung Lee (Researcher, Research Department)

308th 17 December 2019
Making New Home and Rejecting Inherited Home: The Rongelap People Reconstruct Their Life from Atomic Testing
NAKAHARA Satoe (Researcher, Research Department)

309th 18 February 2020
Invitation to the Visual Keyword Map of the global environmental studies
KUMAZAWA Terukazu (Associate Professor, RIHN Center)

13. RIHN General Meeting (RGM)

RIHN researcher, office staffs, and outside research collaborators gather to review the year's progress. All project leaders present their research findings and accomplishments and receive questions from the floor.

Attracting 359 attendees in its three-day duration, the annual meeting generated dialogue among RIHN researchers and improved general awareness of RIHN's progress and evolution within the larger fields of environmental research.

Date: 27 - 29 November 2019
Venue: Co-op inn Kyoto

14. Press Conferences

RIHN holds official press conferences in order to release information on its academic activities, research projects, symposia, publications and latest environmental findings. As a public institution with a public mandate, such activities provide an important link between RIHN and the citizenry. In fiscal 2019, One press conference was held as below.

The 1st Press Conference in FY2019
Date: 25 October 2019
Venue: Heartpia-Kyoto, AV room

15. Publications

15-1 RIHN Science Series

"East Himalaya: Civilization of affluence without cities"
Edited by ANDO Kazuo (in Japanese)

15-2 Others

"SOCIAL SUSTAINABILITY, PAST AND FUTURE: Undoing Unintended Consequences for the Earth's Survival"
Edited by Sander E. van der Leeuw

"Mountains, water and people"
Designed by Risa Shimauchi, Edited by Risa Shimauchi, Minami Nakai, Koichi Ando, Masako Senda and others

15-3 RIHN News: Humanity & Nature Newsletter

This periodical communicates RIHN identity and latest news to specific research communities. The newsletter is published in an A4 format with easy-to read content. Issues 77-80 were published in fiscal year 2019.

Individual Achievements

A	ABE Ken-ichi	Professor
	AIBA Masahiro	Specially Appointed Assistant Professor
	ALTIERI Miguel Angel	Invited Scholar
	ARAKI Hikaru	Research Associate
B	BABA Takeshi	Visiting Professor
D	DOI Minako	Research Associate
E	ENDO Aiko	Visiting Associate Professor
	ESCHBACH David	Visiting Researcher
F	FARABI-ASL Hadi	Researcher
	FRY Jacob Redman	Senior Researcher
	FUJII Shigeo	Visiting Professor
	FUJISAWA Natsuho	Researcher
	FUJIYOSHI Rei	Researcher
G	GRACE Wong	Visiting Associate Professor
H	HABU Junko	Visiting Professor
	HARAGUCHI Takashi	Visiting Researcher
	HARMON Thomas Christopher	Invited Scholar
	HAYASHI Hiroaki	Visiting Professor
	HAYASHI Koji	Researcher
	HAYASHIDA Sachiko	Professor
	HOMMA Saki	Research Associate
	HUANG Wanhui	Researcher
I	IKEYA Tohru	Researcher
	ISHIBASHI Hiroyuki	Researcher
	ISHIDA Takuya	Researcher
	ISHII Reiichiro	Associate Professor
	ISHIKAWA Satoshi	Visiting Professor
	ITO Keisuke	Visiting Researcher
	IWASAKI Yumiko	Research Associate
J	JIANG Hong-wei	Research Fellow NIHU for Area Studies
K	KAJITA Ryosuke	Researcher
	KANDPAL Richa	Research Associate
	KANEMOTO Keiichiro	Associate Professor
	KANIE Norichika	Visiting Professor
	KATSURA Tomomi	Research Associate
	KASUGA Fumiko	Visiting Professor
	KATAFUCHI Yuya	Research Associate
	KARATSU Fukiko	Research Associate
	KAWASAKI Masahiro	Visiting Professor
	KIKUCHI Naoki	Visiting Professor
	KIM Satbyul	Research Fellow NIHU for Area Studies
	KIMIJIMA Satomi	Researcher
	KIMURA Aoi	Research Associate
	KIMURA Ayako	Research Associate
	KOBASHI Takuro	Visiting Associate Professor
	KOBAYASHI Kunihiko	Researcher
	KOBAYASHI Mai	Researcher
	KOBAYASHI Yuko	Research Associate
	KOHLER Timothy Alan	Invited Scholar
	KONDO Yasuhisa	Associate Professor

	KOZAN Osamu	Associate Professor
	KUANG Xiaoxu	Researcher
	KUMAZAWA Terukazu	Associate Professor
	KURATA Junko	Research Associate
	KUSAGOU Takayoshi	Visiting Professor
L	LAMBINO Ria Adoracion Apostol	Specially Appointed Associate Professor
	LEE Jemyung	Researcher
	LEE Sanghyun	Researcher
M	MALLEE Hein	Professor
	MANAGI Shunsuke	Visiting Professor
	MASUHARA Naoki	Senior Researcher
	MATSUMOTO Tae	Associate Professor
	MATSUMOTO Takuya	Visiting Researcher
	MATSUOKA Yuko	Research Associate
	MCGREEVY Steven Robert	Associate Professor
	MIMURA Yutaka	Researcher
	MIZUNO Kosuke	Visiting Professor
	MOREAU Yoann	Visiting Associate Professor
	MYO Han THUN	Research Associate
N	NAKAHARA Satoe	Researcher
	NAKAI Minami	Research Associate
	NAKAO Seiji	Specially Appointed Assistant Professor
	NAKASHIZUKA Tohru	Specially Appointed Professor
	NAKATSUKA Takeshi	Visiting Professor
	NGUYEN Tien Hoang	Senior Researcher
	NILES Daniel Ely	Associate Professor
	NITZCHE Kai Nils	Researcher
O	ODA Kimisato	Researcher
	OH Tomohiro	Visiting Researcher
	OKA Masami	Research Associate
	OKABE Akiko	Visiting Professor
	OKADA Saeko	Associate Professor
	OKAMOTO Takako	Research Associate
	OKUDA Noboru	Associate Professor
	ONISHI Yuko	Assistant Professor
	OSAWA Takamasa	Researcher
	OHTA Kazuhiko	Researcher
R	RUPPRECHT Christoph David Dietfried	Senior Researcher
S	SAIJO Tatsuyoshi	Specially Appointed Professor
	SAKAKIBARA Masayuki	Professor
	SENDA Masako	Research Associate
	SHAHRIER Shibly	Researcher
	SHIBATA Akira	Visiting Professor
	SHIMADA Nahoko	Researcher
	SHIMAUCHI Risa	Research Associate
	SHIMIZU Takao	Researcher
	SHIN Ki-Cheol	Associate Professor
	SHINKAI Rika	Researcher
	SHIODERA Satomi	Researcher
	SHIRAI Yuko	Researcher

	SOUDA Katsuya	Researcher
	SPIEGELBERG Maximilian	Researcher
	SUDA Masashi	Visiting Researcher
	SUETSUGU Satoko	Research Associate
	SUGIHARA Kaoru	Specially Appointed Professor
	SUGIMOTO Hayato	Research Associate
T	TAHERZADEH Ahrash	Senior Researcher
	TAKATA Shoko	Research Associate
	TAKEHARA Mari	Research Associate
	TAKESHIMA Hirohiko	Visiting Researcher
	TAKEUCHI Kiyoshi	Visiting Associate Professor
	TAMURA Norie	Senior Researcher
	TANAKA Ueru	Visiting Professor
	TANIGUCHI Makoto	Professor
	TAYASU Ichiro	Professor
	TERADA Masahiro	Visiting Associate Professor
U	UEDA Sachiko	Research Associate
	UEHARA Yoshitoshi	Researcher
W	WAKAMATSU Hisanori	Specially Appointed Assistant Professor
	WANG-ERLANDSSON Lan	Visiting Researcher
	WATANABE Kazuo	Visiting Associate Professor
	WATANABE Kirie	Research Associate
	WIN Thiri Kyaw	Researcher
	WONG Roy Bin	Invited Scholar
Y	YABUSAKI Shiho	Researcher
	YAMADA Taiki	Researcher
	YAMAMOTO Aya	Research Associate
	YAMANAKA Manabu	Senior Researcher
	YAMAUCHI Taro	Professor
	YASUDA Akiko	Research Associate
	YASUNARI Tetsuzo	Director-General
	YONEMOTO Shohei	Visiting Professor
	YOSHIDA Takehito	Associate Professor
	YOSHIMIZU Chikage	Researcher
	YUZEN Natsuko	Research Associate

AIBA Masahiro

Specially Appointed Assistant Professor

—Achievements—

[Papers]

[Original Articles]

・Tatsuro Nakaji, Hiroyuki Oguma, Masahiro Nakamura, Panida Kachina, Lamthai Asanok, Dokrak Marod, Masahiro Aiba, Hiroko Kurokawa, Yoshiko Kosugi, Abdul Rahman Kassim, Tsutom Hiura 2019,11 Estimation of six leaf traits of East Asian forest tree species by leaf spectroscopy and partial least square regression. *Remote Sensing of Environment* 233:111381. DOI:10.1016/j.rse.2019.111381 (reviewed).

FARABI-ASL Hadi

Researcher

—Achievements—

[Papers]

[Original Articles]

・Andrew Chapman, Kenshi Itaoka, Hadi Farabi-Asl, Yasumasa Fujii, Masaru Nakahara 2020,02 Societal penetration of hydrogen into the future energy system: Impacts of policy, technology and carbon targets. *International Journal of Hydrogen Energy* 45(7):3883-3898. DOI:10.1016/j.ijhydene.2019.12.112 (reviewed).

[Research Presentations]

[Invited Lecture / Honorary Lecture / Panelist]

・Hadi Farabi-Asl Impacts of CCS: domestic energy model. CO2 management in energy transition, 2020.01.31-2020.01.31, Kyushu University.

・Hadi Farabi-Asl Energy systems analysis under deep-decarbonization constraints. 5th International Exchange and Innovation Conference on Engineering & Sciences, 2019.10.24-2019.10.25, Kyushu University, Japan. Keynote speaker at the second day of conference

FUJIYOSHI Lei

Researcher

Born in 1985.

[Academic Career]

Faculty of Fisheries Science, Hokkaido University, Bachelor (2010)

Course in Geochemistry, Division of Earth System Science, Graduate School of Environmental Science, Hokkaido University, M.Course (2012)
Course in Geochemistry, Division of Earth System Science, Graduate School of Environmental Science, Hokkaido University, D.Course (2017)

[Professional Career]

Assistant Technical Staff, Field Science Center, Faculty of Agriculture, Yamagata University (2017)

[Higher Degrees]

D.Sc(Hokkaido University,2017)
M.Sc(Hokkaido University,2012)

[Fields of Specialization]

Environmental Science using Isotopes

—Achievements—

[Papers]

[Original Articles]

- Lei Fujiyoshi, Atsuko Sugimoto, Youhei Yamashita, Xiaoyang Li 2019 Influence of soil N availability on the difference between tree foliage and soilδ15N from comparison of Mongolia and northern Japan. *Ecological Indicators* 101:1086-1093. DOI:10.1016/j.ecolind.2018.09.055 (reviewed).
- Ayako Enta, Mika Hayashi, Maximo Larry Lopez Caceres, Lei Fujiyoshi, Akira Oikawa, Felix Seidel 2019 Nitrogen resorption and fractionation during leaf senescence in typical tree species in Japan. *Journal of Forestry Research*. DOI:10.1007/s11676-019-01055-z (reviewed).
- Lei FUJIYOSHI, Takeshi NISHIMURA, Takaaki KATO, and Ichiro TAYASU 2019 Residents' Understanding of and Interest in Isotope Techniques for Groundwater Conservation: A Study of Symposium Participants in Oshino Village, Yamanashi Prefecture. *Papers on Environmental Information Science* 33:133-138. DOI:10.11492/ceispapers.ceis33.0_133 (in Japanese) (reviewed).

[Research Presentations]

[Oral Presentation]

- Lei Fujiyoshi, Ichiro Tayasu, Shiho Yabusaki, Takashi F. Haraguchi, Chikage Yoshimizu, Kenichi Ohkushi, Fumiko Furukawa, Masayuki Itoh, Yudai Yamamoto, Tadashi Yokoyama, Hiromune Mitsuhashi Dynamics of sulfate and nitrate inferred from stable isotope techniquesin Chikusa river watershed, Hyogo Prefecture. Japan Geoscience Union Meeting, 2019.05.26-2019.05.30, Makuhari Messe, Chiba, Japan.
- Lei FUJIYOSHI, Takeshi NISHIMURA, Takaaki KATO, and Ichiro TAYASU Residents' Understanding of and Interest in Isotope Techniques for GroundwaterConservation: A Study of Symposium Participants in Oshino Village, YamanashiPrefecture. Annual meeting of Environmental Information Science in 2019, 2019.11.27-2019.11.27, Nihon University Hall,Tokyo,Japan. (in Japanese)
- Fujiyoshi L, Tayasu I, Yabusaki S, Haraguchi T, Yoshimizu C, Ohkushi K, Furukawa F, Itoh M, Yamamoto Y, Yokoyama Y, Mitsuhashi H Contrasting seasonal dynamics of nitrate and sulfate in Chikusa River watershed, Hyogo, Japan. The 67th ANNUAL MEETING OF THE ECOLOGICAL SOCIETY OF JAPAN, 2020.03.04-2020.03.08, Meijo University Tempaku Campus. (in Japanese)

[Poster Presentation]

- Christoph RUPPRECHT, Lei FUJIYOSHI, Steven MCGREEVY, Ichiro TAYASU Trust me? Consumer trust in expert information on food product labels. 1st ISO-FOOD International Symposium on Isotopic and Other Techniques in Food Safety and Quality, 2019.04.01-2019.04.03, Grand Hotel Bernardin, Piran, Slovenia.
- Fujiyoshi L, Tayasu I, Yabusaki S, Haraguchi T, Yoshimizu C, Ohkushi K, Furukawa F, Itoh M, Yamamoto Y, Yokoyama Y, Mitsuhashi H Contrasting seasonal dynamics of nitrate and sulfate in Chikusa River watershed, Hyogo, Japan. The 9th Symposium on Environmental Isotope Study, 2019.12.20-2019.12.20, Research Institute for Humanity and Nature. (in Japanese)

HAYASHIDA Sachiko

Professor

Born in 1957.

—Achievements—

[Papers]

[Original Articles]

- Kajino, M., S.Hayashida, T. Sekiyama, M. Deushi, K. Ito, and X. Liu 2019,12 Detectability assessment of a satellite sensor for lower tropospheric ozone responses to its precursors emission changes in East Asian summer. *Scientific Reports* 9(19629(2019)). DOI:10.1038/s41598-019-55759-7 (reviewed).
- Kim, J., U. Jeong, M-H. Ahn, J. H. Kim, R. J. Park, H. Lee, C.H. Song, Y-S. Choi, K-H. Lee, J-M. Yoo, M-J. Jeong, S. K. Park, K-M. Lee, C-K. Song, S-W. Kim, Y-J. Kim, S-W. Kim, M. Kim, S. Go, X. Liu, K. Chance, C. C. Miller, J. Al-Saadi, B. Veihelmann, P. K. Bhartia, O. Torres, G. G. Abad, D. P. Haffner, D. H. Ko, S. H. Lee, J-H. Woo, H. Chong, S. S. Park, D. Nicks, W. J. Choi, K-J. Moon, A. Cho, J-M. Yoon, S-K. Kim, H. Hong, K. Lee, H. Lee, S. Lee, M. Choi, P. Veefkind, P. Levelt, D. P. Edwards, M. Kang, M. Eo, J. Bak, K. Baek, H-A. Kwon, J. Yang, K. M. Han, B. Kim, H-W. Shin, H. Choi, E. Lee, J. Chong, Y. Cha1, Ja-Ho Koo, H. Irie, S. Hayashida, Y. Kasai, Y. Kanaya, C. Liu, J. Lin, J. H. Crawford, G. R. Carmichael, M. J. Newchurch, B. L. Lefer, R. J. Swap, A. K H Lau, T. P. Kurosu, G. Jaross, B. Ahlers, M. Dobber, T. McElroy, Y. Choi 2019,08 New Era of Air Quality Monitoring from Space: Geostationary Environment Monitoring Spectrometer (GEMS). *Bulletin of the American Meteorological Society*. DOI:10.1175/BAMS-D-18-0013.1 (reviewed).
- Gupta, A., S. K. Dhaka, Y. Matsumi, R. Imasu, S. Hayashida and V. Singh 2019,06 Seasonal and annual variation of AIRS retrieved CO2 over India during 2003–2011. *Journal of Earth System Science* 128(4):92. DOI:10.1007/s12040-019-1108-7 (reviewed).

