Lake Biwa and the World's Lakes: Sustainability of Resource Use and Conservation
琵琶湖と世界の自然湖沼：資源利用と環境保全の持続可能性

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ABSTRACT: Many of the world's lakes, including Lake Biwa, have been afflicted by deterioration of environmental condition and ecosystem integrity over the past decades, resulting in their resource values significantly degraded. This has been particularly noticeable among lakes in rapidly developing countries. "Lakes", nonetheless, have been conspicuously absent till recently from the global debates on freshwater. This may have been due to the fact that the range of issues facing lakes spans almost all of the major freshwater issues debated in various freshwater fora in their own right, such as water supply, pollution, ecological services, floods and droughts, agricultural water use, etc. In the past few years, however, "lakes" have come to hold well in the global water agenda. A World Lake Vision was developed after a few years of intense discussion, with almost all of the major lake organizations participating globally. In addition, a global project on lake and basin management initiatives (LBMI), supported in part by GEF, was inaugurated in March 2003, aiming particularly to address policy, institution, financing and economics, stakeholder participation, and science. Together with WLV and LBMI, the prospect for more effective and focused approach for improving lake situations seems to have become much brighter.
KEYWORD; Lakes, World Lake Vision, GEF, Basin Management Initiatives, Lake Biwa

1. Introduction

In the global freshwater debates in the last decade, "lakes" seem to have positioned themselves somewhat apart from the mainstream agenda. "Lake issues" encompass, naturally, those of water uses for drinking, agricultural and industrial purposes, and of control of floods and droughts, of pollution control and ecosystem services, as well as fishery and biodiversity, etc. They are all part of the "freshwater agenda", but not exclusively of "lakes". Take two great lakes in Asia, for example. Lake Biwa, the largest lake in Japan, is today an extensively regulated water system that serves for drinking water for 14 million people living around the lake and over the entire Yodo River watershed, sustains industrial activities in one of the most productive industrial regions, supports paddy agriculture extensively in the vast areas of the lake watershed. Improvement in water quality, restoration of the degraded shoreline ecosystem functions, as well as better management and resolution of conflicts are of great concern to the people in the lake region. Tonle Sap Lake in Cambodia, another great lake in Asia, is also an extensively regulated lake, not by man however, but by nature. The Tonle Sap River connects the lake with the main Mekong River, together with vast wetlands around periphery. As the main Mekong flood level heightens each year during the southwest monsoon every June or July, the direction of flow of the Tonle Sap River reverses, creating the exceptional water regime with huge changes in the lake water level (from about 1m up to 10 meters) and water volume (from about 2500 km^2 to approximate 11 000 km^2) between seasons. About 1.2 million Cambodians in approximately 160 communes live in the area of maximum flooding around the lake. While the lake serves as a source of drinking water form people around region, the lake is better known for its diverse indigenous fish species serving for local subsistence fishery as well as domestic commercial

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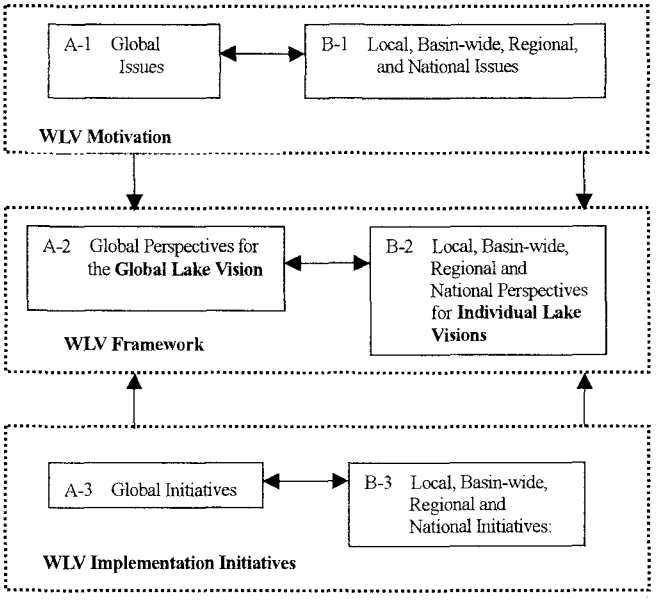
fishery. It also sustains one of the greatest pools of biodiversity on the globe.

Management needs of the two lakes naturally differ greatly, and the reason for rather subdued presence of "lakes" in the previous world's fora on water in recent years may have a lot to do with the differences in the need of individual "lakes" in seeking, perhaps, a road map that deals only with own specific disciplinary agenda rather than the general agenda facing "lakes" per se.

