

## Collaboration between scientists and stakeholders at the scene of environmental issues

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Realization of the "science for the society" has become pressing subject after frequent incidences of environmental issues. Future earth as a solution-oriented science display collaboration with stakeholders as an important target. However, there are many complicated subjects, such as hierarchy of stakeholders, conflict on interests, relationship between decision maker and stakeholder, and so on. This session will be discussed the role and position of scientists in the society through case studies, in order to get clues of careful consideration under serious environmental issues our facing to.

Keywords: scene of environmental issues, scientist, stakeholder, future earth

## Transdisciplinary science toward the adaptive watershed governance: Biodiversity-driven nutrient cycling and human well-being

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#### 1. Research background and objectives

Technological innovations in the use of nutrients, such as nitrogen and phosphorus, to produce food contributed to the great global increase in population, life expectancy, and economic prosperity experienced in the twentieth century. Overexploitation of nutrient resources, however, causes disturbance of natural biogeochemical cycles, accounting for serious eutrophication in many watershed ecosystems around the world. Such nutrient imbalances are a main driver of biodiversity loss on a global scale, leading to deterioration of its ecosystem functions and services. It is now recognized that nutrient imbalances and biodiversity loss are prevalent throughout the planet, posing a risk to sustainable human development. In order to solve these problems related to nutrient imbalances and to ultimately ensure sustainable social-ecological systems, we have to enhance nutrient recycling on watershed scales.

Under such a background, we aim to facilitate cross-linkage of the multi-level governance, in which governments and researchers with a systemic view intend to solve nutrient imbalance-derived issues on the regional and global scales, while civilians want to solve social and environmental issues in the context of their life and livelihood. For such watershed governance to be successful, local and scientific knowledge must be shared and integrated by a variety of stakeholders to reconcile conflicts and interests emerging on different scales. Here I will develop a framework for the adaptive watershed governance, in which civilians are empowered for nature conservation, resulting in enhancement of their well-being, while scientists show how biodiversity enhances nutrient recycling through their conservation activities.

#### 2. Hypothesis

Our hypothesis is that human activities affect biodiversity through alteration of nutrient balances, while biodiversity affects human well-being through alteration of social capitals. A working hypothesis is proposed to explain how the well-being is enhanced through the nature conservation (Fig. 1). First, local communities will be empowered for the nature conservation when they value biodiversity whose wise and sustainable use has been fostered by local knowledge for indigenous culture (Fig. 1-1). If bonding social capitals are accumulated through sharing of the indigenous cultural values among the community member (Fig. 1-2), the well-being will be enhanced (Fig. 1-3). If scientific knowledge showing that the community activities contribute to enhancement of biodiversity-driven nutrient recycling, which ensures public values for sustainability of social-ecological systems, is shared among a variety of stakeholders in the watershed society (Fig. 1-4), the community activities will be supported by non-community members directly or indirectly through social evaluation of public values produced from the biodiversity conservation (Fig. 1-5). A shift from bonding to bridging social capitals will also enhance the well-being (Fig. 1-6). These processes will be driven by transdisciplinary science (Fig. 1-7).

