Multi-disciplinary research for understanding interactions between humans and nature in the Lake Biwa-Yodo River watershed - Hierarchical watershed management concept -

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Aim of the project

We aim to develop a methodology for revealing interactions between human activities and nature in a watershed ("watershed diagnosis") and for consensus building through an interdisciplinary study and practice with the residents and administration in the Lake Biwa-Yodo River watershed.

Three project members make presentations about the project.   Firstly, I talk about the objectives of the project, basic concepts and ideas, research organization, and expected results to give the whole image of this project.   In the second paper, Takuya TANAKA talks on the implementation of the ideas into research activities in the Lake Biwa-Yodo River watershed.   In session 4, Eitaro WADA focuses on the new development of environmental indicator as a diagnosis tool and some preliminary results in this watershed.

Basic concept: Hierarchical watershed management

A watershed is regarded as an essential spatial unit for the effective management of hydrological cycling, material cycling and ecosystems.   It is, however, usually composed of a main river as well as various large and small tributaries branching out like a tree.   This hierarchical (or nested) structure of its river systems, to which human social (decision making) systems are hierarchically structured in parallel (e.g., administrative districts, such as prefecture-cities-communities), causes the people that live in the watershed area where different elements exist, to experience their lives differently, thus, have different interests and opinions.   Therefore, in the process of building consensus on managing a certain watershed, there will be much disagreement and opposition regarding what the subjects are.

Here, we propose "hierarchical watershed management" concept as an ideal model to overcome the difficulties in consensus building arising from the nested structure of the watershed.   The watershed as a whole can be divided into three levels: a "micro-level basin", a "meso-level basin" and a "macro-level basin" (figure 1), where the levels are embedded in the order of micro, meso, and macro.   At each level, adaptive management is carried on following the "Plan -> Do -> Check -> Action" cycle by the governance of multiple stakeholders.   There, depending on the basin characteristics and level, watershed diagnosis tools, such as indicator and model are used to build up a database for social decision-making and for empowerment of residents.   Between levels, a communication facilitation and interpretation system for mutual understanding is designed and provided.   This is the concept of hierarchal watershed management (figure 2).

Research organization and expected results

Focusing on water environmental issue, four working groups: "material cycling", "social & cultural system", "ecosystem" and "watershed information & modeling" work co-operatively at the three levels (macro, meso, micro) of the Lake Biwa-Yodo River watershed.   The material cycling group develops indicators as a diagnosis tool at various spatial scales, tries to implement "environmental capacity" concept.   The social & cultural system group mainly focuses its activity on a meso-level basin, "Aisei land improvement district (Inae area in Hikone city)", supports the residents and administration to make a regional environmental vision of the district by using sociological methods and information obtained by the four working groups.   The

ecosystem group and the watershed information & modeling group establish a platform for sharing and integrating information at the three levels of the watershed by GIS and modeling, develop tools which facilitate communication within and between levels for building consensus.

Practical methods and proposals for the better management of the Lake Biwa-Yodo River watershed will be obtained. By adding customization property as "Linux" to the tools for watershed diagnosis and consensus building, the applicability of these tools would be extended to diverse Asian watersheds.