"Lakes", nontheless, have long been feeling that their common concerns need to be addressed better. A growing number of "lakes" share the notion that conservation and management of lakes must enter the mainstream of the economic development and environmental conservation processes through their comprehensive management.



A-1: e.g., global warming, biodiversity/fishery conflicts, virtual water/global trade, international lakes, global disaster lakes, etc.
B-1: e.g., development impetus on resource values of water, land and ecosystem resources; inadequate, insufficient and /or inappropriate past attempts and efforts for sustainable lake management, etc.
A-2: e.g., Every lake is a global lake; The current global approach in lake conservation and management needs to be further promoted and strengthened; A Global Lake Vision ought to be developed and the associated initiatives and commitments ought to be widely pursued and implemented; Development of individual lake visions ought to be globally promoted and supported.
B-2: e.g., Management of every lake reflects conflicting views from local, basin-wide, regional and national perspectives on values of a lake; Development of a Shared Lake Vision for individual lakes is possible, provided that the Vision Process is made to be a continuously evolving and converging one; A locally, basin-widely, regionally and nationally shared set of principles is necessary for sustainable management of individual lakes.
A-3: e.g., lakes in global freshwater initiatives, international commitments, alliance/collaboration, etc.
B-3; e.g., principles for sustainable lake management, guidelines for development of individual lake management plans, etc.

Fig. 1 Making of a World Lake Vision

2. World Lake Vision

The development of a "**World Lake Vision** (WLV) " was driven by the motivation that sound management and sustainable use of lakes require a common vision. For many lakes, the guiding principles for the sustainable use of lakes may entail integrated water resources management, for many others, they entail that humanity recognizes and appreciates that lakes, cradles of cultures, history and social development for the surrounding communities, are not merely convenient sources

of freshwater and food or interesting places for recreation, but also that they are water bodies of amazing biological complexity, intrinsic beauty. For practical purposes, the intention of WLV is to provide individuals, agencies and organizations with a comprehensive integrated approach in lake management for identifying and addressing significant lake problems, solutions and potential uses while also bringing-up their implications for society and nature. It is also important to note that while the causes of lake problems can be of local, national, international or even global origin, so too, can the consequences (e.g., global climate change and its implications for altering the hydrologic regime in an individual lake drainage basin). Further, the sustainable use and conservation of international or trans-boundary lakes must effectively integrate the national interests of the riparian countries that share them.

Without a comprehensive vision, attempts to address the management and conservation of these important water resources remain fragmented, incomplete and largely ineffective, and yet well-conceived and environmentally-sustainable management plans do not exist for most lakes. Thus, development of a visionary assessment of policy, planning, technology and education to provide fundamental guidance on the management and conservation of the world's lakes, in the form of WLV, requires that the scope of the "vision" not be unduly limited, but rather evolve and develop on the basis of the widest participation of stakeholders. Fig. 1 illustrates an original conceptual framework, linking WLV motivations (A-1, B-1) and WLV implementation initiatives (A-3, B-3) to form a WLV framework (A-2, B-2).

3. Lake Basin Management Initiatives

Better management of lakes cannot be accomplished with just a WLV. The vision has to be complimented with management experiences, lessons learned and best practices. Funds, technologies and trained management personnel will also be required. International technical cooperation and funding agencies are also increasingly aware of the need for many developing countries to deal with sustainable use of lake resources, which require, aside from funds and technology, relevant policy and institutional frameworks.

A project entitled "**Lake and Basin Management Initiatives (LBMI)**" was inaugurated in March 2003 as a collaborative effort of International Lake Environment Committee (ILEC) and its partner organization LakeNet, with support from several funding sources including the Global Environment Funds (GEF). The relationship between WLV and this project, denoted as GEF(LBMI) project, is shown in **Fig. 2**. This project is designed to review some 13 lake management efforts receiving GEF funding and 13 not receiving GEF funding, with preparation of the experience and lessons learned briefs (see **Table 1**). By comparing lake management experiences, not only of those in temperate climate , but also of those in semi-arid, arid and tropical climates, the project will produce outputs that are aimed at nations that have not yet elevated lake management to a national priority or developed lake action plans and management programs. The experience and lessons learned briefs are intended to foster the development of lake action plans and programs. To be pursued also is strengthening of capacity for improved lake basin management at local, provincial, national and global levels.