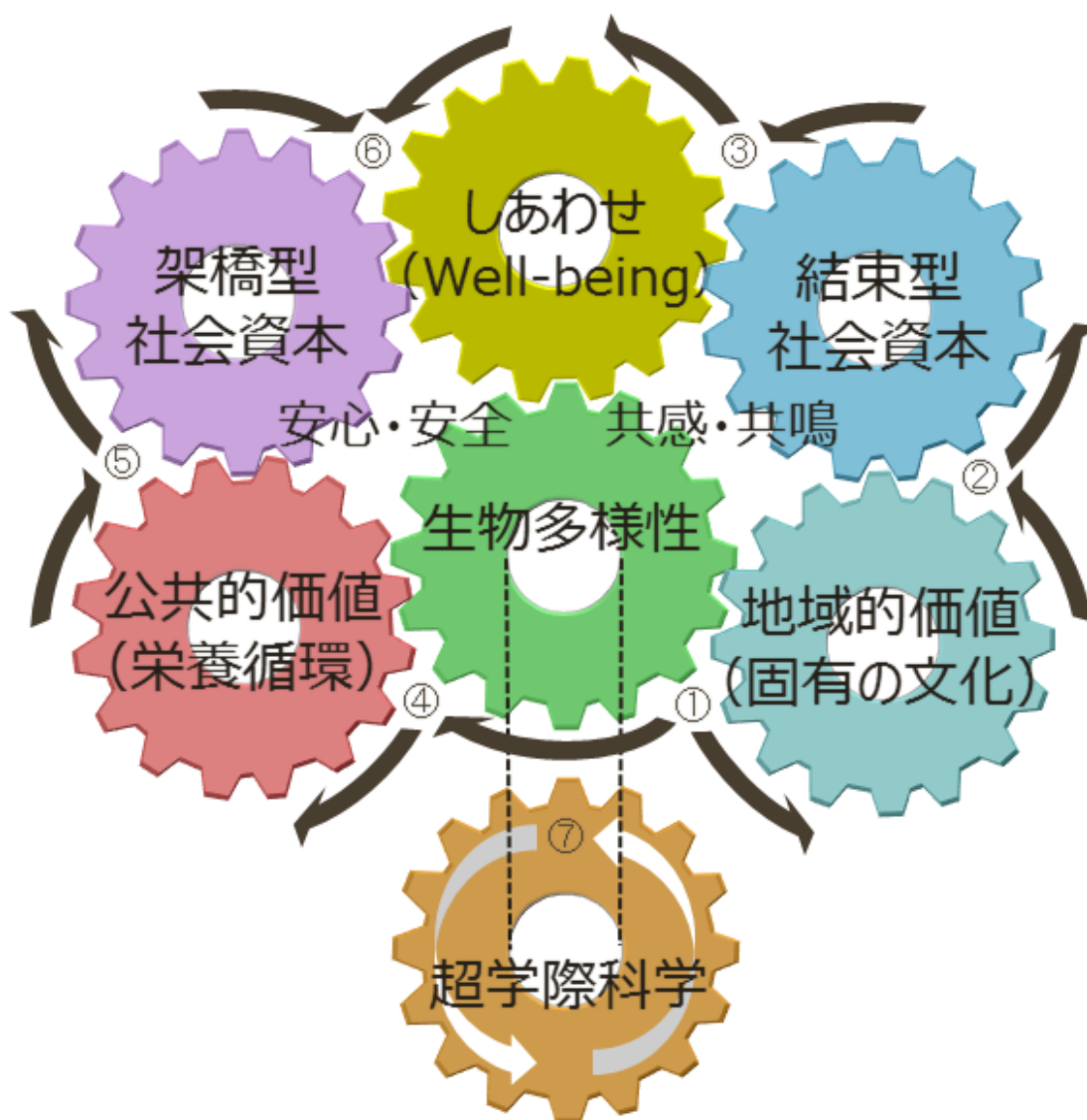
#### 3. Methods

To test this hypothesis, my research project will practice the adaptive watershed governance in two extreme systems, the Lake Biwa Watershed and the Laguna de Bay Watershed, in Asia: the former is infrastructure-oriented low-loading society and the latter high-loading developing society. Finally, I want to find the fundamental framework of the adaptive watershed governance applicable to a variety of society.

#### 4. Perspectives

In developed societies, establishment of infrastructure, such as sewage treatment and tap water systems, has reduced eutrophication, making human life more comfortable and convenient. However, environmental consciousness has been distant from the nature of wetlands as lifeworld. So, what enhances human well-being? Is it enhanced by the infrastructure? We want to seek answers to these questions.

