Monitoring and Assessment of Governance Improvement in Integrated Lake Basin Management (ILBM)

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Abstract. Lakes and other naturally impounded forms of water such as marshes, wetlands, ponds and temporary pools, etc., are generally regarded as "lentic waters". Artificially created waterbodies naturalized reservoirs, waters behind impoundment structure in rivers, etc., also possess lentic water properties. Despite the fact that more than ninety percent of liquid freshwater on the earth's surface is in lentic form, that most of the lotic (flowing) waters has to be transformed to lentic form for withdrawal and distribution, and that the lentic waters have certain biophysical, chemical and ecosystem behavioral features that make their management for sustainable use extremely difficult, the global attention to the challenges facing lentic waters has been rather limited because of the misconception that the challenges facing global waters can be successfully addressed without specifically focusing on lentic water issues per se. This paper addresses the issues pertaining to monitoring and assessment in the cyclic process of basin governance improvement called Integrated Lake Basin Management (ILBM). The issues pertaining to the use of "stress reduction", "enabling process" and "environmental status" indicators in the ILBM Platform Process raises many illuminating perspectives in the linkage among many common threads in water management.

Keywords: Monitoring and Assessment, Integrated Lake Basin Management (ILBM), Governance Improvement, Lake Biwa

1. INTRODUCTION: WHAT IS ILBM

Lakes and reservoirs are broadly considered to be "standing" or "static" water systems or, using a hydrologic term, they are designated "hydrostatic" systems. In contrast, "moving" waters, such as rivers, can be regarded as "hydrodynamic" systems. Similar expressions exist in ecology literature. The

descriptive terms are “lentic” and “lotic” systems. The meaning of “lentic” is basically the same as for hydrostatic, while the meaning of “lotic” is the same as for hydrodynamic. However, the lentic and lotic expressions have the additional connotation of their imbedded ecological functions and anthropogenic interactions with humans. The lentic waters, either fresh or saline/brackish, have a particularly vulnerable and fragile property due in large part to their unique biological-chemical-physical features transcending to complex management challenges. The features include, integrating nature (it receives all forms of stress from almost every direction), long water residence time (the received stresses remain long and persistently); and complex response dynamics (the stresses change their form from one state to another within the water body, often not being readily noticed since they take place in small increments).

2. SIX PILLARS OF GOVERNANCE

With the above in mind, the ILBM approach aims to achieve incremental, gradual and long-term improvement of what is called the Six Pillars of Governance, i.e., (1) Institutions to manage a lake and its basin for the benefit of all lake basin resource users; (2) Policies to govern people's use of lake resources, and its impacts on lakes; (3) Involvement of people to facilitate all aspects of lake basin management; (4) Technological possibilities and limitations that often dictate long-term decisions; (5) Knowledge of both traditional and modern scientific origin as the basis for informed decisions; and (6) Sustainable finances to support implementation of all of the above-noted activities. Relevant questions regarding these domains may include:

<Institutions: Organizations for Action>

Is there a focal-point institution in charge? Are the relevant capacity building and training programs effective? Is the institution focusing on priority skills? Is it inclusive and open to cooperating

agencies, community groups, etc.? Are any mid-course corrections needed?

< Policies: Development of Effective Actions>
Is there a management plan with a realistic implementation scope? Does an adequate management plan already exist, or should the existing plan be updated? Are the relevant priorities and phasing clear? Does strong political will exist to support sustainable management? Is sustaining and building political will and commitment appropriately incorporated as part of the management program?

<Involving Stakeholder and People>
Do effective mechanisms exist for participatory implementation? Does the existing management plan include all relevant stakeholders for its implementation? What changes have occurred in regard to awareness and understanding of the problems, and their linkages to stakeholder activities? What are the perceptions of program stakeholders?

<Technological Possibilities and Limitations>
Are the existing technologies working well? If yes, could their performance be further improved? If no, what are the reasons for their not working properly? Have there been unexpected adverse impacts of technology applications? If yes, have the adverse effects been appropriately mediated? If no, should the applications be further replicated? Have either technology options or costs changed, and are such changes reflected in the management plan?

<Knowledge, Information and Role of Science>
Is there a common, shared knowledge base about the priority management challenges? Does a monitoring system exist to measure changes in key governance and other relevant indicators? Is the data base sufficient? What are the remaining key gaps? Are information management tools adequate to be effectively deployed?

<Mobilizing Sustainable Finance>
Is the amount of existing funding adequate to meet the basin management priorities? How can access to financial resources be improved, including access to private funding? Are financing sources maintainable in a medium and long term? Is the available funding channeled properly to the needs of watershed management? How transparent and reliable is the access to funding mechanisms?

These six major topics comprise the essential governance ingredients that collectively form the management regime for the integrated approach for lake basin management encompassed within Integrated Lake Basin Management (ILBM), referred to hereafter as the Six Pillars of Governance in ILBM as shown in **Figure 1**.