Each brief will define, for example, the importance of the lake/reservoir, the key biophysical and socio-economic characteristics, and the principle environmental management challenges. It will assess the principles, approaches and methodologies used for addressing different environmental and sustainable development problems of the lake in question. Particular attention will be drawn to assess the critical policy, legislative and institutional reforms adopted, and the investment, human resources and institutional capacity and other constraints on the environmentally sound management of the lakes. Important also is assessment of key issues of relevance to the GEF and the implementing agencies with regard to approach to investments, capacity building efforts, stakeholder participation in the design and implementation of the programs, sustainability of the lake management institutions, linkage of the lake management programs to the broader national and regional water resources management reforms, and scientific quality of the program/project.

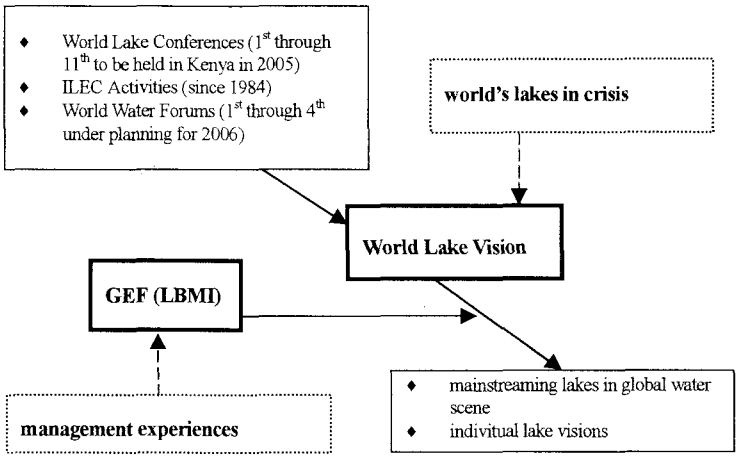


Fig. 2 World Lake Vision (WLV) and GEF (LBMI) in Perspective

4. Experience and Lessons Learned from Lake Biwa Management

A typical lake brief consisting of Background (biophysical features, environments, political and socio-economic features on development and conservation), Biophysical Environment (past and current conditions, history of lake degradation, lake and drainage basin resource conflicts), Management Environment (lake management programs and processes, reduction of lake stresses, enabling environment) and Lessons Learned and Recommended Initiatives (changes in political interest and commitment, sustainable institutions, financing mechanism, legislative frameworks, stakeholder participation, and scientific information and research). Of particular importance is the last section on Lessons Learned and Recommended Initiatives about which the following description is introduced for Lake Biwa.

4.1 Changes in political interest and commitment

- The higher the resource value of the lake, the stronger the interest and commitment becomes. The political interest and commitment will come in different forms at different times of the history of lake management, and they are often the end result rather than the achievable objective. When opposing political interests and commitments clashes, the process of dispute resolution has to be instituted. Dispute resolution may be enhanced sometimes by such mediating factors as scientific knowledge, third-party initiatives and concerns, and innovative institutional arrangements.
- It is difficult, in general, to achieve sustainable management of lake resources without political commitment and interest. However, political commitment and interest alone won't achieve sustainable management of lake resources, as sustainability depends greatly on the synergy created by the basin communities, individual citizens, local industries and the local government, facilitated by political interest and commitment.

4.2 Sustainable institutions

- Regardless of development or conservation, comprehensive management of large lakes that support municipal, industrial and agricultural activities of significant magnitude like that of Lake Biwa, will require very strong local government capacity to implement the needed infrastructure development projects that may typically span decades.
- Many of the infrastructure projects for lake resource development and conservation will require decades of continuous construction works and sustainable management. Special institutional design with integrated rather than sectoral arrangements may be quite useful for efficient implementation of these projects.

- Suitable institutional arrangements that satisfy local government needs to provide basic environmental services to the communities such as sewerage, industrial waste management, etc., may not necessary be sufficient to bring about the needed improvements in environmental and ecological condition of the lake since lake management will invariably require integrated management of water, air and land resources, encompassing such activities as control of non-point sources of pollution, restoration of ecological functions of land and riparian environments, etc. Efficient mobilization of limited financial and manpower resources to deal with a range of interrelated environmental issues will require holistic and flexible institutional arrangements.

Table 1. Tentative List of Lakes and Reservoirs to be Included in the Study.