[Research Presentations]

[Oral Presentation]

- Hayashida, S. Keynote Speech ; Aakash Project : Challenge toward Clean Air, Public Health and Sustainable Agriculture. the 4th World Association of Soil and Water Conservation (WASWAC) Conference, 2019.11.05-2019.11.09, Delhi, India.

[Poster Presentation]

- Hayashida, S., Y. Matsumi, K. Yamaji, M. Kajino, P. K. Patra, and Aakash project members New project “Aakash” aiming at reduction of crop-residue burning in North India: interdisciplinary approach toward clean air, public health and sustainable agriculture. 4th Atmospheric Composition and the Asian Monsoon(ACAM) Workshop, 2019.06.26-2019.06.28, Malaysia.

IKEYA Tohru

Researcher

[Academic Career]

Graduate School of Science, The University of Tokyo(1992)

Graduate School of Environmental Sciences, University of Tsukuba(1987)

College of Biological Sciences, University of Tsukuba(1985)

[Professional Career]

JSPS-Post-doctral Fellow, Division of bioenergetics, National Institute for Basic Biology, Okazaki, Japan（1992）

Research Scientist, Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokosuka, Japan（1994）

Research Promotion Technician, National Institute of Polar Research, Tokyo, Japan（1998）

Assistant Researcher, Department of Systems Science, The University of Tokyo, Tokyo, Japan（1999）
Research Associate, Department of Life Sciences, Graduate school of Arts and Sciences, The University of Tokyo, Tokyo, Japan（2003）
Postdoctoral Researcher, Ocean Research Institute, The University of Tokyo, Tokyo, Japan（2006）
Joint industry-university project researcher, Ocean Research Institute, The University of Tokyo, Tokyo, Japan（2007）
Project researcher, Ocean Research Institute, The University of Tokyo, Tokyo, Japan（2008）
Project researcher, Atmosphere and Ocean Research Institute The University of Tokyo, Kashiwa, Japan（2010）
Project researcher, Department of Biological Sciences, Graduate School of Science, The University of Tokyo, Tokyo, Japan（2014）
Joint industry-university project researcher, Faculty of Environment & Information Sciences Yokohama National University, Japan（2014）

[Higher Degrees]

Ph.D.(The University of Tokyo, 1992)
M.A. (University of Tsukuba, 1986)

[Fields of Specialization]

Aquatic ecology, Environmental Sciences

[Academic Society Memberships]

Botanical Society of Japan
Ecological Society of Japan
Deep ocean water Applications Society
Association for the Sciences of Limnology and Oceanography
Nature Restoration and Conservation Society, Japan
Japanese Society of Environmental Education
The Plankton Society of Japan
The Japanese Society of Limnology
Japan Geoscience Union

[Awards]

Early Career Travel Grant for the Joint Aquatic Sciences Meeting 2014 in Portland, Oregon (Association for the Science of Limnology and Oceanography)

—Achievements—

[Papers]

[Original Articles]

- Elfritzson M. Peralta, Alexis E. Belen, Gelsie Rose Buenaventura, Francis Godwin G. Cantre, Katharine Grace R. Espiritu, Jana Nicole A. De Vera, Cristine P. Perez, Aleziz Kryzzien V. Tan, Irisse Bianca B. De Jesus, Paul Palomares, Jonathan Carlo Briones, Tohru Ikeya, Francis S. Magbanua, Rey Donne S. Papa, and Noboru Okuda 2019,07 Stream benthic macroinvertebrate assemblages reveal the importance of a recently established freshwater protected area in a tropical watershed. *Pacific Science* 73(3):305-320. DOI:10.2984/73.3.1 (reviewed).
- Ishida, T., Y. Uehara, T. Iwata, A. P. Cid-Andres, S. Asano, T. Ikeya, K. Osaka, J. Ide, O. L. A. Privaldos, I. B. B. De Jesus, E. M. Peralta, E. M. C. Triño, C. Ko, A. Paytan, I. Tayasu, N. Okuda 2019,04 Identification of phosphorus sources in a watershed using a phosphate oxygen isoscape approach. *Environmental Science & Technology* 53(9):4707-4716. DOI:10.1021/acs.est.8b05837 (reviewed).

[Research Presentations]

[Oral Presentation]

- Gregorio, J.N., E. M. Peralta, I. B. B. de Jesus, T. Ikeya, J. C. A. Briones, R. D. S. Papa, F. S. Magbanua, N. Okuda Benthic macroinvertebrate assemblages and water quality reflect the impacts of land use and land cover in Marikina Watershed, Philippines. Japan Geoscience Union Meeting 2019, 2019.05.26-2019.05.30, Makuhari Messe, Chiba, Japan.

・Peralta, E. M., L. S. Batucan Jr., A. E. Belen, I. B. B. De Jesus, T. Ishida, C-Y. Ko, Y. Kobayashi, T. Ikeya, Y. Uehara, T. Iwata, A. S. Borja, J. C. A. Briones, F. S. Magbanua, R. D. S. Papa, N. Okuda Multiple stressors and protection efforts in highly urbanized watersheds in the Philippines. Japan Geoscience Union Meeting 2019, 2019.05.26-2019.05.30, Makuhari Messe, Chiba, Japan.

・Ikeya, T., T. Ishida, Y. Uehara, S. Asano, I. Tayasu, N. Okuda, M. Ushio, S. Fujinaga, C-Y. Ko, E. M. Peralta, N. F. Ishikawa, T. Iwata The analysis of the community composition of riverine bacteria and microalgae in relation to nutrient status and diversity: the case in irrigation season in the Yasu River, Japan. Japan Geoscience Union Meeting 2019, 2019.05.26-2019.05.30, Makuhari Messe, Chiba, Japan.

KAJITA Ryosuke

Researcher

Born in 1989.

[Academic Career]

Faculty of Foreign Language, Osaka University (2012)

Graduate School of Asian and African Area Studies, Kyoto University (2017)

[Professional Career]

Researcher, Center for Southeast Asian Studies, Kyoto University (2017)

Researcher, Research Institute for Humanity and Nature (2017)

[Higher Degrees]

Master Degree of Area Studies (Kyoto University, 2014)

Doctoral Degree of Area Studies (Kyoto University, 2017)

[Fields of Specialization]

Area Studies

[Academic Society Memberships]

Japan Society for Natural Disaster Science

—Achievements—

[Papers]

[Original Articles]

・T.Osawa, R.Kajita 2020,03 News of Indonesian fires in 2019. *Newsletter, Toward the Regeneration of Tropical Peatland Societies Project*(8):8-10.

・R Kajita 2019,11 Historical precipitation data in Sumatra and Kalimantan from 1879 to 1900, by using Dutch colonial materials. *IOP Conference Series: Earth and Environmental Science* 361(012003):1-13. DOI:10.1088/1755-1315/361/1/012003 (reviewed).

・KAJITA, R. 2019,05 Reconstruction of Historical Rainfall Records at 24 Observation Stations in Sumatera, 1879-1900. *Discussion Paper Series, Tropical Peatland Society Project*(7):1-20. (in Japanese)

[Research Presentations]

[Poster Presentation]

・Ryosuke Kajita Reconstruction of seismic and eruption records from colonial Indonesian materials (植民地期インドネシアにおける災害史料を用いた地震・火山噴火記録の復元). Research Forum for The Overseas Scientific Research Coordination Team, 2019.07.06, Research Institute for Languages and Cultures of Asia and Africa, Tokyo University of Foreign Studies. (in Japanese)

[Invited Lecture / Honorary Lecture / Panelist]

・Ryosuke Kajita Peatland Fire and Haze in Indonesia -Introduction of Project Research-. Introduction of RIHN with Sarawak University, 2019.11.20, Research Institute for Humanity and Nature.

KANEMOTO Keiichiro

Associate Professor

[Awards]

Encouragement Prize of sustainability study with a global multiregional input-output model at the 11th LCA Japan Forum Awards for 2020

Highly Cited Researcher in the field of Cross-Field, Clarivate Analytics, 2019

Highly Cited Researcher in the field of Cross-Field, Clarivate Analytics, 2018

Outstanding Reviewer Awards for Environmental Research Letters, IOP Publishing, 2018

—Achievements—

[Papers]

[Original Articles]

・Keisuke Nansai, Susumu Tohno, Satoru Chatani, Keiichiro Kanemoto, Midori Kurogi, Yuta Fujii, Shigemi Kagawa, Yasushi Kondo, Fumiya Nagashima, Wataru Takayanagi, Manfred Lenzen. 2020,01 “Affluent countries inflict inequitable mortality and economic loss on Asia via PM2.5 emissions”. *Environment International* 134(105238). DOI:10.1016/j.envint.2019.105238 (reviewed).

・Keiichiro Kanemoto, Daniel Moran, Yosuke Shigetomi, Christian Reynolds, Yasushi Kondo. 2019,12 “Meat consumption does not explain differences in household food carbon footprints in Japan”. *One Earth* 1(4):464-471. DOI:10.1016/j.oneear.2019.12.004 (reviewed).

[Review Articles]

・Keiichiro Kanemoto, Daniel Moran. 2019,09 “Carbon Footprint Accounting for the Rising Global South: Status and Opportunities”. *One Earth* 1(1):35-38. DOI:10.1016/j.oneear.2019.08.006

[Research Presentations]

[Oral Presentation]

・Diana Sietz, Monika Wulf, Ana Paula Aguiar, Odirilwe Selomane, Thomas Hickler, Aidin Niamir, Daniel Müller, Ruth Delzeit, Anke Frank, Andy Purvis, Samantha Hill, Adriana de Palma, Prajal Pradhan, Daniel Moran, Keiichiro Kanemoto, Livia Schäffler, Kirsten Thonicke. “Mapping global land-based opportunities and challenges to simultaneously achieve biodiversity and food security”. Kosmos Conference Navigating the Sustainability Transformation in the 21st Century, 2019.08.28-2019.08.30, Berlin, Germany.

・Keiichiro Kanemoto. “Tracking Products and the Environment”. RIHN 14th International Symposium, Fair Use of Multiple Resources in Cross-Scale Context, 2019.07.11-2019.07.12, Kyoto, Japan.

・Keisuke Nansai, Susumu Tohno, Satoru Chatani, Keiichiro Kanemoto, Shigemi Kagawa, Yasushi Kondo. “PM2.5-driven economic losses generated by the global trade”. The 10th International Conference on Industrial Ecology, 2019.07.07-2019.07.11, Beijing, CHINA.

・Daniel Moran, Keiichiro Kanemoto, Thomas Wiedmann, Peter-Paul Pichler, Johannes Tobben. “Spatial Demand Modeling: Calculating the Carbon Footprint of 13,000 Cities in the BYMARKA Project”. The 10th International Conference on Industrial Ecology, 2019.07.07-2019.07.11, Beijing, CHINA.

・Tesshu Hanaka, Keiichiro Kanemoto, Shigemi Kagawa. “Structural Similarity Analysis based on the Network Characteristics of Sectors”. The 27th International Input-Output Conference, July 2019, Glasgow, Scotland.

・Keiichiro Kanemoto, Tesshu Hanaka. “Edge Clustering for Supply Chain Networks”. The 27th International Input-Output Conference, July 2019, Glasgow, Scotland.

KONDO Yasuhisa

Associate Professor

Born in 1979.

[Academic Career]

Department of Archaeology, The University of Tokyo, PhD course (2006-2009)

Department of Archaeology, The University of Tokyo, master course (2002-2005)

Department of Archaeology, The University of Tokyo, undergraduate course (1998-2002)

[Professional Career]

Member, Science Council of Japan (2020)

Part-time Lecturer, Doshisha Women's College of Liberal Arts (2019)

Visiting Research Fellow, National Institute of Science and Technology Policy (2016)

Associate Professor, Research Institute for Humanity and Nature (2014)

JSPS Research Fellow (PD), Tokyo Institute of Technology (2011)

Project Researcher, The University Museum, The University of Tokyo (2010)

Visiting Scholar, Center for Spatial Information Science, The University of Tokyo (2010)

JSPS Research Fellow (PD), The University of Tokyo (2009)

JSPS Research Fellow (DC2), The University of Tokyo (2008)

[Higher Degrees]

D.Litt. (The University of Tokyo, 2010)

M.A. (The University of Tokyo, 2005)

[Fields of Specialization]

Open Science

Geographical Information Science

Archaeology

[Academic Society Memberships]

International Association of Geomorphologists

Computer Applications and Quantitative Methods in Archaeology (CAA)

CIPA Heritage Documentation

European Geosciences Union (EGU)

Japan Geoscience Union (JpGU)

GIS Association of Japan (GISA)

The Association of Japanese Geographers (AJG)

Anthropological Society of Nippon

Society of Archaeological Studies

Japan Society for West Asian Archaeology (JSWAA)

Japanese Palaeolithic Research Association (JPRA)

Japan Consortium for International Cooperation in Cultural Heritage

Japan Society for Research Policy and Innovation Management (JSRPIM)

[Awards]

Kurita Water and Environmental Research Award (2016)

CSIS DAYS 2011 Presentation Award (2011)
Japanese Society for Archaeological Informatics Katata Award (2008)

—Achievements—

[Papers]

[Original Articles]

- Yasuhisa Kondo, Akihiro Miyata, Ui Ikeuchi, Satoe Nakahara, Ken'ichiro Nakashima, Hideyuki Ōnishi, Takeshi Osawa, Kazuhiko Ota, Kenichi Sato, Ken Ushijima, Bianca Vienni Baptista, Terukazu Kumazawa, Kazuhiro Hayashi, Yasuhiro Murayama, Noboru Okuda, Hisae Nakanishi 2019,10 Interlinking open science and community-based participatory research for socio-environmental issues. *Current Opinion in Environmental Sustainability* 39:54-61. DOI:10.1016/j.cosust.2019.07.001 (reviewed).
- Takehiro Miki, Taichi Kuronuma, Yasuhisa Kondo 2019,09 Burial landscape of Bāt during the Um An Nar Period: Reconsideration through spatial statistics. *The Journal of Oman Studies* 20:48-77. (reviewed).

[Research Presentations]

[Oral Presentation]

- Yasuhisa Kondo, Akihiro Miyata, Ui Ikeuchi, Satoe Nakahara, Ken’ichiro Nakashima, Hideyuki Onishi, Takeshi Osawa, Kazuhiko Ota, Kenichi Sato, Ken Ushijima, Bianca Vienni Baptista, Terukazu Kumazawa, Kazuhiro Hayashi, Yasuhiro Murayama, Noboru Okuda, Hisae Nakanishi Interlinking open science to team-based action research for socio-environmental cases. INSciTS 2019, 2019.05.20-2019.05.23, Lansing Center, Lansing, MI, USA.
- Yasuhisa Kondo Ethical issues in open science. Japan Geoscience Union Annual Meeting 2019, 2019.05.20-2019.05.26, Makuhari Messe Chiba, Japan.
- Yasuhisa Kondo, Yoko Iwamoto Network analysis of an archaeological research project: A graphical monitoring of the developing interdisciplinary co-authorship of the PaleoAsia project. 47th annual conference of Computer Application and Quantitative Methods in Archaeology, 2019.04.23-2019.04.27, Jagiellonian University, Krakow, Poland.

[Poster Presentation]

- Yasuhisa Kondo, Hideyuki Onishi, Ui Ikeuchi, Ken'ichiro Nakashima On-site survey on the research mind-set of researchers from different fields in the PaleoAsia Project. The 7th Conference on Cultural History of PaleoAsia, 2019.05.11-2019.05.12, Nagoya University, Nagoya, Japan. (in Japanese)
- Yasuhisa Kondo, Takehiro Miki, Taichi Kuronuma, Hiroyuki Kitagawa Test excavations and dating of Wadi Tanuf Cave 1 in the interior of Oman. The 7th Conference of Cultural History of PaleoAsia, 2019.05.11-2019.05.12, Nagoya University, Nagoya, Japan.

KUANG Xiaoxu

Researcher

Born in 19881017.