3. PLATFORM PROCESS AND INDICATORS

The incremental, gradual and long-term

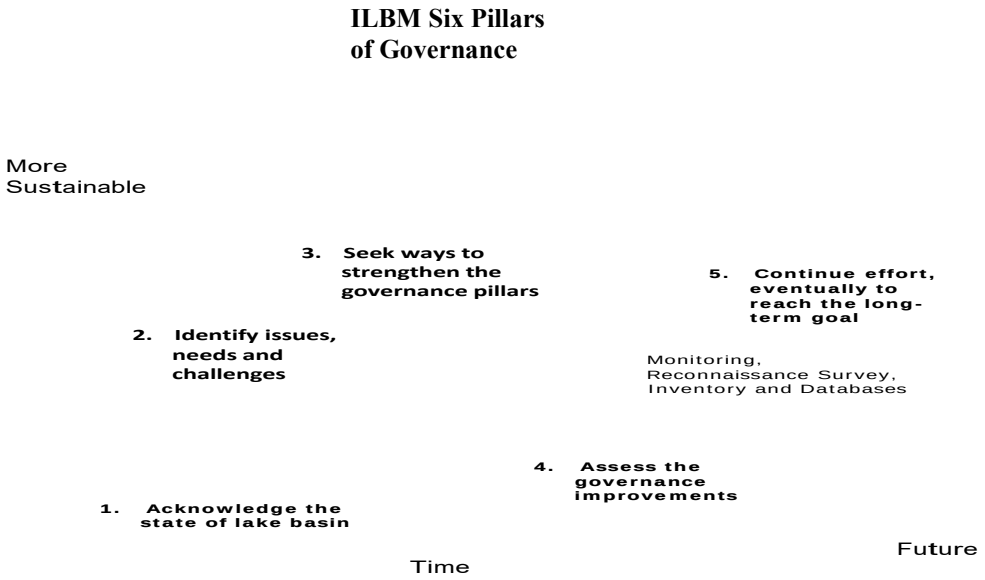

Figure 1. Conceptual Illustrations of ILBM Platform Process with Incremental Improvement of Six Pillars of Governance

improvement of Six Pillars of Governance would have to involve a cyclic process called an ILBM Platform Process also shown in **Figure 1.** It begins with **Step 1)**, "Description of the State of Lake Basin Management" with the information and data originally obtained. **Step 2)** would involve a consultative process among the concerned stakeholders, identifying the "Needs"and "Challenges" in fulfilling the gap between how the stated of Six Pillars of Governance as compared to the desired state at the end of the current cyclic process. In **Step 3)**, the stakeholders should be ready to discuss and consider how the "Challenges" identified above in Step 2) may be collectively and productively addressed, taking note of a wide range of substantive issues. This step also requires critical self-analysis of the background and reasons why such "Challenges" arose in the first place. **Step 4)**, to be elaborated in detail below, is a monitoring and assessment step based on which the cyclic process of ILBM Platform Process would be repeated back to Steps 1) through 3), before eventually reaching **Step 5)** which would be a future goal continuously to be strived toward.

In Step 4), there are two important considerations for assessing incremental improvements in lake basin governance; namely, i.e., i) assessment methodologies and indicators; and ii) time intervals for review and assessment.

As for i), the kind of indicators to choose, and therefore the assessment methodologies thereof, may be broadly categorized into two, i.e., "output-oriented" and "outcome-oriented". Further, the "output-oriented" indicators would be either a) the "enabling process" related or b) the "stress reduction" related. The "outcome-oriented" indicators are generally c) the "environmental status" related.

Some examples of the a) "enabling process indicators" may include: realization of stakeholder involvement in the creation of a management plan; imposition of certain regulatory requirements such as the mesh size of fishing nets (as in the case of certain African lakes); and legal and institutional reforms for harmonization of various environmental management plans.

Some examples of b) "stress reduction indicators" may include: increased reed bed area resulting from de-siltation operations; reduced industrial pollution loading by the imposition of more stringent enforcement; reduction of excess water withdrawals; reduced agrochemical application per cropland area; reduced silt and sediment carried into the lake.

Some examples of c) "environmental status indicators" may include: the increase or decrease in nutrient concentrations in lake water; improvement in the state of ecosystem health, as reflected in an increased biodiversity index and the extent to which communities and stakeholders benefitted from the measured changes in environmental conditions. The approach suggested here is similar to those proposed for the implementation of internationally funded projects by multilateral and bilateral funding agencies, but ILBM aims at improving the basin governance far beyond individual project periods.