GEF Lakes/Reservoirs		Non-GEF Lakes/Reservoirs	
Lake/Reservoir	**Country**	**Lake/Reservoir**	**Country**
Africa			
Baringo	Kenya	Nakuru, Naivasha	Kenya
Chad	Cameroon, Central African Republic, Chad, Niger, Nigeria, Sudan		
Malawi	Malawi, Mozambique, Tanzania	Kariba	Zambia, Zimbabwe
Tanganyika	Burundi, Congo, Tanzania, Zambia		
Victoria	Kenya, Tanzania, Uganda		
South and East Asia			
Dianchi	China	Biwa	Japan
Khanka/Xingkai	China, Russia	Chilika	India
Tonle Sap	Cambodia	Laguna de Bay	Philippines
		Toba	Indonesia
		Bhopal	India
Europe and Central Asia			
Aral	Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan	Constance	Austria, Germany, Switzerland
Baikal	Russia		
Ohrid	Albania, Former Yugoslav Republic of Macedonia		
Peipsi	Estonia, Russia		
Americas			
Titicaca	Bolivia, Peru	Champlain	USA, Canada
		Great Lakes	USA, Canada
		Nicaragua	Nicaragua
		Tucurui	Brazil

4.3 Financing mechanism

- The financial base of lake-region governments alone may not be sufficient to undertake the necessary development and conservation projects. As implied in the Special Law for Lake Biwa Comprehensive Development and cost-sharing with the downstream local governments under Lake Biwa Comprehensive Development Project (LBCDP, 1972-1997), the special legislation to facilitate mobilization of financial resources from the central government, including preferential subsidies, as well as from the downstream local governments that benefit from development of lake resources, could be of critical importance.

4.4 Legislative frameworks

- Lake management encompasses a wide range of environmental issues, each of which has to be properly addressed with specific legal provisions that will meet particular requirements specific to individual lakes. The legal provisions to promote regional development, with specific aim to develop resource values of a lake, may or may not have adequate provisions for environmental and ecological needs of the lake and its watershed. It will be most useful to introduce and

implement formal and informal legal provisions, including local government ordinances, which can meet specific needs of the local communities that will have to deal with such environmental requirements.

4.5 Stakeholder participation

- For a lake that is as complex as Lake Biwa, resolution of conflicting resource-use interests among sectors, of severely strained relationships among the upstream, downstream and riparian local governments, and of development impetus of industries vs. environmental conservation initiatives of citizens and local NGOs, etc., the stakeholder participation has been and will continue to be essential part of lake management. While there exist no set formula to bring about successful stakeholder participation, not to mention amicable resolution of conflicts themselves, the stakeholders must accept to live with conflicts that may be significantly ameliorated with mutual facilitation over the course of continuous dialogues.
- The central government can often play a crucial role in resolving conflicting interests among the riparian local governments, both in terms of being part of the river-lake basin institutional system and through political facilitation, often accompanied with legal, financial and institutional provisions. In the case of Lake Biwa-Yodo River management, the Central Government played dual roles, i.e., both as an important part of the river-lake basin system and as a facilitator with legal, financial and institutional provisions.

4.6 The linkages between the lake management water resources management efforts

- LBCDP was devised to meet the projected water resources needs of the Keihanshin Industrial Belt to cater for the thriving Japanese economy in the early 1970s. While water resource remains to be as important a factor to as 30 years ago, the subsequent environmental and ecological concern in lake management have evolved and grown also to become as important a national agenda as water resource development.
- On one hand, the fact that Lake Biwa management has had strong linkage with the broader national and regional water resources management efforts greatly facilitated Lake Biwa achieve what the local government alone would never would have been able to achieve, i.e., implementation of LBCDP. The strong linkage with regional and national water resources management efforts did significantly affect the environmental and ecological integrity of the lake watershed and its coastal zones. It is important for local government to be aware, therefore, that it receives due support from regional and national governments for the conservation of lake environments as well.

5. Concluding Remarks: Experience Brief on Scientific Information and Research

Sustainable lake management is synonymous to sustainable use of lake resources. Sustainable use of lake resources won't be achievable unless the respective users agree to some basic principles in resource availability in the past, now and in future, with due protection and conservation measures collectively introduced. While the scientific knowledge today is still far too limited to determine how a particular lake fares with regard to the sustainability of resource values over the course of time, making judgment on resource sustainability without scientific knowledge in relation to possible natural and anthropogenic variances would be futile. A scientifically well-informed decision is important, not because that the decision will be correct, but because the decision can be assessed scientifically to be corrected with new scientific findings. While there is no good measure of the appropriate level of investment on science for lake management, the level of funds wasted for lack of scientific approach in management far outweigh the required investment.

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