Keywords: Nutrient imbalance, Social capital, Biodiversity, Transdisciplinary science, Human well-being, Watershed governance



## Attempt at Clinical Volcano Disaster Studies

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Disaster prevention is a major area of collaboration with the society for earth science communities. One example is volcano eruption disaster mitigation and management. The eruption of Mt. Ontake in central Japan revealed that local governments and other stakeholders are not able to sufficiently take initiative and effectively collaborate for volcano disaster management, though there are many governmental organizations contribute for mitigation and management. This presentation introduces the MEXT-J funded research project for local disaster management support ("Clinical Volcano Disaster Studies") focusing on three volcanos in central Japan to solve the above mentioned problem, in collaboration among local governments and natural science/policy study researchers. This project is an application of a university's institutional trial of trans-disciplinary research called "Clinical Environmental Studies," to volcano disaster management. The presentation elaborates Clinical Environmental Studies.

Keywords: volcano disaster, Clinical Environmental Studies, transdisciplinary

## Land use and vulnerability of atoll nations in the Pacific and Indian Oceans

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Atoll nations established on cays on coral atolls in the Pacific and Indian Oceans face the potential risk of future sea level rise. This paper reports the status of disasters based on field research in the atoll nations, and then discusses the relationship between disaster and geomorphology/land use based on the examples of Tuvalu, Kiribati, and Maldives.

In Tuvalu, half of the national population of ~10,000 lives on the capital island, Fongafale, located on the Funafuti Atoll. The traditional settlements are located on the beach ridge beside the lagoon at a height of ~2 m. New settlements and facilities such as power plants are built on the lowland between the windward storm ridge and the beach ridge and suffer flooding during the spring tide.

In Kiribati, 34,000 (one third of the national population) people live in the capital, South Tarawa. The elevation of a traditional settlement is 2 to 3 m above Mean Sea Level. The new residential areas including a school, small factories, and shops, are built on the lower part of the cay. In addition, many reclamation activities by residents are observed along the lagoon coast in South Tarawa.

In Maldives, 154,000 (one third of the national population) people live on the capital island, Malé, which has an area of ~2 km<sup>2</sup>. The area of Malé Island has been doubled by landfills and surrounded by breakwaters.

The fully equipped island is recognized as a safe from coastal erosion due to sea level rise and tsunamis. Therefore, the population of such an island increases and advances the urbanization on that particular cay. The vulnerability of atoll nations should also be considered from the point of view of the uneven distribution of the population owing to the rapid migration of people as well as from that of the measures taken against sea level rise.

Keywords: Atoll Nation, Land Use, Settlement, Sea Level Rise

## Surprising, Learning and Encouraging: Interaction researcher and local people on the field of desertification study in the Sahel

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In this presentation, I will discuss the similarity and difference of scientific knowledge and indigenous knowledge through the case of scientist's intervention to farmers for improvement of land degradation (desertification) in Sahel area such as Niger and Burkina Faso. To considering this topics, I will use the notion of "etic" and "emic" which are used in cultural anthropology.

Keywords: Etic and Emic, Scientific knowledge and indigenous knowledge, Combat against desertification

## Co-designing local water resources management with stakeholders

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The concept of Integrated Water Resources Management (IWRM) was first proposed in the 1990s, during an increasing worldwide environmental awareness, and has been recognized as a fundamental principle for comprehensive water resources management, involving various sectors and many stakeholders. However, IWRM implementation in local communities and effective assessment of the influence of human activities on the water environment is yet challenging. Therefore, this study aims to present water resources management at the local level, which is the foundation of IWRM, to be a social implemented, and to develop the knowledge structure and ability for implementing this management among the concerned parties. In particular, we considers a management structure that reflects the relationship among various water users. Based on this specific content and the necessary conditions for establishing the management structure, this study aims to suggest desirable local water resources management guidelines through co-operation between science and society.

Keywords: collaborative actions with stakeholders, Local water resources management, Social learning