[Academic Career]

Jilin Institute of Chemical Technology, China(2013)
Department of Graduate School of Science and Engineering, Yamagata University, M.Course(2016)
Department of Graduate School of Science and Engineering, Yamagata University, Ph.D.Course(2019)

[Professional Career]

Research Institute for Humanity and Nature(2019)

[Higher Degrees]
D.Eng(Yamagata University, 2019)

[Fields of Specialization]
Materials chemistry

[Academic Society Memberships]
Japan Society of Material Cycles and Waste Management

—Achievements—

[Research Presentations]

[Oral Presentation]

- Xiaoxu Kuang Solidification/Stabilization of F, B, As, Cr (VI) From Solid Wastes Using Metal Salt Inhibitors, Portland Cement and Crushed Stone Powder. 2nd ASEAN - Japan Meeting Point of Collaboration by Stakeholders and Researchers for Reducing Environmental Problems in ASEAN Countries, 2019.12.11-2019.12.11, Nay Pyi Taw, Myanmar.
- Xiaoxu Kuang Sustainable approach for recycling crushed stone powder for the removal of hazardous Ions (F, B, As, Cr(VI)) from solid wastes. 2019 Korea-Japan-Taiwan Joint Geoscience Symposium, 2019.10.14-2019.10.18, Busan, Korea.

KUMAZAWA Terukazu

Associate Professor

Born in 1974.

[Higher Degrees]
Dr of Engineering

[Fields of Specialization]
Environmental planning
Regional informatics

—Achievements—

[Papers]

[Review Articles]

- Aiko Endo, Makoto Yamada, Yuji Miyashita, Ryo Sugimoto, Akira Ishii, Jun Nishijima, Masahiko Fujii, Takaaki Kato, Hideki Hamamoto, Michinori Kimura, Terukazu Kumazawa, Jiaguo Qi 2020,02 Dynamics of Water–Energy–Food Nexus Methodology, Methods, and Tools, Current Opinion in Environmental Science & Health. *Current Opinion in Environmental Science & Health* 13:46-60. DOI:10.1016/j.coesh.2019.10.004 (reviewed).
- Yasuhisa Kondo, Akihiro Miyata, Ui Ikeuchi, Satoe Nakahara, Ken'ichiro Nakashima, Hideyuki Ōnishi, Takeshi Osawa, Kazuhiko Ota, Kenichi Sato, Ken Ushijima, Bianca Vienni Baptista, Terukazu Kumazawa, Kazuhiro Hayashi, Yasuhiro Murayama, Noboru Okuda, Hisae Nakanishi 2019,08 Interlinking Open Science and Community-based Participatory Research for Socio-environmental Issues. *Current Opinion in Environmental Sustainability* 39:54-61. DOI:10.1016/j.cosust.2019.07.001 (reviewed).

[Research Presentations]

[Oral Presentation]

・Yasuhisa Kondo, Akihiro Miyata, Ui Ikeuchi, Satoe Nakahara, Ken'ichiro Nakashima, Hideyuki Onishi, Takeshi Osawa, Kazuhiko Ota, Kenichi Sato, Ken Ushijima, Bianca Vienni Baptista, Terukazu Kumazawa, Kazuhiro Hayashi, Yasuhiro Murayama, Noboru Okuda, Hisae Nakanishi Interlinking open science to team-based action research for socio-environmental cases. INSciTS 2019, 2019.05.20-2019.05.23, Lansing Center, Lansing, MI, USA.

LEE Sanghyun

Researcher

—Achievements—

[Research Presentations]

[Oral Presentation]

・Masuhara, N., Lee, S. H., and Taniguchi, M. From Region to City: Downscaling issues of Water-Energy-Food Nexus in Japan. 2019 Fall meeting AGU, 2019.12.09-2019.12.13, San Francisco, US.

[Poster Presentation]

・Lee, S. H., Taniguchi, M., and Masuhara, N. Development of the multi-local system dynamics modeling for regional Water-Energy-Food Nexus based on resource-sheds management. 2019 Fall meeting AGU, 2019.12.09-2019.12.13, San Francisco, US.

・Taniguchi, M., Lee, S. H., and Masuhara, N. Multi-scale water-energy-food Nexus in Asia. 2019 Fall meeting AGU, 2019.12.09-2019.12.13, San Francisco, US.

・Lee, S. H., Taniguchi, M., and Masuhara, N. Implication of multi-scale WEF Nexus on integrated natural resource management, with a focus on holistic impacts of food security and economic growth in Japan. 2019 INWEPF-PAWEES International Conference, 2019.11.05-2019.11.07, Seoul, Korea.

・Lee, S. H., Taniguchi, M., and Masuhara, N. Analysis of regional sustainability forSDGs in Japan from the perspective onWater-Energy-Food Nexus. EGU General Assembly 2019, 2019.04.07-2019.04.12, Vienna, Austria.

MASUHARA Naoki

Senior Researcher

Born in 1974.

[Academic Career]

Department of Environmental Engineering, Faculty of Engineering, Osaka University (1997)

Department of Local Administration, Faculty of Politics, Waseda University, M. Course (2000)

Department of Local Administration, Faculty of Politics, Waseda University, D. Course w/o Dissertation (2007)

[Professional Career]

Researcher, Research Institute for Local Initiatives of Environmental Policy (2000)

Visiting researcher, Comprehensive Center for Environmental Research, Waseda University (2007)

Visiting researcher, Center for Regional Studies, Hosei University (2009)

Deputy Director-General, Research Institute for Local Initiatives of Environmental Policy (2011)
Project researcher, Asia Ring-of-Fire Nexus project, RIHN (2013)

[Higher Degrees]

Doctor of Engineering (Osaka University, 2017)
Master of Political Science (Waseda University, 2000)

[Fields of Specialization]

Public Administration
Local Government Studies
Environment and Energy Policy
Citizen Participation Studies

[Academic Society Memberships]

The Society of Environmental Science, Japan
The Center for Environmental Information Science

[Awards]

Encouragement award from the Society of Environmental Science, Japan (2012)
Award of excellent presentation from the Japan Association for Planning and Public Management (2017)
Award of excellent poster presentation from the Center for Environmental Information Science (2018)

—Achievements—

[Research Presentations]

[Invited Lecture / Honorary Lecture / Panelist]

・Naoki Masuhara (Panelist) Issues and possibilities for making Kyoto smart city from Water-Energy nexus perspective. Open Seminar on Kyoto Decarbonization through Smart City Development, 2019.05.13, RIHN, Kyoto City.

MCGREEVY Steven R.

Associate Professor

Born in 1978.

[Academic Career]

Division of Natural Resource Economics, Graduate School of Agriculture, Kyoto University (2008-2012)
College of Continuing Education, University of Minnesota (2002-2004)
St. John's University- Collegeville, MN (1997-2000)

[Professional Career]

Lecturer, Seisen Jogakuin College (2007)
Monbukagakusho Scholar, Graduate School of Agriculture, Kyoto University (2009)
Lecturer, Nagano National College of Technology (2011)
Assistant Professor, Research Institute for Humanity and Nature (2013~)

[Higher Degrees]

D.Ag. (Kyoto University, 2012)
M.LS. (University of Minnesota-Twin Cities, 2004)
B.A.: Major- Biology; Minor- Environmental Studies (St. John's University- Collegeville, MN, 2000)

[Fields of Specialization]

Rural Sustainable Development

Environmental Sociology

[Academic Society Memberships]

Japan Biochar Association
International Biochar Initiative
Japanese Association for Rural Studies
Rural Sociology Society
Future Earth Systems of Sustainable Consumption and Production Knowledge-Action Network

—Achievements—

[Books]

[Chapters/Sections]

- McGreevy, Steven R. & Naoki Matsudaira 2019,11 "Re-evaluating smallholders: the international situation and Japanese trends"(Shonou saihyouka no kokusaiteki jyokyo to nihon no koudou). Japanese Association for Rural Studies (ed.) Reviving smallholders (Shonou no Fukken). Annual Reports from the Japanese Association for Rural Studies, 55. Nousangyouson Bunkakyoukai, Tokyo. (in Japanese)

[Papers]

[Original Articles]

- Rupprecht, Christoph, Lei Fujiyoshi, Steven R. McGreevy, Ichiro Tayasu. 2020,02 Trust me? Consumer trust in expert information on food product labels. *Food and Chemical Toxicology*. DOI:10.1016/j.fct.2020.111170 (reviewed).
- Mangnus, Astrid, Joost M. Vervoort, Steven R. McGreevy, Kazuhiko Ota, Christoph D. D. Rupprecht, Momoe Oga, & Mai Kobayashi 2019 New pathways for governing food system transformations: a pluralistic practice-based futures approach using visioning, back-casting, and serious gaming. *Ecology and Society* 24(4):2. DOI:10.5751/ES-11014-240402 (reviewed).

[Research Presentations]

[Oral Presentation]

- McGreevy, Steven R. Introducting the FEAST Project: Lifeworlds of Sustainable Food Consumption and Production: Agrifood Systems in Transition. Special Seminar of the Faculty of Social Sciences and Humanities, 2019.12.20-2019.12.20, Mahidol University, Bangkok.
- McGreevy, Steven R. Transdisciplinary processes in the FEAST Project. RIHN Terra School, 2019.12.10-2019.12.12, Research Institute for Humanity and Nature.
- McGreevy, Steven R. Sufficiency futures worth living & how to get there: niche development, practice-based scenarios, & the social imaginary. Opening and Enacting New Futures: ASU / Future Design / FEAST Workshop on intergenerational futures, 2019.11.07-2019.11.09, Research Institute for Humanity and Nature.
- McGreevy, Steven R. Lifeworld-level scenarios: Re-crafting social practices for food in Bangkok". Opening and Enacting New Futures: ASU / Future Design / FEAST Workshop on intergenerational futures, 2019.11.07-2019.11.09, Research Institute for Humanity and Nature.
- McGreevy, Steven R. Sustainable Transitions through Food Policy Councils. Japanese Society of Contemporary and Applied Philosophy Summer School, 2019.09.15-2019.09.17, Research Institute for Humanity and Nature. (in Japanese)
- Ota, Kazuhiko, Joost Vervoort, Astrid Mangnus, Steven R. McGreevy, Kazutochi Iida, Yukihiro Tsujita, Masahiko Murakami, Michitaka Ohtani Co-creating Serious Games for Sustainability Transition: A case study of the Serious Board Game Jam 2018 in Kyoto. Digital Games Research Association DiGRA 2019, 2019.08.06-2019.08.10, Kyoto City, Ritsumeikan University.
- McGreevy, Steven R. & Kanang Kantamaturapoj "Storifying visions of future food-related social practices & mapping emergence pathways in material-competency-meaning chains: three cases from Bangkok". Global Research Forum on Sustainable Production and Consumption 2019, 2019.06.26-2019.06.29, Hong Kong, Hong Kong University of Science and Technology.

・McGreevy, Steven R. Chair (Session: "Food futures in Asia: imagining and experimenting with post-growth food procurement and consumption to redefine rural-urban linkages"). Global Research Forum on Sustainable Production and Consumption 2019, 2019.06.26-2019.06.29, Hong Kong, Hong Kong University of Science and Technology.

・McGreevy, Steven R. (Chair) Session: Changing personal and public consumption: Experiences and movements (. Global Research Forum on Sustainable Production and Consumption 2019, 2019.06.26-2019.06.29, Hong Kong, Hong Kong University of Science and Technology.

・McGreevy, Steven R. New settlers in a withering rural Japan: changing notions of the “good life” and prospects for sustainability. American Association of Geographers Annual Meeting, 2019.04.05, Washington D.C., Marriott.

[Invited Lecture / Honorary Lecture / Panelist]

・McGreevy, Steven R. Change Kameoka, change the world: Sustainable food for the post-carbon age. 31st RIHN Regional Seminar, 2020.01.19, Kameoka City, Galeria Kameoka. (in Japanese)

・McGreevy, Steven R. Making sense of the foodscape & radical food futures. Sylff Leaders Workshop, 2019.04.08, Ritsumeikan Asia Pacific University.

NAKASHIZUKA Tohru

Specially Appointed Professor

Born in 1956.

—Achievements—

[Papers]

[Original Articles]

・Yoshifuji, N., Kumagai, T., Kume, T., Tateishi, M., Inoue, Y., Aoneyama, A. & Nakashizuka, T. 2019,12 Limited stomatal regulation of the largest-size class of Dryobalanops aromatica in a Bornean tropical rainforest in response to artificial soil moisture reduction. *Journal of Plant Research*. DOI:10.1007/s10265-019-01161-3

・Imai, H., Kohsaka, R. & Nakashizuka, T. 2019,10 A multi-year investigation of the factors underlying decreasing interactions of children and adults with natural environments in japan. *Human Ecology* 47(5):717-731. DOI:10.1007/s10745-019-00108-5 (reviewed).

・Ushio M, Osada Y, Kumagai T, Kume T, Pungga R, Nakashizuka T, Itioka T, Sakai S 2019,10 Dynamic and synergistic influences of air temperature and rainfall on general flowering in a Bornean lowland tropical forest. *Ecological Research*. DOI:10.1111/1440-1703.12057 (reviewed).

・Suzuki, M., Umeki, K., Orman, O., Shibata, M., Tanaka, H., Iida, S., Nakashizuka, M. Masaki, T. 2019,08 When and why trees decrease their resource allocation to apical growth? The importance of reproductive onset. *Oecologia*. DOI:10.1007/s00442-019-04477-y (reviewed).

・Masaki, T., Nakashizuka, T., Niiyama, K., Tanaka, H., Iida, S., Bullock, J.M., Naoe, S. Shigeo Iida, James M. Bullock and Shoji Naoe 2019,08 Impact of the spatial uncertainty of seed dispersal on tree colonization dynamics in a temperate forest. *Oikos*. (reviewed).

[Research Presentations]

[Invited Lecture / Honorary Lecture / Panelist]

・Nakashizuka, T. Effects of climate change on forest ecosystems in Japan. The e-ASIA JRP Congference on Climatic Change and Natural Disaster., 2019.08.14, Vladivostok, Russia.

NITZSCHE Kai

Researcher

Born in 1987.

[Academic Career]

Humboldt University of Berlin, Doctor Course (2017)

Georg-August-University of Goettingen, Master Course (2012)

University of Bremen, Bachelor Course (2010)

[Professional Career]

Researcher, Research Institute for Humanity and Nature (2019-present)

Postdoctoral Research Fellow of the Japan Society for the Promotion of Science, Research Institute for Humanity and Nature (2017-2019)

Visiting Reseacher, National Institute for Agro-Environmental Sciences (2015-2016)

Doctoral Researcher, Leibniz Centre for Agricultural Landscape Research (2013-2016)

[Higher Degrees]

Ph.D (Humboldt University of Berlin, 2017)

MSc (Georg-August-University of Goettingen, 2012)

BSc (University of Bremen, 2010)

[Fields of Specialization]

Isotope Biogeochemistry

Isotope Environmental Science

Soil Science

Stream Ecology

[Academic Society Memberships]

Ecological Society of Japan

Japan Geoscience Union

—Achievements—

[Papers]

[Original Articles]

- Nitzsche K.N., Kato Y., Shin K.-C. and Tayasu I. 2019 Magnesium isotopes reveal bedrock impacts on stream organisms. *Science of the Total Environment* 688:243-252. DOI:10.1016/j.scitotenv.2019.06.209 (reviewed).

OKUDA Noboru

Associate Professor

Born in 1969.