As for ii), the time intervals for review and assessment can vary from a few months to several years. The most dictating factor in the determination of time intervals is the availability of data and information for monitoring and assessment. In the case of a) the "enabling process" related indicators and b) the "stress reduction" related indicators, the ILBM Platform members (the stakeholders) generally find their ways to compile the needed data and information gradually over the cyclic process, particularly when the Platform process is formally supported by the local and national governments. In the case of c) the "environmental status" related indicators, however, the institutionalized process of data and information acquisition has a strong linkage with the conventional systems of ambient and regulatory monitoring as discussed below.

4. MONITORING AND ASSESSMENT ISSUES: A CASE OF LAKE BIWA, JAPAN

Lake Biwa, the largest lake in Japan serving drinking water to some 14 million in the whole of Shiga Prefecture, most of the Kyoto and Osaka metropolitan regions as well as part of Hyogo Prefecture to the west of Osaka Prefecture. The lake serves also for other uses including paddy irrigation and industrial water supplies. In the meantime, the laks is also a prime natural asset in terms of its scenic and cultural values, with thriving tourism and recreational activities. Fishery activities are still active, though the output value in terms of the prefectural economy is rather minimal. Lake Biwa has been one of the eleven designated lakes under the Law Concerning Special Measures for Conservation of Lake Water Quality (enacted in 1984, amended in 2005). The Law stipulate that the designated lakes develop and implement the "Lake Water Quality Conservation Plan", which will have to be periodically revised based on the reviews in the progress in terms of the degree to which the lake water quality meet the target values of ambient water quality standards in term of the concentration of

Chemical Oxygen Demand (COD), Total Nitrogen (TN) and Total Phosphorus (TP). While the structure and the substance of this Law is far more sophisticated than ILBM Platform Process described above, the conceptual framework of the Law is fundamentally the same as that of ILBM in that it promotes gradual, incremental and long-term improvement of basin governance, with the key driving forces being the improvement in the values of a) "enabling process", b) "stress reduction" and c) "environmental status" indicators, the last of which include the above ambient water quality standard values of prime importance, COD, TN and TP in addition to "Health Items" that include a whole range of trace organic and inorganic chemicals.

The measurements of these two sets of water quality parameters are conducted by Shiga Prefectural Government in collaboration with a regional office of a national government ministry in charge, monthly at 28 sites in the Northern Basin, 19 sites in the Southern Basin and 2 sites at the exiting Seta River, meaning that the budget invested in such elaborate ambient water quality monitoring is quite substantial. In addition, the water supply bureaus of Kyoto and Osaka also conduct "source water quality monitoring" for the water supply systems separately.

Of course, the data and information on "environmental status" would not just be limited to water quality measurement values. The status of ecosystem health is another important dimension. The assessment activities encompasses a wide range of subjects including the species and quantity dynamics of phytoplankton, submerged and terrestrial macrophytes (water weeds), micro and macro invertebrates, benthic fauna and bacteria, fish. What makes this subject of "environmental status" more involved and challenging, particularly in the case of such multiply valued lentic water systems as Lake Biwa, is the interrelationships among the indicators within the "environmental status" category, as well as the interrelationships of the indicators belonging to "environmental status" with those belonging to "enabling process" and "stress reduction" categories.

As for the former, i.e., the interrelationships among the indicators within the "environmental status" set, the major driving forces affecting them are food-chain and biodiversity dynamics. For example, some recent findings include the climate change effects over the past decades resulting in such changes in ecosystem dynamics, leading to the proliferation of macrophytes clogging the water intake facilities and of noxious taste and odor

problems necessitating additional chemicals for their removal, resulting in enormous financial burdens for the water supply facilities downstream.

As for the latter, i.e., the interrelationships of the indicators belonging to "environmental status" with those belonging to "enabling process" and "stress reduction" categories, the situation is suggestive of the linkage between the ambient standards and the regulatory standards of discharged effluents into the lake as well as to the water courses flowing into the lake. The regulatory standards of discharged effluents include those pertaining to 1) harmful substances, 2) living environment and 3) pollution load amount assessment, all of which are the direct outputs of the "enabling process" provisions, such as laws and regulations for discharge control measures and related activities.

5. CONCLUSION: ANECDOTAL OBSERVATIONS

The extent and the magnitude of the challenges facing lakes and other naturally impounded forms of water exhibiting the lentic water properties are of global concern, while the global attention to the challenges facing them has been rather limited. The concept of ILBM has been slowly but steadily accepted by the national governments and international programs as a most reasonable approach to address the issues facing the management of basin resources for sustainable use. The conceptual design of the Platform Process is also well accepted, though the process of monitoring and assessment for governance improvement needs to be refined further. The institutionalized approach based on a legal framework such as one implemented in Japan for Lake Biwa and other designated lakes would serve as a useful model. The use of "environmental status" indicator, as compared to the use of "stress reduction" and "enabling process" indicators should be further improved and enhanced with a global collaboration framework at the local, regional and international levels. For that, the number of application cases should be greatly increased beyond those implemented in Asian, African and Latin American countries where many promising initial experiences have been reported.

References:

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