Completed Research

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

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

Megacities and the Global Environment

Project Leader **MURAMATSU Shin** The University of Tokyo

What, and how much, have we learned?

The seven findings presented below represent the accomplishments of the Megacity Project over the past five years.

(1) We identified the principle underlying the ideal organization of megacities from the standpoint of sustainability of human society. That is to say, we delineated constraints for cities so that the burden they place on the global environment does not exceed planetary boundaries. In order to enable this, it is necessary to mobilize humanity in a direction that maximizes the economic and social potential of cities. In doing so, it is critically important that we simultaneously pursue optimal benefits in the three areas of global environment, society, and economy (the *triple benefit principle*)

(2) We developed the City Sustainability Index (CSI) as a means of assessing megacities. Using this index, we assessed 18 megacities and found that none can be considered sustainable at present (Figure). What policies and measures, then, are needed to respond to this situation? In reply to this question we proposed a fundamental approach to achieving the ideal organization of megacities (3), which we coined "radical incrementalism with long-term vision." Megacities are extremely large and complex. At present, it is not possible to find an optimal solution for all aspects of megacities. Radical incrementalism entails (a) repeatedly choosing actions from among the feasible options that are locally optimal in the short-term while (b) maintaining a long-term vision for pursuing sustainability for humankind and (c) emphasizing a city's history.

Similarly, in order to deal with the size and complexity of megacities, it is necessary to deliberate on the ideal organization of cities with a wide range of experts and variety of stakeholders. We proposed a "megacity scenario-based approach" (4) as a means for realizing such co-design. Furthermore, as a prerequisite to achieving the ideal organization of megacities, we pointed out the importance of taking the local ecosphere into consideration while also paying attention to the geographic characteristics and history of a given city (5). Each megacity is influenced by the climate, livelihood patterns, and topography of the particular ecosphere in which it is located, whether it be in the Monsoon Asia or mid-latitude arid region. Each megacity is further constrained, in both positive sense and negative senses, by events that occur on the time axis.

We also pointed out that in order to realize the ideal organization of megacities, we should focus on "residential environment" (6), which is the most important space in which humans live. The Megacity Project identified two means of intervening in the residential environment based on an inclusive urbanism approach focusing on the triple benefit society. Furthermore, we pointed out that in order to achieve the ideal organization of megacities, we should pay close attention to the economic development of the middle class (7). This focus on the economic component of the triplet benefit stems from the belief that people begin to consider the sustainability of human society only after they feel a certain degree of economic affluence.

Our vision of global environmental studies

Global environmental studies integrates a wide range of disciplines in order to think about the means necessary "for humankind to continue existing on the planet called Earth while enjoying a certain degree of affluence." There are a number of possible approaches to creating such a field of study. In our project, we focused on cities, which are home to half of the world's population, and, especially among these, on 18 megacities with a population of 10 million or greater.

New connections

The identification and development of the seven concepts and approaches presented above represent the accomplishments of our Megacity Project. Detailed content of each can be found in *Shiriizu: Megashitii* (Series: Megacities) a complete set of 6 volumes scheduled to be published by the University of Tokyo Press in 2016.

Figure City sustainability index (CSI)
A model constructed to invesigate the sustainability of 18 megacities (Tokyo, Jakarta, Seoul, Mumbai, Sao Paulo, Mexico City, Manila, New Delhi, Cairo, Kolkata, Osaka-Kobe, Shanghai, Buenos Aires, New York, Los Angeles, Karachi, Dhaka, and Moscow).

Designing Local Frameworks for Integrated Water Resources Management

Project Leader **KUBOTA Jumpei** RIHN
Co-Project Leader **Dorotea Agnes RAMPISELA** Hasanuddin University

Background and objectives

The concept of Integrated Water Resources Management (IWRM) was first proposed in the 1990s in order to recognize and coordinate the many stakeholders and sectors involved in water resources management. While IWRM has focused on integrating the sectors and organizations governing water resources, it has not typically been able to incorporate demands from local water users or taken account of their cultural or historical backgrounds. New frameworks or guidelines have been requested in the field of local-to-regional water resources management.

The objective of this project is to propose knowledge structures and functions of water resources management to local-level stakeholders who play the essential role in adapting IWRM into society. The research therefore involves considerable exchange between the scientific study of water cycles in particular places and the wide range of stakeholders involved in water management and use. The project's goals are to develop cooperation between science and society in order to stimulate the co-creation of desirable local water resource management.

Achievement

In order to accomplish the goals of the project, we established several study sites in Indonesia, Turkey, Egypt and Japan. Project research put special emphasis on sites in Indonesia and Turkey as they present a simple hydrological contrast between humid and arid regions, while their historical and cultural differences offer comparative examples of water management structures. We held stakeholder meetings and conducted action research in field study areas in order to promote mutual understanding of how different actors perceive water-related problems and to seek new ways of establishing proper water resources management.

In Indonesia, field surveys in the subak systems of Bali indicated recent changes in their societal functions and roles related to globalization and mass tourism. At the same time, a stakeholder meeting held in Bali in 2013 demonstrated that problems such as water pollution caused by illegal waste dumping and illegal constructions on irrigation canals have recently arisen between subak members and outsiders. Through intensive dialogues among stakeholders, the project established a new "Forum DAS" (river committee) including subak representatives, officials and engineers in local governments, scientists, and NGO workers in order to address these problems beyond the normal scale of subak governance. In South Sulawesi, a lack of communication among water managers was clearly identified in the stakeholders meeting in January 2014, in which almost a hundred farmer leaders, water managers, and governmental supervisors participated. After this meeting, the project supported further autonomous discussion among water managers by utilizing the traditional "apalili" meeting. These meetings established a detailed schedule of water allocation which was then shared with water managers and farmers, improving the performance of water allocation and, consequently, rice production in 2014. In 2015, this method was applied to other irrigation districts,

In Turkey, we identified similar problems in water management, including information disparities and unclear responsibilities in spite of privatization. Excessive use of irrigation water and chemical fertilizer was responsible for degradation of watershed environment and land productivity. After a stakeholders' meeting in March 2014, we conducted a pilot project on night irrigation with WUAs, NGO and a private financing agency, in order to address over-irrigation and resulting decrease in production. This project was very successful, reducing water used for irrigation by more than 30 %, while improving production by 26%.

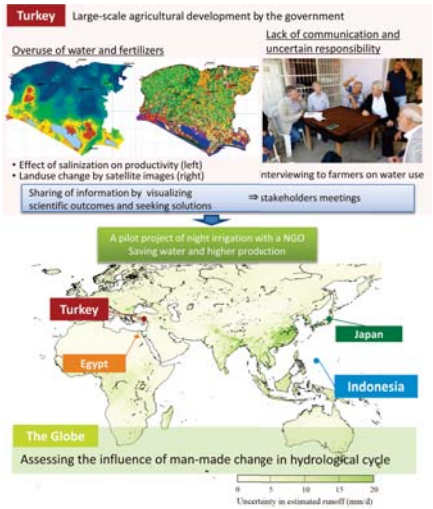

Figure 1 Progress of the project at a glance. The map in the center indicates the uncertainty indicated by a model predicting water runoff, on which the key elements of research problems and findings in the case study sites on water resources management are featured. Deeper green color signifies higher uncertainty in estimating water resources, and demonstrated the need for transdisciplinary approaches to local-level co-creation of water knowledge and resource management.

Figure 2 The results of stakeholders meetings in Indonesian study sites

http://www.chikyu.ac.jp/rihn_e/project/C-09.html
http://www.chikyu.ac.jp/P-C09/