[Professional Career]

Lecturer, Mie University, Department of Liberal Arts (1998)

Postdoctoral fellow, Ehime University, Department of Biology and Earth Science (1998)

Research Fellow, Ehime University, Center for Marine Environmental Studies (2002)

Associate Professor, Kyoto University, Center for Ecological Research (2005)

Invited Associate Professor, Research Institute for Humanity and Nature (2013)
Associate Professor, Research Institute for Humanity and Nature (2014)

[Higher Degrees]

B.S. (Science University of Tokyo, Department of Biological Science, 1992)
M.S. (Ehime University, Department of Biology, 1994)
Ph.D. (Kyoto University, Department of Biology, 1998)

[Academic Society Memberships]

The Ichthyological Society of Japan
The Ecological Society of Japan
Japan Ethological Society
Society of Evolutionary Studies
The Japanese Society of Fisheries Science
The Japanese Society of Limnology

[Awards]

Best Poster Award for International Symposium “Long-term Variations in the Coastal Environments and Ecosystems” held in Ehime University (2004)
Young Ichthyologist Award 2005 from The Ichthyological Society of Japan (2005)
CHED REPUBLICA AWARDS(2016)
35th Association of Systematic Biologists of the Philippines-Symposium and Annual Meeting「Taxonomic Sufficiency: Implications from ecological studies on aquatic insects in Philippine watersheds」（2017）
Ecological Research Award: Integrating isotopic, microbial, and modeling approaches to understand methane dynamics in a frequently disturbed deep reservoir in Taiwan. By Itoh, M., H. Kojima, P.-C. Ho, C.-W. Chang, T.-Y. Chen, S. S.-Y. Hsiao, Y. Kobayashi, M. Fujibayashi, S.-J. Kao, C.-h. Hsieh, M. Fukui, N. Okuda, T. Miki & F.-K. Shiah（2018）

—Achievements—

[Books]

[Chapters/Sections]

・Okuda, N., T. Takeyama, T. Komiya, Y. Kato, Y. Okuzaki, Z. Karube, Y. Sakai, M. Hori, I. Tayasu & T. Nagata 2020 A food web and its long-term dynamics in Lake Biwa: a stable isotope approach. Kawanabe, Hiroya, Nishino, Machiko, Maehata, Masayoshi (ed.) Lake Biwa: Interactions between Nature and Peoplee (2nd Edition). (Eds. Kawanabe, H. et al.). Springer Academic, Cham, pp.331-337.

[Papers]

[Original Articles]

・Ide, J., T. Ishida, A. P. Cid-Andres, K. Osaka, T. Iwata, T. Hayashi, M. Akashi, I. Tayasu, A. Paytan, N. Okuda 2020,03 Factors characterizing phosphate oxygen isotope ratios in river water: an inter-watershed comparison approach. *Limnology*. DOI:10.1007/s10201-020-00610-6

・Peralta, E. M., L. S. Batucan Jr., I. B. B. De Jesus, E. M. C. Triño, Y. Uehara, T. Ishida, Y. Kobayashi, C.-Y. Ko, T. Iwata, A. S. Borja, J. C. A. Briones, R. D. S. Papa, F. S. Magbanua & N. Okuda 2020,01 Nutrient loadings and deforestation decrease benthic macroinvertebrate diversity in an urbanised tropical stream system. *Limnologica* 80. DOI:https://doi.org/10.1016/j.limno.2019.125744

・Kamiya, E., U. Misako & N. Okuda 2020,01 Do atypical 15N and 13C enrichment in parasites result from isotope ratio variation of host tissues they are infected?. *Limnology* 21(1):139-149. DOI:10.1007/s10201-019-00596-w

・Kondo,Y., A.Miyata, U.Ikeuchi, S.Nakahara, K.Nakashima, H.Ōnishi, T. Osawa, K. Ota, K.Sato, K.Ushijima, Bianca Vienni Baptista, T.Kumazawa, K.Hayashi, Y. Murayama, N.Okuda, H.Nakanishi 2019,10 Interlinking open science and community-based participatory research for socio-environmental issues. *Current Opinion in Environmental Sustainability* 39:54-61. DOI:10.1016/j.cosust.2019.07.001 (reviewed).

- Mendoza, M. U., J. C. A. Briones, M. Itoh, K. S. A. R. Padilla, J. I. Aguilar, N. Okuda & R. D. S. Papa 2019,09 Small maar lakes of Luzon Island, Philippines: their limnological status and implications on the management of tropical lakes – a review. *Philippine Journal of Science* 148(3):559-572. DOI:http://philjournalsci.dost.gov.ph/accepted-articles/94-next-issue/vol-148-no-3-september-2019/1103-small-maar-lakes-of-luzon-island-philippines-their-limnological-status-and-implications-on-the-management-of-tropical-lakes-a-review
- Ohba, S., K. Suzuki, Y. Sakai, J. Shibata & N. Okuda 2019,07 Effects of irrigation system alterations on the trophic position of a threatened top predator in rice-field ecosystems. *Freshwater Biology* 64(10):1737-1746. DOI:10.1111/fwb.13365
- Peralta, E. M. Peralta, A. E. Belen, G. R. Buenaventura, F. G. G. Cantre, K. G. R. Espiritu, J. N. A. De Vera, C. P. Perez, A. K. V. Tan, I. B. B. De Jesus, P. Palomares, J. C. Briones, T. Ikeya, F. S. Magbanua, R. D. S. Papa, and N. Okuda 2019,07 Stream benthic macroinvertebrate assemblages reveal the importance of a recently established freshwater protected area in a tropical watershed. *Pacific Science* 73(3):305-320. DOI:10.2984/73.3.1 (reviewed).
- Ishida, T., Y. Uehara, T. Iwata, A. P. Cid-Andres, S. Asano, T. Ikeya, K. Osaka, J. Ide, O. L. A. Privaldos, I. B. B. De Jesus, E. M. Peralta, E. M. C. Triño, C. Ko, A. Paytan, I. Tayasu, N. Okuda 2019,04 Identification of phosphorus sources in a watershed using a phosphate oxygen isoscape approach. *Environmental Science & Technology* 53(9):4707-4716. DOI:10.1021/acs.est.8b05837 (reviewed).

[Research Presentations]

[Oral Presentation]

- Takuya Takahashi, Yukiko Uchida, Hiroyuki Ishibashi, Noboru Okuda How does forest ownership influence forest-related subjective well-being? A case study in the upper Yasu River watershed, Shiga Prefecture, Japan. Society For Environmental Economics and Policy Studies 24th Annual Conference（環境経済・政策学会 2019 年大会), 2019.09.28-2019.09.29, Fukushima university. Fukushima city. (共著発表）
- Fukushima, S., K. Takemura, Y. Uchida, S. Asano & N. Okuda When does mutual trust among community members lower their happiness?: Moderating effect of residential mobility. Society for Personality and Social Psychology (SPSP) Annual Convention 2020, 2020.02.27-2020.02.29, New Orleans, USA.
- Uehara Y., Okuda,N Fish nursery paddy field project. Japan-Korea Rural planning seminar2019, 2019.10.19, Otsu, Shiga.
- Yachi, S., S. Asano, T. Ikeya, H. Ishibashi, T. Ishida, Y. Uehara, K. Wakita & N. Okuda Diversity of community revitalization process and its relation with biodiversity in the Yasu-River sub-watershed. Japan-Korea Rural Planning Seminar 2019 by The Association of Rural Planning, 2019.10.19, Otsu,Shiga.
- Cabardo, J. A. I. V., F. C. R. Ramirez, O. L. Privaldos, Y. Uehara, T. Ishida, L. Fujiyoshi, K. Osaka, F. Magbanua, R. D. Papa & N. Okuda Quantification of soluble reactive phosphorus in the Silang-Santa Rosa subwatershed". Philippine Association for the Advancement of Science and Technology (PhilAAST) Conference, 2019.09.11-2019.09.12, Pasay City, Philippines.
- Nakano, S., K.-H. Chang, H. Doi, Y. Hodoki, N. Ishii, Z. Kawabata, Y. Kobayashi, P. M. Manage, Y. Nishibe, K. Ohbayashi & N. Okuda Planktonic processes and food web structure/dynamics in shallow ponds, with special reference to cyanobacterial bloom. Society of Wetland Scientists-Asia Chapter and Korean Wetlands Society Joint Meeting, 2019.08.19-2019.08.22, Suncheon City, Korea.
- Kondo, Y., A. Miyata, U. Ikeuchi, S. Nakahara, K. Nakashima, H. Onishi, T. Osawa, K. Ota, K. Sato, K. Ushijima, B. V. Baptista, T. Kumazawa, K. Hayashi, Y. Murayama, N. Okuda, H. Nakanishi Interlinking open science to team-based action research for socio-environmental cases. SciTS 2019 Conference, 2019.05.20-2019.05.23, Lansing, Michigan.
- Onodera, S., Saito, M., Jin, G., Rusydi, A., Tomozawa, Y., Wang, K., Ban, S., Okuda, N Phosphorus discharge via groundwater into the lake, based on lacustrine groundwater discharge (LGD) and alluvial plain sediment. JpGU 2019 meeting, 2019.05.26-2019.05.30, Makuhari, Chiba.
- Okuda, N., Z. Karube, Y. Sakai, T. Takeyama, I. Tayasu, C. Yoshimizu & T. Nagata Biodiversity increases integrated trophic position of macroinvertebrate communities in coastal food webs: Testing the vertical diversity hypothesis. JpGU 2019 meeting, 2019.05.26-2019.05.30, Makuhari, Chiba.
- Peralta, E. M., L. S. Batucan Jr., A. E. Belen, I. B. B. De Jesus, T. Ishida, C.-Y. Ko, Y. Kobayashi, T. Ikeya, Y. Uehara, T. Iwata, A. S. Borja, J. C. A. Briones, F. S. Magbanua, R. D. S. Papa & N. Okuda Multiple stressors and protection efforts in highly urbanized watersheds in the Philippines. JpGU 2019 meeting, 2019.05.26-2019.05.30, Makuhari, Chiba.
- Gregorio, J. A. N., E. M. Peralta, I. B. B. De Jesus, T. Ikeya, J. C. A. Briones, R. D. S. Papa, F. S. Magbanua & N. Okuda Benthic macroinvertebrate assemblages and water quality reflect the impacts of land use and land cover in Marikina Watershed, Philippines. JpGU 2019, 2019.05.26-2019.05.30, Makuhari Messe, Chiba.

・Ikeya, T., T. Ishida, Y. Uehara, S. Asano, I. Tayasu, N. Okuda, M. Ushio, S. Fujinaga, C.-Y. Ko, E. M. Peralta, N. F. Ishikawa & T. Iwata The analysis of the community composition of riverine bacteria and microalgae in relation to nutrient status and diversity: the case in irrigation season in the Yasu River, Japan. JpGU 2019 meeting, 2019.05.26-2019.05.30, Makuhari Messe, Chiba.

・Saito, M., Onodera, S., Tomozawa, Y., Wang, K., Ban, S., Okuda, N Evaluation for temporal variation in groundwater inflow to the lagoons connected to Lake Biwa by radon (222Rn) tracer analysis. JpGU 2019 meeting, 2019.05.26-2019.05.30, Makuhari, Chiba.

・Tomozawa, Y., Wang, K., M.Saito ,S. Ban, N.Okuda, S.Onodera Altitude effect of water stable isotopic ratio of ravine water and its contribution to groundwater in alluvial plains - Comparison in east and west side catchments of Lake Biwa. JpGU 2019 meeting, 2019.05.26-2019.05.30, Makuhari, Chiba.

・Okuda, N Watershed governance: a case in the Lake Biwa Watershed. RIHN International Symposium 2019: Fair use of multiple resources in cross-scale context, 2019.07.11-2019.07.12, RIHN, Kyoto.

・Peralta E, Magbanua FS, Briones JCA, Okuda N, Papa RDS Disentangling multiple stressors and highlighting the importance of freshwater protected area in highly urbanized watersheds in the Philippines. 41st ASM of the National Academy of Science & Technology, 2019.07.10-2019.07.11, EDSA Shangri-La Plaza, Mandaluyong City, Philippine.

・Mendoza MU, Aguilar JI, Padilla KSAR, Itoh M, Okuda N, Papa RDS The biogeochemical cycling of methane (CH4) in lakes Calibato, Pandin and Yambo: Implications on the lakes' carrying capacity. 41st ASM of the National Academy of Science & Technology, 2019.07.10-2019.07.11, EDSA Shangri-La Plaza, Mandaluyong City, Philippine.

[Poster Presentation]

・Okuda, N., M. Milette, J. Aguilar, K. Padilla, J. Briones, R. Papa, M. Ito, M. Fujibayashi, T.-H. Tu, L.-H. Lin, P.-L. Wang, Y. Kobayashi, E. Austria, F.-K. Shiah Methanotrophic food webs in tropical lakes: a preliminary report. The 84th Annual Meeting of the Japanese Society of Limnology, 2019.09.27-2019.09.28, Kanazawa University, Kanazawa.

・Wang, K., S. Onodera, M. Saito, N. Okuda & T. Okubo Estimation of groundwater recharge and phosphorus transport under different precipitation conditions in a suburban catchment, using SWAT model. JpGU 2019meeting, 2019.05.26-2019.05.30, Makuhari, Chiba.

RUPPRECHT Christoph D. D.

Senior Researcher

Born in 1983.

[Academic Career]

Griffith University, Environmental Futures Research Institute, PhD Urban geography, planning, ecology (2015)

Ludwig-Maximilians-University Munich, Department for Asian Studies, Magister Artium (2009)

Ludwig-Maximilians-University Munich, Faculty of Biology, EES Master Program Guest Student (2008)

Hokkaido University Short Term Exchange Program (2006)

[Professional Career]

Senior Researcher, FEAST Project, Research Institute for Humanity and Nature (2018-)

Project Researcher, FEAST Project, Research Institute for Humanity and Nature (2016-2018)

Adjunct Lecturer, Doshisha University (2017-)

Adjunct Lecturer, Kyoto University (2017-2020)

Adjunct Lecturer, Graduate School of Agricultural and Life Sciences, University of Tokyo (2017)

Visiting Researcher, Environmental Futures Research Institute, Griffith University (2015)

[Higher Degrees]

Ph.D. Geography, Urban Planning, Ecology (Griffith University 2015)

M.A. Japanology, Biology, Philosophy (Ludwig-Maximilians-University Munich 2009)

[Fields of Specialization]

Urban geography

Environmental planning
Food systems
Degrowth

[Academic Society Memberships]

Japanese Institute of Landscape Architecture
American Association of Geographers
Royal Geographical Society with IGB
International Association for the Study of the Commons
Japan Geoscience Union

[Awards]

Japan Geoscience Union Meeting Student Outstanding Presentation Award (2013)
American Association of Geographers Urban Geography Specialty Group Dissertation Award (2016)
Research Institute for Humanity and Nature Early Career Researcher Award (2019)

—Achievements—

[Papers]

[Original Articles]

- Rupprecht, C. D. D., Cui, L. 2020,03 Understanding Threats to Young Children's Green Space Access in Unlicensed Daycare Centers in Japan. *International Journal of Environmental Research and Public Health* 6:1948. DOI:10.3390/ijerph17061948 (reviewed).
- Rupprecht, C. D. D., Fujiyoshi, L., McGreevy, S. R., Tayasu, I. 2020,02 Trust me? Consumer trust in expert information on food product labels. *Food and Chemical Toxicology* 137:111170. DOI:10.1016/j.fct.2020.111170 (reviewed).
- Mangnus, A. C., Vervoort, J. M., McGreevy, S. R., Ota, K., Rupprecht, C. D. D., Oga, M., Kobayashi, M. 2019,11 New pathways for governing food system transformations: a pluralistic practice-based futures approach using visioning, back-casting, and serious gaming. *Ecology and Society* 24(4):2. DOI:10.5751/ES-11014-240402 (reviewed).
- Kim, M., Rupprecht, C. D. D., Furuya, K. 2019,11 Typology and Perception of Informal Green Space in Urban Interstices: A case study of Ichikawa city, Japan. *International Review for Spatial Planning and Sustainable Development* 8(1):4-20. DOI:10.14246/irspsd.8.1_4 (reviewed).

[Review Articles]

- Rupprecht, C. D. D. 2019,04 Degrowth and Landscape. *Journal of the Japanese Institute for Landscape Architecture* 83(1):6-7. (in Japanese) (reviewed).

[Research Presentations]

[Oral Presentation]

- Shinkai, R., Spiegelberg, M., Rupprecht, C. D. D. Contributing to the local community through hobby beekeeping and the scope for small-scale social business. 28th RIHN Chiiki Renkei Seminar, 2019.07.18, Hokkaido University. (in Japanese)
- Rupprecht, C. D. D., Multispecies Project team Multispecies Cities: Co-designing more-than-human well-being in the Asia-Pacific. Institute of Australian Geographers Conference, 2019.07.09-2019.07.13, Hobart, Tasmania.
- Rupprecht, C. D. D., Spiegelberg, M., Shinkai, R., Gan, J. Eastern honeybee beekeeping in Japan and its socio-ecological context: a transdisciplinary, more-than-human journey. Institute of Australian Geographers Conference, 2019.07.09-2019.07.13, Hobart, Tasmania.
- Rupprecht, C. D. D. Imagining satomachi: A radical vision for post-growth Japanese cities. Urban Land Teleconnection and Sustainability seminar, 2019.07.01, University of Tokyo.
- Rupprecht, C. D. D. Imagining satomachi: A radical vision for post- growth Japanese cities based on biocultural diversity and urban landscape stewardship. Global Research Forum on Sustainable Production and Consumption, 2019.06.26-2019.06.29, Hong Kong University of Science and Technology.

・Kim, M., Rupprecht, C. D. D., Unfamiliarity inference from Familiarity: Perception of Informal Green Space from the understanding of urban green space. American Association of Geographers Conference, 2019.04.03-2019.04.07, Washington DC.

・Rupprecht, C. D. D. Whose social infrastructure? Young children's green space access during daycare in aging Japan. American Association of Geographers Conference, 2019.04.03-2019.04.07, Washington DC.

[Invited Lecture / Honorary Lecture / Panelist]

・Rupprecht, C. D. D. Multispecies health: multispecies thinking as a response to conceptual challenges of recent microbiome insights. 4th Ecohealth Seminar, 2019.06.20, RIHN.

SAIJO Tatsuyoshi

Specially Appointed Professor

Born in 1952.

[Academic Career]

Graduated from Faculty of Economics, University of Kagawa(1975)
Completed Master Course(Economics) Hitotsubashi University(1978)
Completed DoctoralCourse(Economics)University of Minnesota(1985)

[Professional Career]

Lecturer, Department of Economics, Ohio State University(1985)
Assistant Professor, Department of Economics, University of California at Santa Barbara(1986)
Assistant Professor, Institute of Socio-Economic Planning, University of Tsukuba(1988)
Post-Doctoral Fellow, Center in Political Economy, Washington University at St. Louis(1989)
Visiting Assistant Professor, Department of Economics, University of of California at Santa Barbara(1989)
Associate Professor, Institute of Socio-Economic Planning, University of Tsukuba(1991)
Professor, Institute of Socio-Economic Planning, University of Tsukuba(1995)
Professor, Institute of Social and Economic Research, Osaka University(1995)
Visiting Scholar, Rational Choice Center, Department of Economics, Duke University(1999)
Faculty Fellow, Research Institute of Economy, Trade and Industry(2001)
Research Associate, California Institute of Technology(2002)
Associate member of the Science Council of Japan（2006）
Professor at Research Institute for Sustainability Science at Osaka University(2006)
Researcher at CASSEL, UCLA(2007)
Vice President of Economic Science Association(2010)
Professor, Center for Environmental Innovation Design for Sustainability, Osaka University(2010)
Professor, School of Management, Kochi University of Technology（2013）
Specially Appointed Professor atResearch Institute for Sustainability Science at Osaka University(2013)
Member of the Science Council of Japan（2014）
Professor, Institute of Economic Research, Hitotsubashi University(2015)
Professor, School of Management and Research Center of Future Design, Kochi University of Technology(2016)
Specially Appointed Professor, Research Institute for Humanity and Nature(2016)

[Higher Degrees]

Doctor of Philosophy, University of Minnesota(1985)
Master of Economics, Hitotsubashi University(1978)
Bachelor of Economics, University of Kagawa(1975)

[Fields of Specialization]

Future Design

[Academic Society Memberships]

Society for Environmental Economics and Policy Studies
Economic Science Association
Japanese Economic Association

—Achievements—

[Papers]

[Original Articles]

- Y. Nakagawa, R. Arai, K. Kotani, M. Nagano, T. Saijo 2019,08 Intergenerational Retrospective Viewpoint Promotes Financially Sustainable Attitude. Futures. Elsevier, DOI:10.1016/j.futures.2019.102454 (reviewed).
- Tatsuyoshi Saijo 2019,06 "Second Thoughts of Social Dilemma in Mechanism Design". Walter Trockel (ed.) Social Design. Springer Nature, Switzerland, pp.157-171.
- J. Konow, T. Saijo, K. Akai 2020,03 Equity versus equality: Spectators, stakeholders and groups. *Journal of Economic Psychology* 77. DOI:10.1016/j.joep.2019.05.001 (reviewed).

[Research Presentations]

[Invited Lecture / Honorary Lecture / Panelist]

- Tatsuyoshi Saijo session "Is modern businesscapable of implementing successful long-term strategies?". Saint Petersburg International Economic Forum 2019（SPIEF 19）, 2019.06.06-2019.06.08, St. Petersburg, Russia.
- Tatsuyoshi Saijo Exploring 'Future Design Towns' - Social Technology Cases from Across Asia that are Revolutionizing Systems and Policy. UNDP RIC Zoom Webinar Series Session #2, 2019.04.30.

SAKAKIBARA Masayuki

Professor

Born in 1959.

[Academic Career]

April 1978 – March 1982: Hokkaido University School of Science
April 1982 – March 1984: Master Course of Graduate School of Science, Hokkaido University
April 1984 – Sept. 1987: Doctor Course of Graduate School of Science, Hokkaido University

[Professional Career]

April 1988- July 1988: Research Fellow of the Japan Society for the Promotion of Science
Aug. 1988- Oct. 1993: Assistant professor of Department of Earth Sciences, Faculty of Science, Ehime University
Nov. 1993- March 2005: Associate Professor of Department of Earth Sciences, Faculty of Science, Ehime University
April 2005- March 2006: Professor of Department of Earth Sciences, Faculty of Science, Ehime University
April 2006- Professor of Graduate School of Science and Engineering, Ehime University
April 2013- Director of Asia-Africa Center, Institute for International Relations
April 2015- Director SUIJI (Six-University Initiative Japan Indonesia) Promotion Office
April 2016－2017 Vice Dean of Faculty of Collaborative Regional Innovation
April 2018 Special Aide to the President of Ehime University
June 2018- Professor of RIHN

[Higher Degrees]

D.Sc(Hokkaido University, 1987)

—Achievements—

[Papers]

[Original Articles]

・Basri, Sakakibara. M., SERA. K. 2020,02 Mercury in Soil and Forage Plants from Artisanal and Small-Scale Gold Mining in the Bombana Area, Indonesia. *Toxics 2020* 8. DOI:10.3390/toxics8010015 (reviewed).

[Research Presentations]

[Oral Presentation]

・Sakakibara, M. Bio-Eco-Geo-Medi-Socio (BEGMES)-Science Study of Environmental Pollution in Artisanal and Small-Scale Gold Mining Area in Indonesia. The 2nd ASEAN-Japan Meeting point of Collaboration by Stakeholders and Researchers for Reducing Environmental Problems in ASEAN Countries (TRPNEP2019), 2019.12.11-2019.12.11, Hilton Nay Pyi Taw, Naypyidaw, Myanmar.

・Sakakibara, M. Establishment of multi-layered environmental governance in collaboration with private sectors. The 7th Joint seminar with Hokkaido University and RIHN/The 28th RIHN Regional Community Seminars, 2019.07.18-2019.07.18, Hokkaido University, Sapporo. (in Japanese)

[Invited Lecture / Honorary Lecture / Panelist]

・Sakakibara. M. The Role of Mathematics and Natural Sciences in Transdisciplinary Approaches to Solve Complex Problems in Society. Seminar for Faculty of Science Department of Geography, State University of Gorontalo, 2020.03.04, Gorontalo, Indonesia.

・Sakakibara. M. Transdisciplinary approach for solving complex society problems. Seminar for Faculty of Law, State University of Gorontalo, 2020.03.02, Gorontalo, Indonesia.

・Sakakibara, M Mercury-Contaminated Whitening Cosmetics in Indonesia. The seminar for Master's course students of Public health for University Muslim Indonesia, 2019.11.17, University Muslim Indonesia, Makassar, Indonesia. (Invitation lecture)

・Sakakibara, M. Studies of Environmental Pollutions and Health Problems in Indonesia for Remediating Polluted Environments. The seminar for the under graduate students of Public health for University Muslim Indonesia, 2019.11.17, University Muslim Indonesia, Makassar, Indonesia. (Invitation lecture)

・Sakakibara, M. Reduction of Environmental Problems and Future Business by Introducing Sustainable Finance, The Issue of Chinese versus America Trade War. International Class at University Bosowa, 2019.10.22, University Bosowa, Makassar, Indonesia.

・Sakakibara, M. Waste and its Environmental Problem -How do we manage the waste?. International Class in School of Public Health of Makassar University, 2019.10.21, Hasanuddin University, Makassar, Indonesia. (Invitation lecture)

・Sakakibara, M. Heavy Metal Pollution and its Toxity. International Class at Indonesia Timur University, 2019.10.21, Indonesia Timur University, Makassar, Indonesia. (Invitation lecture)

・Sakakibara, M. Studies of Environmental Pollutions and Health Problems in Indonesia for Remediating Polluted Environments. International Class at University Muslim Indonesia, 2019.10.20, University Muslim Indonesia, Makassar, Indonesia. (Invitation lecture)

・Sakakibara, M. Co-creation of sustainable regional innovation for reducing risk of high-impact environmental pollution. ISeNREM 2019, 2019.08.15, Bogor Agricultural University (IPB), Bogor, Indonesia.

・Sakakibara, M. Medical Geology and its Challenges. 2nd Japan - ASEAN Medical Seminar on Human Health Impact of Heavy Metals, 2019.05.05, Indonesia, Gorontalo.

・Sakakibara, M. Medical Geology and its Challenges. 1st Japan - ASEAN Medical Seminar on Human Health Impact of Heavy Metals, 2019.05.03, Indonesia, Makassar.

・Sakakibara, M. Bio-Eco-Geo-Medi-Socio (BEGMES)-science study of environmental pollution in artisanal and small-scale gold mining area in Indonesia. 1st INTERNATIONAL CONFERENCE ON HEALTH SCIENCES IN DEVELOPING COUNTRY, 2019.11.16-2019.11.17, Four points by Sheraton, Makassar, Indonesia.

・Sakakibara, M., Tanaka, K., Kasamatsu, K., Shimagami, M., Komatsu, S. Co-creation of sustainable regional innovation for reducing risk of high-impact environmental pollution. International Conference on Environmental Sustainability and Climate Change, 2019.04.22-2019.04.23, ANA Crowne Plaza Osaka, Osaka.

SHIRAI Yuko

Researcher

—Achievements—

[Papers]

[Original Articles]

・Shirai, Yuko, Leisz, J. Stephen, Fox, Jefferson and Rambo, A. Terry 2019,12 Commuting Distances to Local Non-Farm Employment Sites and the Impact on Rural Out-Migration: The Case of Northeast Thailand. *Asia Pacific Viewpoint* 60(3):280-295. (reviewed).

SPIEGELBERG Maximilian

Researcher

Born in 1981.

[Professional Career]

2013-2010 Coordinator, Interdisciplinary Distance-learning Environmental Studies Master, FernUni Hagen

2009 Field Assistant, Project on Combating Desertification, GTZ Turkmenistan & Bonn

[Higher Degrees]

Ph.D. Environmental Management (Kyoto Uni, 2017)

M.A. Peace & Conflict Studies (Philipps Uni Marburg, 2009)

B.Sc. Environmental & Resource Management (BTU Cottbus, 2006)

—Achievements—

[Research Presentations]

[Oral Presentation]

・Spiegelberg, Maximilian; Pongkijvorasin, Sittidaj "Beyond extractive relationships for upland Asia: exploring dependency and sufficiency in an urbanizing age". 2019 Hong Kong Conference of the Global Research Forum on Sustainable Production and Consumption, 2019.06.26-2019.06.29, Hong Kong.

[Invited Lecture / Honorary Lecture / Panelist]

・Spiegelberg, Maximilian Upland futures in an urban era: Spaces between the continuation of traditions and exploration of alternative lifeworlds. 4th International Conference on Regional Development (ICRD) “Rural Development in Urban Age: Do Rural-Urban Linkages Matter?”, 2019.08.06-2019.08.07, Diponegoro University, Semarang, Indonesia.

・Shinkai, Rika; Spiegelberg, Maximilian 趣味養蜂を通じた地域貢献と小規模ソーシャル・ビジネスへの展望. 7th Hokkaido University and RIHN Joint Seminar, 28th RIHN Regional Community Seminar, 2019.07.18, Hokkaido University. (in Japanese)

SUGIHARA Kaoru

Specially Appointed Professor

Born in 1948.

[Academic Career]

Graduated from Faculty of Economics, Kyoto University, March 1971

Completed the Master Course (Economics), University of Tokyo, June 1973

Completed the Doctor Course (Economics), University of Tokyo, March 1976

[Professional Career]

Worked for Marubeni Corporation, Dublin Office (1976)

Lecturer in Economic History, Faculty of Economics, Osaka City University (1978)

Associate Professor of Economic History, Faculty of Economics, Osaka City University (1981)

Lecturer in the Economic History of Japan, Department of History, School of Oriental and African Studies (SOAS), University of London (1985)

Senior Lecturer in the Economic History of Japan, Department of History, SOAS, University of London (1991)

Professor of Economic History, Faculty of Economics (from 1997 Graduate School of Economics, Osaka University (1996)

Professor of The Center for Southeast Asian Studies (CSEAS), Kyoto University (2006)

Professor of Graduate School of Economics, University of Tokyo (2012)

Professor of National Graduate Institute for Policy Studies (GRIPS), Tokyo (2013)

Senior Professor of National Graduate Institute for Policy Studies (2014)

Specially Appointed Professor of Research Institute for Humanity and Nature (cross appointment with GRIPS from April to September 2016: full appointment from October 2016)

Member, Science Council of Japan (2011)

[Higher Degrees]

Doctor of Economics, University of Tokyo

MA (Economics), University of Tokyo

BA (Economics), Kyoto University

[Fields of Specialization]

Economic History

Environmental History

[Academic Society Memberships]

Socio-Economic History Society

Business History Society of Japan

The Japan Association of Asian Studies

The Japanese Association for South Asian Studies

[Awards]

*The 39th Nikkei Keizai Tosho Bunkasho [The Nikkei Book Prize for Economics], 1996

*The 18th Suntory Gakugeisho [The Suntory Book Prize for Academic Works], 1996

—Achievements—

[Books]

[Chapters/Sections]

・Kobayashi, A. and Sugihara, K. 2019 “Changing Patterns of Sarawak Exports, c.1870 to 2013”. Noboru Ishikawa and Ryoji Soda (ed.) *Anthropogenic Tropical Forests: Human–Nature Interfaces on the Plantation Frontier*. Advances in Asian Human-Environmental Research. Springer, Singapore, pp.563-585. DOI:10.1007/978-981-13-7513-2

・Sugihara, K. 2019 “The Asian Path of Economic Development: Intra-regional Trade, Industrialization and the Developmental State”. Shiraishi, T. and Sonobe, T. (ed.) *The Emerging States and Economies: Their Origins, Drivers and Challenges Ahead*. Emerging-Economy State and International Policy Studies. Springer, pp.73-99. DOI:10.1007/978-981-13-2634-9

・Sugihara, K. 2019 “Multiple Paths to Industrialization: A Global Context of the Rise of Emerging States”. Otsuka, K. and Sugihara, K. (ed.) *Paths to the Emerging State in Asia and Africa*. Emerging-Economy State and International Policy Studies. Springer, pp.1-33. DOI:10.1007/978-981-13-3131-2

[Editing]

[Editing / Co-editing]

・Otsuka, K. and Sugihara, K. (ed.) 2019 *Paths to the Emerging State in Asia and Africa*. Emerging-Economy State and International Policy Studies. Springer, 292pp. DOI:10.1007/978-981-13-3131-2

[Research Presentations]

[Oral Presentation]

・Sugihara, K. “Past and Present of the Seafront Industrial Complex: A Comparative Perspective”. Second Research Seminar for Program 1, 2019.10.07, Research Institute for Humanity and Nature, Kyoto.

・Sugihara, K. "Indian Ocean Trade, 1910-1950". International Seminar on Economic History, Grants-in-Aid for Scientific Research (B) 'A Statistical Study of Indian Ocean Trade: Towards a Reappraisal of Regional Trade in Modern World History', 2019.08.08, GRIPS, Tokyo.

[Invited Lecture / Honorary Lecture / Panelist]

・Sugihara, K. “The Great Acceleration in Asia: Beyond ‘Coal and North America’". Convergence/Divergence: New Approaches to the Global History of Capitalism Conference, 2019.09.28, Brasenose College, Oxford, United Kingdom.

TANIGUCHI Makoto

Professor

Born in 1959.

[Academic Career]

University of Tsukuba, Japan Ph.D. Hydrology (1987)

University of Tsukuba, Japan M.S. Hydrology (1984)

University of Tsukuba, Japan B.S. Geosciences (1982)

[Professional Career]

Research Institute for Humanity and Nature, Associate Professor (2007 -)

Research Institute for Humanity and Nature, Associate Professor (2003 - 2007)

Department of Earth Sciences, Nara University of Education, Professor (2000 - 2003)

Department of Earth Sciences, Nara University of Education, Associate Professor (1993 - 2000)

Department of Earth Sciences, Nara University of Education, Research Associate (1988 - 1990)

Division of Water Resources, CSIRO, Australia, Visiting Scientist (1987 - 1988)

[Higher Degrees]

D.Sc (The University of Tsukuba,1987)

M.Sc.(The University of Tsukuba,1984)

[Fields of Specialization]

Environmental dynamic analysis

Hydrology/Weather/Oceanic physics

[Academic Society Memberships]

American Geophysical Union

International Association of Hydrological Sciences
International Association of Hydrogeology
Japanese Association of Groundwater Hydrology
Japanese Association of Hydrological Science
Japan Society of Engineering Geology
The Japan Society of Hydrology and Water Resources
The Association of Japanese Geographers
The Japanese Society of Limnology

[Awards]

Award of 7th Japanese Association of Limnology (Yoshimura Prize, 2005)
Research award from the Association of Japanese Geographers (1987)

—Achievements—

[Papers]

[Original Articles]

- Taniguchi M., Lee S. 2020,02 Identifying Social Responses to Inundation Disasters: A Humanity-Nature Interaction Perspective. *Global Sustainability* 3. (reviewed).
- Dalin, C., Taniguchi, M., Green, T.R. 2019,07 Unsustainable groundwater use for global food production and related international trade. *Global Sustainability* 2(e12):1-11. DOI:10.1017/sus.2019.7 (reviewed).
- Taniguchi M., Dulai, H., Burnett, K.M., Santos, I.R., Sugimoto, R., Stieglitz, T., Kim, G., Nils, M., Burnett, W.C. 2019 Submarine Groundwater Discharge: Updates on its Measurement, Magnitude and Effects. *Frontiers in Envirnmental Science*. DOI:10.3389/fenvs.2019.00141 (reviewed).
- Miyakoshi, A., Taniguchi, M., Ide, K., Kagabu, M., Hosono, T., and Shimada, J. 2019 Identification of changes in subsurface temperature and groundwater flow after the 2016 Kumamoto earthquake using long-term well temperature-depth profiles. *J. Hydrol* 582. DOI:10.1016/j.jhydrol.2019.124530 (reviewed).

[Research Presentations]

[Oral Presentation]

- Taniguchi, M., Lee, S., Masuhara, N. Water centric nexus on multi-scale water. 46th IAH, (International Association of Hydrogeologists) Congress, 2019.09.21-2019.09.28, The Trade Fairs and Congress Center of Malaga, Malaga, Spain.
- Taniguchi, M., Lee, S., Masuhara, N. Water centric nexus on multi-scale water-energy-food. 27th IUGG General Assembly, 2019.07.08-2019.07.18, Montreal International Convention Center, Montreal, Canada.
- Taniguchi, M., Miyakoshi, A., Hamamoto, H. Subsurface warming revealed from repeated measurements of temperature-depth profiles in the world, JV04-IUGG2019-0929 2019.7.15. 27th IUGG General Assembly, 2019.07.08-2019.07.18, Montreal International Convention Center, Montreal, Canada.

[Invited Lecture / Honorary Lecture / Panelist]

- Taniguchi, M. Submarine groundwater discharge in an era of unprecedented change. International Union of Geodesy and Geophysics, H12-IUGG19-0924, 2019.07.12, Montreal International Convention Center, Montreal, Canada.
- Taniguchi, M. Submarine groundwater discharge in an era of unprecedented change. 27th IUGG General Assembly, 2019.07.08-2019.07.18, Montreal International Convention Center, Montreal, Canada.
- Taniguchi, M. Groundwater management for global sustainability. JpGU2019, 2019.05.28, Makuhari Messe, Chiba, Mihama.
- Taniguchi, M. Multi-scale Water-Energy-Food Nexus under the industrialization and urbanization. APEC Nexus meeting, 2019.05.07, Honolulu, Hawaii., US.
- Taniguchi, M. Integrated Management of Water-Energy-Food Nexus in Asia-Pacific Region. APEC Nexus meeting, 2019.05.06, Honolulu, Hawaii., US.

TAYASU Ichiro

Professor

Born in 1969.

[Academic Career]

Department of Zoology, Graduate School of Science, Kyoto University, Doctor Course(1997)

Department of Zoology, Graduate School of Science, Kyoto University, Master Course(1994)

Department of Zoology, Faculty of Science, Kyoto University(1992)

[Professional Career]

Professor, RIHN Center, Research Institute for Humanity and Nature (2016)

Professor, Center for Research Promotion, Research Institute for Humanity and Nature (2014)

Associate Professor, Center for Ecological Research, Kyoto University (2003)

Assistant Professor, Research Institute for Humanity and Nature (2002)

Postdoctoral Research Fellow (Research Abroad) of the Japan Society for the Promotion of Science; Laboratoire d'Ecologie des Sols Tropicaux, Institut de Recherche pour le Developpement (2000)

Postdoctoral Research fellow (PD) of the Japan Society for the Promotion of Science; Laboratory of Forest Ecology, Graduate School of Agriculture, Kyoto University, Japan (1997)

[Higher Degrees]

Ph.D (Kyoto University, 1997)

M Sc. (Kyoto University, 1994)

[Fields of Specialization]

Isotope Ecology

Animal Ecology

Freshwater Ecology

Soil Ecology

Isotope Environmental Science

[Academic Society Memberships]

Ecological Society of Japan

The Japanese Society of Limnology

The Japanese Society of Soil Zoology

The International Union for the Study of Social Insects

Japan Geoscience Union

Advancing the Science of Limnology and Oceanography

[Awards]

16th Inoue Research Award for Young Scientists (1999)

20th Biwako Prize for Ecology (2019)

—Achievements—

[Books]

[Authored/Co-authored]

・Tayasu, I., Shin, K.-C. and Fujiyoshi, L. eds. 2020,03 A world drawn by Environmental Isotope Study: 2020 edition. Research Institute for Humanity and Nature, Kyoto, 100pp. (in Japanese)

[Papers]

[Original Articles]

- Ide, J., Ishida, T., Cid-Andres, A.P., Osaka, K., Iwata, T., Hayashi, T., Akashi, M., Tayasu, I., Paytan, A. and Okuda, N. 2020,03 Factors characterizing phosphate oxygen isotope ratios in river water: an inter-watershed comparison approach. *Limnology* 21:365-377. DOI:10.1007/s10201-020-00610-6 (reviewed).
- Matsubayashi, J., Osada, Y., Tadokoro, K., Abe, Y., Yamaguchi, A., Shirai, K., Honda, K., Yoshikawa, C., Ogawa, N.O., Ohkouchi, N., Ishikawa, N.F., Nagata, T., Miyamoto, H., Nishio, S. and Tayasu I. 2020,03 Tracking long-distance migration of marine fishes using compound-specific stable isotope analysis of amino acids. *Ecology Letters* 23:881-890. DOI:10.1111/ele.13496 (reviewed).
- Rupprecht, C.D.D., Fujiyoshi, L., McGreevy, S.R. and Tayasu, I. 2020,02 Trust me? Consumer trust in expert information on food product labels. *Food and Chemical Toxicology*. DOI:10.1016/j.fct.2020.111170 (reviewed).
- Suetsugu, K., Matsubayashi, J. and Tayasu, I. 2020,01 Some mycoheterotrophic orchids depend on carbon from dead wood: Novel evidence from a radiocarbon approach. *New Phytologist* 227:1519-1529. DOI:10.1111/nph.16409 (reviewed).
- Gotou, Y., Koiwa, T., Shin, K.-C. and Tayasu, I. 2019,12 Development of the method for discriminating the geographical origin of okra using elemental analysis and strontium isotope ratio. *Research Report of Food Products* 43:20-26. (in Japanese)
- Katsuta, N., Matsumoto, G.I., Hase, Y., Tayasu, I., Haraguchi, T.F., Tani, E., Shichi, K., Murakami, T., Naito, S., Nakagawa, M., Hasegawa, H. and Kawakami, S.-i. 2019,11 Siberian permafrost thawing accelerated at the Bølling/Allerød and Preboreal warm periods during the last deglaciation. *Geophysical Research Letters* 46:13961-13971. DOI:10.1029/2019GL084726 (reviewed).
- Fujiyoshi, L., Nishimura, T., Kato, T. and Tayasu, I. 2019,11 Residents' understanding of and interest in isotope techniques for groundwater conservation. *Papers on Environmental Information Science* 33:133-138. DOI:10.11492/ceispapers.ceis33.0_133 (in Japanese) (reviewed).
- Naoe, S., Tayasu, I., Sakai, Y., Masaki, T., Kobayashi, K., Nakajima, A., Sato. Y., Yamazaki, K., Kiyokawa, H. and Koike, S. 2019,10 Downhill seed dispersal by temperate mammals: a potential threat to plant escape from global warming. *Scientific Reports* 9:14932. DOI:10.1038/s41598-019-51376-6 (reviewed).
- Suetsugu, K., Yamato, M., Matsubayashi, J. and Tayasu, I. 2019,07 Comparative study of nutritional mode and mycorrhizal fungi in green and albino variants of Goodyera velutina, an orchid mainly utilizing saprotrophic rhizoctonia. *Molecular Ecology* 28:4290-4299. DOI:10.1111/mec.15213 (reviewed).
- Nitzsche, K.N., Kato Y., Shin, K.-C. and Tayasu, I. 2019,06 Magnesium isotopes reveal bedrock impacts on stream organisms. *Science of the Total Environment* 688:243-252. DOI:10.1016/j.scitotenv.2019.06.209 (reviewed).
- Igarashi, S., Shibata, M., Masaki, T., Tayasu, I. and Ichie, T. 2019,05 Mass flowering of Fagus crenata does not depend on the amount of stored carbohydrates in trees. *Trees* 33:1399-1408. DOI:10.1007/s00468-019-01867-w (reviewed).
- Matsubayashi, J. and Tayasu, I. 2019,04 Collagen turnover and isotopic records in cortical bone. *Journal of Archaeological Science* 106:37-44. DOI:10.1016/j.jas.2019.03.010 (reviewed).
- Ishida, T., Uehara,Y., Iwata, T., Cid-Andres, A.P., Asano, S., Ikeya, T., Osaka, K., Ide, J., Privaldos, O.L.A, De Jesus, I.B.B., Peralta, E.M. Triño, E.M.C., Ko, C.-Y., Paytan, A., Tayasu, I. and Okuda, N. 2019,04 Identification of phosphorus sources in a watershed using a phosphate oxygen isoscape approach. *Environmental Science and Technology* 53(9):4707-4716. DOI:10.1021/acs.est.8b05837 (reviewed).

YAMANAKA Manabu D.

Senior Researcher

Born in 1955.

[Academic Career]

Doctor Course, Department of Atmosphere-Hydrosphere Science, Graduate School of Science, Nagoya University (1982-85)
Research Student, Institute of Space and Astronautical Science, Ministry of Education, Science and Culture (1981-85)

Master Course, Department of Atmosphere-Hydrosphere Science, Graduate School of Science, Nagoya University (1980-82)
Auditor, Faculty of Science, Kyoto University (1979-80)
Course for High-School Teacher of Science, Osaka Kyoiku University (1975-79)

[Professional Career]

Senior Project Researcher, Research Institute for Humanity and Nature (2020-present)
JICA Expert, Can Tho University, Vietnam (2018-present)
Project Researcher, Research Institute for Humanity and Nature (2018-20)
JICA Expert, Department of Meteorology, Sri Lanka (2016)
Professor Emeritus, Kobe University (2016-present)
Senior Staff, Japan Agency for Marine-Earth Science and Technology (2016-18)
JICA Expert, Agency for Assessment and Application of Technology, Indonesia (2010-14)
Principal Scientist, Japan Agency for Marine-Earth Science and Technology (2009-16)
Professor, Graduate School of Science, Kobe University (2007-18)
Senior Scientist, Japan Agency for Marine-Earth Science and Technology (2007-09)
Group Leader, Frontier Observational Research System for Global Change, Japan Marine Science and Technology Center (1998-09)
Professor, Graduate School of Science and Technology, Kobe University (1998-2007)
Associate Professor, Radio Atmospheric Science Center, Kyoto University (1995-98)
Lecturer, Radio Atmospheric Science Center, Kyoto University (1989-95)
Lecturer, Faculty of Education, Yamaguchi University (1987-89)
JSPS Postdoctoral Fellow, Institute of Space and Astronautical Science (1986-87)
JSPS Junior Research Fellow, Water Research Institute, Nagoya University (1985-86)
Technical Assistant, Research Reactor Institute, Kyoto University (1979-1980)

[Higher Degrees]

D.Sc (Nagoya University, 1985)
M.Sc (Nagoya University, 1982)
B.Ed (Osaka Kyoiku University, 1979)

[Fields of Specialization]

Atmosphere-Hydrosphere Science

[Academic Society Memberships]

The Meteorological Society of Japan
The Japanese Society for Planetary Sciences
Japan Geoscience Union (JpGU)

—Achievements—

[Papers]

[Original Articles]

- As-syakur, A. R., K. Imaoka, K. Ogawara, M. D. Yamanaka, T. Tanaka, Y. Kashino, I W. Nuarsa and T. Osawa 2019,10 Analysis of spatial and seasonal differences in the diurnal rainfall cycle over Sumatera revealed by 17-year TRMM 3B42 dataset. *SOLA* 15:216-221. DOI:10.2151/sola.2019-039 (reviewed).

[Review Articles]

- Yamanaka, M. D. 2019,07 Interfacial, international and interdisciplinary studies on Maritime-Continent peatland controlling global climate. *J. Japan Soc. Hydrol. and Water Resour.* 32(4):189-200. DOI:10.3178/jjshwr.32.189 (in Japanese) (reviewed).

[Research Presentations]

[Oral Presentation]

・山中大学・川崎昌博・松見豊・大橋勝文・Muhammad Arif Rahman・甲山治・小川まり子・橋口浩之・森修一 インドネシア泥炭地域レーダー観測に関する最近の話題. *第 13 回 MU レーダー・赤道レーダーシンポジウム*, 2019.09.09-2019.09.10, 宇治. (in Japanese) （報告書刊行予定）

・Yamanaka, M. D. Evolution of tropical coastal triple boundary zone as biosphere and anthroposphere. *AsiaPEX Kickoff Conference*, 2019.08.28-2019.08.30, Sapporo.

・Syamsudin, F., S. Lestari, R. Sulisyowati, S. Mori and M. D. Yamanaka Characteristics of rainfall extremes over Jakarta and an approach of flood monitoring using weather radar data and river discharge of Ciliwung River. *AsiaPEX Kickoff Conference*, 2019.08.28-2019.08.30, Sapporo.

・Ogino, S.-Y., M. D. Yamanaka, S. Mori and J. Matsumoto Role of coastal precipitation in Asian monsoon. *AsiaPEX Kickoff Conference*, 2019.08.28-2019.08.30, Sapporo.

・Katsumata, M., S. Mori, Hamada J.-I., M. Hattori, F. Syamsudin and M. D. Yamanaka Diurnal cycle over a coastal area of the maritime continent as derived by special networked soundings over Jakarta during Harimau2010. *AOGS2019*, 2019.07.28-2019.08.02, Singapore. http://www.asiaoceania.org/aogs2019/public.asp?page=browse_abstract.htm

・Yamanaka, M. D. Climate-biogeosphere-anthroposphere interactions over the maritime-continent peatland. *AOGS2019*, 2019.07.28-2019.08.02, Singapore. http://www.asiaoceania.org/aogs2019/public.asp?page=browse_abstract.htm

・山中大学 陸海空三重境界層および生物・人類圏としての海大陸沿岸域. *JpGU2019*, 2019.05.26-2019.05.30, 幕張. (in Japanese) https://confit.atlas.jp/guide/event/jpgu2019/subject/AOS15-05/class?cryptoId= https://confit.atlas.jp/guide/event-img/jpgu2019/AOS15-05/public/pdf?type=in

[Poster Presentation]

・Yamanaka, M. D., S. Mori, H. Hashiguchi, A. Sulaiman, R. Sulistyowati, M. Ogawa and O. Kozan Radar-based "diurnal-cycle indices" for hydrometeorology over Indonesian maritime continent: Conceptual discussions. *39th International Conference on Radar Meteorology, American Meteorological Society*, 2019.09.16-2019.09.20, Nara.

・Rahman, M. A., M. D. Yamanaka, M. Kawasaki, D. S. Nugroho, Y. Matsumi, M. Ohashi, H. Hashiguchi, S. Mori and O. Kozan Weather radar detection of tropical mixed-layer top capping forest-fire smog over maritime-continent peatland. *39th International Conference on Radar Meteorology, American Meteorological Society*, 2019.09.16-2019.09.20, Nara.

・濱田純一・松本淳・山中大学・S. Hasan・F. Syamsudin インドネシア・ジャカルタにおける 降水季節変化とその長期変動. *日本気象学会 2019 年春季大会*, 2019.05.15-2019.05.18, 東京. (in Japanese) 予稿集 p.74

YAMAUCHI Taro

Professor

Born in 1968.

[Academic Career]

School of Health Sciences, Faculty of Medicine, University of Tokyo, B.A. (1993)

School of International Health, Graduate School of Medicine, University of Tokyo, M. Health Sci. (1995)

School of International Health, Graduate School of Medicine, University of Tokyo, Ph.D. (Health Sci.) (1998)

[Professional Career]

Part-time Lecturer, Kagawa Nutrition University (1998)

Visiting Fellow, Research School of Pacific and Asian Studies, Australia National University (1999)

Post-doctoral Fellow, Japan Society for the Promotion of Science (JSPS) (2000)

Assistant Professor, Department of Human Ecology, Graduate School of Medicine, University of Tokyo (2002)

Visiting Associate Professor, National Institute for Humanity and Nature (2007)

Associate Professor, Faculty of Health Sciences, Hokkaido University (2007)

Professor, Faculty of Health Sciences, Hokkaido University (2013)

Professor,Research Institute for Humanity and Nature(2018)

[Higher Degrees]

Ph.D(The University of Tokyo, 1998)

M.Health Sci.(The University of Tokyo, 1995)

[Fields of Specialization]

Human Ecology

Global Health

Biological Anthropology

Human Nutrition

—Achievements—

[Papers]

[Original Articles]

- He JB, Zeng Y, Hao M, Yamauchi T 2020,03 Knowledge, attitudes and practices of sanitation and hygiene among primary school students in rural area of Northeast China. *Sanitation Value Chain* 4(1):39-50. DOI:10.34416/svc.00018 (reviewed).
- Reginald Adjetey Annan, Charles Apprey, Odeafo Asamoah-Boakye, Satoru Okonogi, Taro Yamauchi, Takeshi Sakurai 2019,09 The relationship between dietary micronutrients intake and cognition test performance among school-aged children in government-owned primary schools in Kumasi metropolis, Ghana. *Food Science & Nutrition* 7(9):3042-3051. DOI:10.1002/fsn3.1162 (reviewed).
- Wang PP, Hao M, Han W, Yamauchi T 2019,09 Factors associated with nutritional status and motor development among young children. *Nursing & health sciences* 21:323-329. DOI:10.1111/nhs.12604 (reviewed).
- Yumiko Otsuka, Lina Agestika, Hidenori Harada, Lies Sriwuryandari, Neni Sintawardani, Taro Yamauchi 2019,08 Comprehensive assessment of handwashing and faecal contamination among elementary school children in an urban slum of Indonesia. *Tropical Medicine & International Health* 24(8):954-961. DOI:10.1111/tmi.13279 (reviewed).
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[Research Presentations]

[Oral Presentation]

- Yamauchi T, Harada H, Mishima N Designing sanitataion systems collaborating with local communities: Participatory action research, fecal contamination assessment, and parasitic infection screening. The 2nd International Workshop for sanitation and hygiene in Cameroon, 2020.02.09, Yaounde, Camerron.

・Agestika L, Hamidah U, Sintawardani N, Yamauchi T Unsafe child heces disposal as a risk factor of child stunting in an urban slum of Indonesia. The 4th International Symposium on Green Technology for Value Chains 2019, 2019.10.23-2019.10.24, Tangerang, Indonesia.

・Yamauchi T Children living in obese and low physial fitness era: intergeneration changes among Japanese children. The 14th International Congress of Physiological Anthropology, 2019.09.27, National University of Singapore, Singapore.

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[Invited Lecture / Honorary Lecture / Panelist]

・Taro Yamauchi Developing the Sanitation Value Chain: Co-designing future sanitation systems through community based participation research. 8th Zambia Water Forum and Exhibition (ZAWAFE), 2019.06.10-2019.06.12, Mulungushi International Conference Centre, Lusaka, Zambia.

・Taro Yamauchi Sanitation and Health: Sanitation Value Chain. Future Earth Health Knowledge-Action Network Symposium, 2019.05.20-2019.05.23, Academia Sinica, Taipei, Taiwan.

YOSHIDA Takehito

Associate Professor

Born in 1972.

[Academic Career]

Bachelor of Fisheries, Hokkaido University, Japan (1995)

Master of Fisheries, Hokkaido University, Japan (1997)

Doctor of Science, Kyoto University, Japan (2001)

[Professional Career]

Postdoctoral Associate, Department of Ecology and Evolutionary Biology, Cornell University (2001)

Postdoctoral Fellow, Japan Society for the Promotion of Science, at Department of Ecology and Evolutionary Biology, Cornell University (2003)

Research Associate, Department of Ecology and Evolutionary Biology, Cornell University (2005)

Research Fellow, Japan Society for the Promotion of Science, at Research Institute for Humanity and Nature, Japan (2006)

Lecturer, Department of General Systems Studies, University of Tokyo (2006)

Associate Professor, Department of General Systems Studies, University of Tokyo (2008)

[Higher Degrees]

D.Sc (Kyoto University, 2001)

[Fields of Specialization]

Ecology, Limnology

[Academic Society Memberships]

Ecological Society of Japan

Japanese Society of Limnology

Society of Population Ecology

Society of Evolutionary Studies, Japan

Ecological Society of America

Association for the Sciences of Limnology and Oceanography

International Society of Limnology

[Awards]

Denzaburo Miyadi Award in 2005 (Ecological Society of Japan)

Young Scientist Initiative Award in 2007 (Society of Evolutionary Studies, Japan)

—Achievements—

[Books]

[Chapters/Sections]

・Tomita R, Hasu Project (a NGO in Mikatagoko area), Yoshida T. 2019 Sharing Experiences and Associated Knowledge in the Changing Waterscape: An Intergenerational Sharing Program in Mikatagoko Area, Japan. Saito O. (ed.) Sharing Ecosystem Services. Science for Sustainable Societies, 7. Springer, Singapore, pp.87-115. DOI:10.1007/978-981-13-8067-9_5

Appendix 1 Number and Affiliation of Project Members

Project Number	Title of the project	Total	RIHN	University / College			Inter-University Research Institute	Public Institution	Private Institution	Others	Overseas Institution
				National	Public	Private					
Research Program1 (FR3)	Toward the Regeneration of Tropical Peatland Societies: Building International Research Network on Paludiculture and Sustainability Management	48	9	22	1	6	1	1	1	1	6
Research Program1 (FR2)	Research and Social Implementation of Ecosystem-based Disaster Risk Reduction as Climate Change Adaptation in Shrinking Societies	113	4	59	7	14	0	18	10	0	1
Research Program 2 (FR5)	Biodiversity-driven Nutrient Cycling and Human Well-being in Social-ecological Systems	114	11	33	10	14	0	19	3	4	20
Research Program 2 (FR1)	Mapping the Environmental Impact Footprint of Cities, Companies, and Household	31	7	11	0	3	0	3	0	0	7
Research Program 3 (FR4)	Lifeworlds of Sustainable Food Consumption and Production: Agrifood Systems in Transition	89	11	14	2	10	0	6	11	4	31
Research Program 3 (FR3)	The Sanitation Value Chain: Designing Sanitation Systems as Eco-Community-Value System	60	5	28	1	4	0	3	0	2	17
Research Program 3 (FR1)	Co-creation of Sustainable Regional Innovation for Reducing Risk of High-impact Environmental Pollution	42	4	14	1	4	0	1	4	0	14
Research Program 1 (PR)	Study of behavior modification of public people by sharing daily activity and air quality information toward clean air and promoting public health	52	1	21	0	3	0	4	1	2	20
Individual Collaboration FS (KOBASHI)	Study for energy transition policy and strategy towards RE100% Asian cities	55	1	11	0	3	2	6	4	2	26
Individual Collaboration FS (NILES)	Humanities for the Environment: developing a cultural approach to environmental knowledge	14	2	0	0	0	0	0	0	1	11
Institutional Collaboration FS (OKABE)	Future Image of Living Sphere by Restructuring Sustainable Relation between Humans and Land	14	0	10	1	0	0	0	0	0	3

Institutional Collaboration FS (MANAGI)	Sustainable Urban Design using Inclusive Wealth	10	0	9	0	1	0	0	0	0	0
Institutional Collaboration FS (WONG)	Fair for whom? Comparing politics, power and precarity in transformations of swidden social-ecological systems in Southeast Asia and Sub-Sahara Africa	12	0	5	0	0	0	0	0	0	7
Incubation Studies Proposers	-	6	2	2	1	0	0	1	0	0	0
Core Program (FR3)	Proposal and Verification of the Validity of Isotope Environmental Traceability Methodology in Environmental Studies	36	12	5	4	4	0	7	1	2	1
Core Program (FR2)	Information Asymmetry Reduction in Open Team Science for Socio-environmental Cases	34	9	10	2	5	2	2	2	0	2
Core FS (ONISHI)	Co-design and stakeholder engagement according to geographical scales	8	3	1	0	0	0	0	1	0	3
Core FS (BABA)	Development of the Methodology for the Integrated Future Scenario Building with Trans-disciplinary Approach	6	0	2	0	2	0	2	0	0	0
-	Cooperative research program on Environmental Isotope Study	73	1	42	3	7	2	15	2	0	1
	Total	817	82	299	33	80	7	88	40	18	170

As of 31 March, 2020

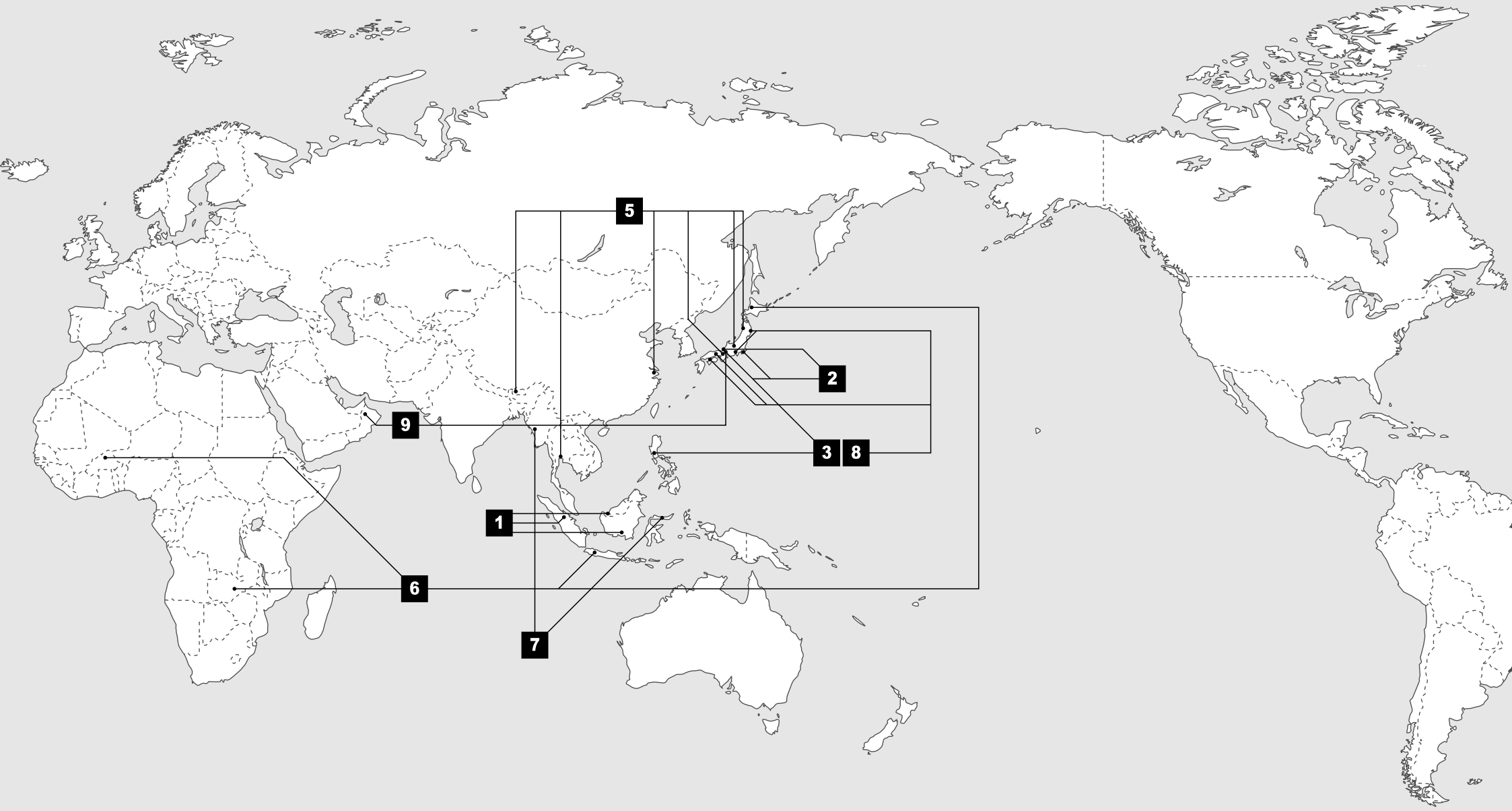
Appendix 2 Research Fields of Project Members

Project Number	Title of the Project	The Number of Projects Members				Research Background of Project Members
		Natural Sciences	Humanities	Social Sciences	Total	
Research Program1 (FR3)	Toward the Regeneration of Tropical Peatland Societies: Building International Research Network on Paludiculture and Sustainability Management	29	3	16	48	(Natural Sciences) GIS Spatial Informatics, Political Ecology, Environmental Engineering, Environmental Anthropology, Meteorology, Informatics, Plant Ecology, Forest Ecology, Hydrology, Mathematical Informatics, Ecology, Ecology, Policy Studies, BiogeoChemistry, Atmospheric Chemistry, Atmospheric Environment, Air Quality Measurement, Area Informatics, Urban Environmental Engineering, Soil Science, Agriculture, Agrometeorology, Agricultural Hydrology, Agricultural Engineering, Computational Chemistry (Humanities) Anthropology, Forest Policy, History (Social Sciences) Indonesian Political Economy, Indonesia Studies, Political Ecology, Environmental and Agricultural Change, Economics, Economic History, Social Anthropology, Human Geography, Politics, Political Economy, Regional Studies, Land Issue Studies, Agriculture
Research Program1 (FR2)	Research and Social Implementation of Ecosystem-based Disaster Risk Reduction as Climate Change Adaptation in Shrinking Societies	79	8	26	113	(Natural Sciences) GIS, Landscape Science, Space Utilization Engineering, River Environment, Pollen Analysis, Environmental Systems Engineering, Environment Design, Environmental Impact Assessment, Environmental Policy, Environmental Policy, Environmental Impact Assessment, Social Engineering and Environmental Management, Sustainable Science, Environmental Agriculture, Fish Physiological Ecology, Spatial Information Science, Spatial Informatics, Community Ecology, Landscape Ecology, Landscape Ecological Conservation, Architecture, International Fisheries Development, Erosion Control, Forest Policy, Human Environment Design, Water Environment, Water Engineering, Ecology, Ecosystem Management, Ecosystem Management Engineering, Ecosystem Assessment Management, Biodiversity Informatics, Landscape Architecture, Regional Environment Studies, Regional Planning, Global Environmental Studies, Traditional Architecture, Urban Planning, Urban Engineering, Civil Engineering, Civil Engineering Informatics, Statistical Science, Conservation Ecology, Watershed Management, Watershed Hydorology, Theoretical Ecology, Artificial Intelligence, Watershed Policy, Landscape Ecology and Planning, Landscape Planning, Silviculture (Humanities) Archaeology, History by Region, Japanese History, Cultural Anthropology, Ethnology, Japanese History (Social Sciences) Community, Local Community Disaster Prevention, Rviers, Environmental Economy, Environmental Sociology, Environmental Policy, Economic Verification, Architecture, National Land Design, Natural Environment Policy, Natural Capital, Social Economics and Agriculture, Community Participation in Disaster Recovery, Forest Policy, Water Environment, Hydrology, Politics, Landscaping, Tourism, Landscape Architecture, General Insurance, Regional Policy, Cultural Policy, City, Agricultural Business Management, Regional Planning, Rural Informatization, Disaster Prevention
Research Program 2 (FR5)	Biodiversity-driven Nutrient Cycling and Human Well-being in Social-ecological Systems	83	3	28	114	(Natural Sciences) d18Op Isotope Analysis, Plankton Ecology, Stable Isotope Analysis of Food Webs, Nutrient Cycling, Satellite Ecology, Applied Ecology, Applied Geophysics, River Sediment Macroinvertebrate, Chemical Oceanography, Marine EcoSystem Engineering, Environmental Systems Engineering, Environmental Economy, Environmental Governance, Environmental Agriculture, Environmental Microbiology, Environmental Analytic Chemistry, Environmental Conservation, Fish Ecology, Fish Genetics and Breeding Science, Fungology, Fungal Diversity, Spatial Statistics, Community Ecology, Lake Synthetic Science, Lake Sediment Macroinvertebrate, Nitrate Isotope Analysis, Plant Ecology, Plant Physiological Ecology, Forestry and Environmental Studies, Forest Hydrology, Forest Ecology, Evolutionary ecology, Hydrosphere Ecology, Aquotic Chemistry, Analytical Chemistry, Aquatic Ecology, Aquatic Biology, Fisheries, Underwater Acoustic Studies, Hydrological Science, Hydrology, Hydrology, Ecology, Mathematical Biology, Evolutionary Biology, Ecological Stoichiometry, Ecological Science, Ecology, Ecosystem Ecology, Biological Science, BiogeoChemistry, Phycology, Freshwater Ecology and Parasitology, Groundwater Chemistry, Geophysics, Benthic Animal Diversity, Isotope Environmental Science, Stable Isotope Ecology, Microbial Ecology, Molecular Ecology, Analytical Chemistry, Conservation Ecology, Limnology, Freshwater Ecology, Freshwater Biology, Basin Environmental Studies, Watershed Water, Phosphorus Cycle, River Basin Conservation (Humanities) Archaeology, Geoinformatics, Cultural Anthropology, Historical Geography (Social Sciences) Community and Project Development, Community Development, Community Organizations and Stakeholder Participation, Applied Economics, Environmental Economy, Environmental Sociology, Environmental Policy, Quantitative Sociology, Lake Policy, International Environmental Law, Industrial Ecology, Sociology, Social Psychology, Regional Planning, Regional Studies, Sociology of Local Community, Integrated Lake Basin Management, Rural Sociology
Research Program 2 （FR1）	Mapping the Environmental Impact Footprint of Cities, Companies, and Household	14	0	17	31	(Natural Sciences) Sustainability Science; Computational Sustainability, Energy System Analysis, Graph Theory, Optimal Transport, Life Cycle Assessment, Chemical Engineering, Marine Ecology, Environmental Agriculture, Engineering, Interindustry Analysis, Input-Output Analysis, Atmospheric Science, Geoinformatics, Environmental Modeling and Mapping, Soil Science, Civil Engineering, Science (Social Sciences) System Engineering, Material Flow and Stock Analysis, Life Cycle Assessment, Applied Econometrics, Chemical Engineering, Micro Data Analysis, Science and Technology Studies, Development Economics, Environmental Economy, Economic Statistics, Econometrics, Applied Econometrics, Industrial Ecology, Interindustry Analysis, Input-Output Analysis, Economics of Waste
Research Program 3 (FR4)	Lifeworlds of Sustainable Food Consumption and Production: Agrifood Systems in Transition	38	10	41	89	(Natural Sciences) Public Health, Urban Agriculture, Human Ecology, Agroecology, App Design, Ecological Footprint, Organic Market, Biochar Burying Agriculture, Food System, Life Cycle Assessment, Climatic Variation, Boundary Agriculture, Landscape, Landscape Ecology, Cultivation Management, Bioresource Agronomy, Sustainable Consumption and Production, Social System, Social Impact Assesment, Sociology, Agricultural Sociology, Agricultural Ethics, Frozn Food Engineering, Fishery Life Cycle Assessment, Biodiversity Informatics, Sociology of Local Community, Urban Planning, Urban Ecology, Urban Geography, Urban Agricultural Economic Management, Soil Science, Land Use Economics, Tropical Agricultural Ecology, Agriculture, Agricultural Life Cycle Asessment, Verification of Agriculture and Live Stock Industry, Unofficial Green Land, Cultural Landscape, Environmental Disign, Organic Agriculture, Beekeeping (Humanities) Environmental Anthropology, Food Studies, Sustainability Social Science, Sustainable Consumption, Anthropocene Studies, Environmental Studies, Environmental Sociology, Environmental Ethics, Sociology, Agricultural Ethics, Political Economy, Regional Policy and Planning, Zooarchaeology, Ecological Anthropology, Rural Development, Climatology, Cultural Anthoropology, Ethnology, History, Metahistory (Social Sciences) Future Studies, International Political Economy of Agriculture and Food, Rural Sociology, Agroecology, Innovation Studies, Green Consumer, Gender Studies, Distribution of Superfoods, Development Sociology, Environmental Governance, Environmental Management, Environmental Impact Assessment, Environmental Studies, Environmental Planning, Environmental Sociology, Environmental Policy, Company Evaluation, Global Agricultural Economics, Creating Future with Children, Natural Resource Management, Sociology, Socioeconomics, Social Policy, Socilogy of Food and Agriculture, Food Consumption, Food loss, Agricultural Geography, Fisheries Science, Policy Science, Organizational Theory, Geography, Urban and Rural Sociology, Soil Science, Agricultural Business Management, Agricultural Economics, Agricultural Policy, Rural Development Sociology, Rural Woman Policy, Gender, Child Care, Forest Policy
Research Program 3 (FR3)	The Sanitation Value Chain: Designing Sanitation Systems as Eco-Community-Value System	32	10	18	60	(Natural Sciences) Environmental Technology, Sanitation Technology, Water Treatment and Reuse, Genetic Engineering, Hygienic Environmental Engineering, Hygienic Engineering, Animal producrion Environmental Sudies, Feed studies, Chemical Engineering, Environmental and Sanitary Engineering, Environmental Studies, Eivironmental Studies, Civil Engineering, Environmental Engineering, Global Food Resources, Water Environment, Water Environment Engineering, Regional Environment Studies, Regional Studies, Geomatics, Agricultural Engineering, Agricultural Civil Engineering, Regional Planning (Humanities) Economic Statistics, Health Science, Human Ecology, Ecological Anthropology, Regional Studies, Agricultural Economics, Cultural Anthropology, Historical Anthropology (Social Sciences) Africa Studies, Sanitation Studies, Medical Anthropology, Development Economics, Environmental Engineering, Educational Technology, Intellectual Property, Health Science, Internaitonal Politics, Social System, Sociology, Social Psychology, Informatics, Teaching Material Development, Human Ecology, Regional Studies, Economic Statistics
Research Program 3 （FR1）	Co-creation of Sustainable Regional Innovation for Reducing Risk of High-impact Environmental Pollution	24	6	12	42	(Natural Sciences) Medical Science, Applied Chemistry, Applied Microbiology, Environmental Science, Environmental Economics, Resource Economics, Environmental Ecology, Environmental Soil Science, Boundary Agriculture, Public Health, Informatics Education, Forest Ecology, Living Environment, Ecology, Geoscience, Global Environmental Studies, Geology, Geology, Petrology, Physics, Analysical Chemistry, Environmental Chemistry, Pharmacotherapy on Neurology (Humanities) Design Studies, British Literature, Environmental Ethics, International Law, Agriculutural Economics, Environmental Economics, Culture and History (Social Sciences) Gender and Social Sciences, Remote Sensing, Development Economics, Environmental Economics, Development Studies, Environmental Science, Environmental Economy, Educational Psychology, Business Organization, Forest Science, Human Resources Development, Regional Environment Studies, Sociology of Local Community, Geography, Agriculutural Economics, Development Economics, Myanmar Studies, Regional Planning
Research Program 1 （PR）	Study of behavior modification of public people by sharing daily activity and air quality information toward clean air and promoting public health	41	7	4	52	(Natural Sciences) Atmospheric Chemistry and Physics, Atmospheric Science, Heat Stress, Heavy Metal Stress, Drought Stress, Seed Priming, Seed Hardening, Seed Physiology, Medical Science, Public Health, Environmental Health, Soil Fertility, Soil Chemistry, Soil Science, Waste Management and Organic Farming Practices, Remote Sensing, Environmental Epidemiology, Environmental Engineering, Environmental Informatics, Environmental Agriculture, Environmental Health, Public Health, International Agricultural Development, Tropical Crop Science, Agronomy, Water Engineering, Atmospheric Simulation, Atmospheric Modeling, Atmospheric Chemistry, Atmospheric Science, Atmospheric Environment, Atmospheric Physics, Groundwater Hydraulics, Soil Science and Plant Nutrition, Soil Microbiology (Humanities) Agricultural Economics, Time Geography, Regional Studies, Geography (Social Sciences) Agricultural Economics, Hygieiology, Public Health, Global Health, Toxicology, Agricultural Economics
Individual Collaboration FS （KOBASHI）	Study for energy transition policy and strategy towards RE100% Asian cities	54	0	1	55	(Natural Sciences) Energy Research, Redydling Technology, Environmental Impact Assessment, Environmental Material, Environmental Policy, Environmental and Social Considerations, Transportation Engineering, Design Engineering, Earth Resource Engineering, Infrastructure and Project (Social Sciences) Politics
Individual Collaboration FS (NILES)	Humanities for the Environment: developing a cultural approach to environmental knowledge	4	8	2	14	(Natural Sciences) Ecosystem (Humanities) Sociology (Social Sciences) Archaeology, Geography
Institutional Collaboration FS (OKABE)	Future Image of Living Sphere by Restructuring Sustainable Relation between Humans and Land	10	1	3	14	(Natural Sciences) Architectural Design, Architecture, Architectural Planning, Disaster Prevention under Residential Environment, Urban Planning (Humanities) Environmental Ethics (Social Sciences) Politics
Institutional Collaboration FS (MANAGI)	Sustainable Urban Design using Inclusive Wealth	0	1	9	10	(Humanities) Humanities and Social Sciences (Social Sciences) Environmental Science, Environmental Management, Environmental Economy, Economics, Urban System Studies, Urban System Enigineering
Institutional Collaboration FS (WONG)	Fair for whom? Comparing politics, power and precarity in transformations of swidden social-ecological systems in Southeast Asia and Sub-Sahara Africa	10	2	0	12	(Natural Sciences) Environmental Studies, Environmental Policy, Environmental Agriculture, Environmental and Social Considerations, Forest Science, Politics, Ecology (Humanities) Regional Studies
Incubation Studies Proposers	-	3	0	3	6	(Natural Sciences) Mineralogy and Petrology, Biodiversity Conservation/Insect Science, Urban Geography/Urban Planning/Urban Ecology/Unofficial Green Land (Social Sciences) Medical Anthropology, Social Survey/Future Design, Fisheries/Natural Resource Management/Forest Policy
Core Program (FR3)	Proposal and Verification of the Validity of Isotope Environmental Traceability Methodology in Environmental Studies	25	2	9	36	(Natural Sciences) Energy Research, Landscape Science, Planetary Space Science, Environmental Impact Assessment, Environmental Studies, Environmental Policy, Environmental Chemodynamics Research, Environmental and Social Considerations, Soli Earth Science, Sociology, Social Psychology, Water Engineering, Ecology, Regional Environmental Engineering, Earth Resource Engineering, Biogeochemistry, Regional Planning (Humanities) Archaeology, Cultural Anthropology, Ethnology (Social Sciences) Environmental Policy, Environmental and Social Considerations, Sociology, Agribusiness, Aquotic Production Science, Politics
Core Program (FR2)	Information Asymmetry Reduction in Open Team Science for Socio-environmental Cases	11	14	9	34	(Natural Sciences) Environmental Studies, Ecology (Social Sciences) Design Studies, History of Science technology, Sociology of Science, Architecture Planning, Architectural History, Social Psychology, Urban Planning, Cultural Anthropology, Ethnology
Core FS (ONISHI)	Co-design and stakeholder engagement according to geographical scales	4	0	4	8	(Natural Sciences) Hydrology, Global Environmental Studies (Social Sciences) Environmental Economy, Environmental Sociology, Environmental Policy
Core FS (BABA)	Development of the Methodology for the Integrated Future Scenario Building with Trans-disciplinary Approach	4	0	2	6	(Natural Sciences) Green Sustainable Chemistry, Atmospheric Chemistry, Basic Informatics, Atmospheric and Aquotic Sciences, Agricultural Environmental Engineering, Agricultural Informatics (Social Sciences) Environmental Policy, Consensus Building, Policy Making Process, Atmospheric and Aquotic Sciences
-	Cooperative research program on Environmental Isotope Study	72	1	0	73	(Natural Sciences) Cosmo and Geochemistry, Applied Entomology, Chemical Oceanography, Anatomy, Marin Science, Environmental Science, Mineralogy and Economic Geology, Ancient Environment, Paleoclimatology, Biomolecular Archaeology, Bioarcheology, Bioresource Science, Resource Geology, Geochemistry, Biological Anthropology, Tree Physiology, Tree Physiology and Ecology, Plant Ecology, Plant Physiological Ecology, Forest Hydrology, Forest Ecology, Forest Environment, Water Environment, Water Environment Management, Hydrology, Hydrology, Applied Geology, Resource Engineering, Hydrology, Ecology, Hydrological Geochemistry, Environmental Engineering, Ecology, Ecosystem Interaction, BiogeoChemistry, Snow and Ice Science, Snow and Ice Science, Geochemistry, Pollination Ecology, Sedimentology, Geochemistry, Geochemistry, Mineralogy, Geochemistry, Hydrology, Geoscience, Biogeocehmistry, Earth Environmental System, Global Environmental Studies, Soil Zoology, Zooecology, Isotope Environmental Science, Isotope Hydrology, Stable Isotope Ecology, Isotope Geochemistry, Analytical Chemistry, Analysical Chemistry, Aquotic Chemistry, Cultural Assets Science, Conservation Ecology, Inorganic Geochemistry, Organic Geochemistry, Limnology, Soil Science, River Basin Conservation (Humanities) Archaeology
	Total	537	76	204	817	

As of 31 March, 2020

Research Project Sites

Appendix 3



Full-Research

Program 1 Societal Transformation under Environmental Change

1 Toward the Regeneration of Tropical Peatland Societies: Building International Research Network on Paludiculture and Sustainable Peatland Management

○Indonesia, Malaysia

2 Research and Social Implementation of Ecosystem-based Disaster Risk Reduction as Climate Change Adaptation in Shrinking Societies

○Japan

Program 2 Fair Use and Management of Diverse Resources

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

○Japan, Philippines

4 Mapping the Environmental Impact Footprint of Cities, Companies, and Household

○World

Program 3 Designing Lifeworlds of Sustainability and Wellbeing

5 Lifeworlds of Sustainable Food Consumption and Production: Agrifood Systems in Transition

○Japan, Thailand, Bhutan, China

6 The Sanitation Value Chain: Designing Sanitation Systems as Eco-Community-Value System

○Zambia, Burkina Faso, Indonesia, Japan

7 Co-creation of Sustainable Regional Innovation for Reducing Risk of High-impact Environmental Pollution

○Sulawesi Island in Indonesia, ASEAN countries

Core Program

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

○Japan

9 Information Asymmetry Reduction in Open Team Science for Socio-environmental Cases

○Japan, Oman