ILBM-G PROJECT REVIEW MEETING
ILEC/IETC, Kusatsu, Japan; 2-6 November, 2010

Introduction
On November 2 - 6, 2010, the Final Review Meeting for the International Lake Basin Management Governance Project (ILBM-G), funded by the Japanese Ministry of Education and the International Lake Environment Committee (ILEC), was held in Kusatsu, Japan, being hosted by ILEC and UNEP-IETC. The purpose was to allow invited experts and committee members to discuss their general experiences with lake and river management, as well as within the framework of Integrated Lake Basin Management (ILBM).

In addition, a Roundtable and a Panel discussion were held on November 7, focusing on the International Symposium ILBM - Governance Project. The purpose of this latter activity was to provide an overview of the topics and issues discussed within the Final Review Meeting to a broader public audience. It also was hoped that the Roundtable and Panel discussions would provide further provide evidence of the need for implementation of the ILBM framework on an international level, both to address the sustainable use of lentic waters for meeting human and ecosystem needs, as well as being a basis for international collaboration and cooperation regarding lakes, their basins and their life-supporting ecosystem services.

Part I of this report summarizes the presentations and conclusions arising from the individual presentations during the November 2-6 ILEC Final Review Meeting, as well as the field trip activities, and their relationship to the overall ILBM process. Part II of this report summarizes the Roundtable and Panel discussions that took place during the November 7 International Symposium.

PART 1: ILBM-G Project Final Review Meeting

This part of this report is structured on a daily basis during 2-6 November, focusing on the individual presentations and their conclusions. The presentations are presented and discussed in the order they were made at the meeting.

Day 1 (2 November)

Presentation 1: Managing the World’s Lentic Waters: Integrated Lake Basin Management (ILBM) Holds the Key

Professor Masahisa Nakamura, Chair, ILEC Scientific Committee, and Director, Center for Sustainability and Environment, Shiga University, Japan:

Overview: This presentation provided background on the purpose and content of the ILBM framework being espoused by ILEC and the Center for Sustainability and Environment. Because all the following presentations are related to the ILBM framework discussed herein, a detailed summary of this presentation is provided. Further information on this topic can be obtained by reviewing the 2005 ILEC publication, “Managing Lakes and their Basins for sustainable Use: A Report for Lake Basin Managers and Stakeholders,” which is accessible via the ILEC website (www.ilec.or.jp).
Lake and their basins throughout the world systems, which represent lentic (non-flowing) water systems, are facing increasingly serious over-allocation and degradation problems throughout the world, examples being:

- India (Bhoj Wetlands, Bhopal) – Serious eutrophication problems persist because of a centuries-old tradition of laundry washing in the lake. The lake also suffers from degradation related to idol immersion. The religious use of the lake also has been impacted by declining lake water levels resulting from overuse and overpopulation, leading to the necessity of having to build artificial pools in which the religious ceremonies can take place;

- Philippines (Laguna Lake) -- A high level of urbanization in the lake basin (3.5 million people) has resulted in serious eutrophication, sedimentation and overfishing, negatively impacting the 13 million people that depend on the lake as a life support system;

- Nepal – Containing more than 5,000 lakes, their degradation has resulted in negatively-impacted biodiversity, diminished economic livelihoods, and reduced aesthetic and cultural values. Being the “water tower” for major river systems draining southern Asia, this region also has a special importance in regard to climate change impacts. The region contains 3,252 glaciers, for example, that have been melting at a noticeably faster rate, causing flooding and sediment intrusion concerns. The long-term impacts of this phenomenon are not yet known, although they have obvious implications for the sustainability of water systems both in this region and downstream;

- Malaysia – Serious soil erosion related to massive palm tree plantations, and high urban and industrial development have resulted in serious eutrophication to many Malaysian lakes, as well as being a source of constants of interest that hinder cooperation between interested parties. There also has been a significant loss of indigenous species as a result of human activities in many lake drainage basins.

Based on such case studies, it is clear that many common lake problems exist throughout the world, differing primarily in the perception of the seriousness of the problems, their overall impacts, and the capability (monetary and human) for dealing with them. Managing these common problems has become a global-scale challenge. IWRM and IRBM were previously developed as a rationale means of attempting to address these and related water issues. However, neither of these approaches focuses on degrading lentic water systems. Lentic water systems contain most of the readily-accessible liquid freshwater on the land surface, and are used for a wider range of life-supporting ecosystem services than other water systems (rivers, groundwater aquifers, estuaries, open oceans). ILBM was developed specifically to address these deficiencies, providing a comprehensive, holistic means of managing lentic water systems for sustainable use, as well as providing a means of integrating the management needs of both lentic and lotic (flowing) water systems (e.g., rivers). Further, in contrast to IWRM and IRBM, ILBM is sufficiently flexible and comprehensive to be applicable to all these water systems, including their surface and sub-surface upstream and downstream components. The ILBM Platform developed by ILEC, and which constituted the major topic of this presentation, and its reiterative application to lentic waters, and their hydrological connections with lotic waters, are illustrated below in Figure 1. As discussed further below, the reiterative nature of the application of the ILBM Platform also allows for its refinement and updating over time, as a result of new information and data and/or new management goals.
The four guiding principles or perspectives of ILBM are as follows:

- **Ecological Service Principle** -- This principle considers different kinds of ecological services (provisioning; regulating; cultural; supporting). Global experience suggests that most management attention is directed to maximizing ecosystem provisioning services (e.g., fish production; water supply; hydropower production), without consideration of the reality that the excessive exploitation of these regulating services can decrease the ability of ecosystems to provide the other services (especially the regulating services). In turn, this degradation can result in feedback loops that affect all these services, thereby degrading the entire lake basin;

- **Change in Resource Value Principle** – This principle focuses on the fact that continuing lake degradation can eventually lead to the loss of a lake ecosystem capacity to provide resource provisioning ecosystem services. Further, once a lake has become degraded beyond a certain point (resulting in a shift in its basic ecosystem structure and function properties), it is usually difficult, if not impossible, to return it to its former non-degraded state;

- **Lentic Water System Principle** – This principle involves consideration of several unique features of lentic water systems in attempting to manage them for sustainable use. These features include their integrating nature, their relatively long water retention times, and their complex dynamics. The integrating nature means that the impacts and root causes of hindrances to their ecosystem services are largely inseparable. Their long water retention times means that in-lake changes are often gradual
in nature, thereby being difficult to observe. It also means that the expected improvements from implementing remedial measures for specific lake basin problems may take a long time to exhibit visible results. The complex dynamics of lakes means that their changes are often unpredictable and uncontrollable;

- **Governance Improvement Principle** – Since governance failures often lie at the core of lake basin problems, the need to consider the components and effectiveness of lake basin governance elements is essential. As identified in the ILBM Platform, these elements include institutions, policies, stakeholder participation, financing, information needs, and the possibility of technologically-based versus changes in human behaviors in management efforts. Because lake basin issues are often inseparable, for example, governance activities must be undertaken across geographic and institutional jurisdictions, involve simultaneous consideration of land and water issues, and must be comprehensive in nature. Further, because lake basin changes are often gradual and not readily-noticed, the implementing policies and financial resources for addressing them must be long-term and, ideally, proactive in nature. Finally, the fact that lake basin issues are often unpredictable and uncontrollable means a precautionary approach should be taken, and that the results of scientific studies and applied science should be used to the maximum extent. Bridging the gaps between all stakeholders and all knowledge bases appears crucial for this goal.

To address these various principles and issues, a basin-wide management approach, incorporating spatial (nested) and temporal (adaptation) scales, must be used. ILBM provides a flexible management framework that can be applied in many contexts. As shown in the above diagram, the ILBM framework involves three reiterative steps which, in turn, allow constant management reevaluation and adaptation. These components include development of lake briefs that can be used to provide the scientific and socio-economic knowledge based needed to assess a given lake and its basin. As noted above, these steps focus on six pillars that are fundamental to successful lake basin governance, including institutions, policy, participation, financing, knowledge and information, and technology. The reiterative nature of ILBM allows for constant reevaluation, revision and enhancement. The role of ILEC in supporting each of these elements includes the distribution of reference materials and information (Lake Brief guidelines; LAKES database; World Lake Databases; training modules and programs), as will be further discussed in later presentations.

Practical conclusions that can be drawn from an understanding of the ILBM framework include the following: (1) attention regarding lake basin governance elements should focus primarily on protecting ecosystem regulating services; (2) long-term approaches are needed to address long-term exploitation, which should also include financing issues; (3) although development interventions can result in immediate resource values, these values also can be lost equally quickly, thereby highlighting the crucial need for lake basin conservation. Experience suggests that the properties of a water body and its basin should guide the needed management efforts, with governance improvements focusing on the six ILBM governance pillars. Shared and transferred experiences also can facilitate widespread knowledge of lake basin management. An additional important consideration is that the inter-linkages between lentic and lotic water systems should not be ignored in developing management strategies. To this end, one proposal was that the term Integrated Lake Basin Management (ILBM) might more appropriately be transformed into Integrated Lentic-Lotic Basin Management (IL2BM).
Presentation 2: ILBM-G Experiences in the Philippines

Dr. Adeline C. Santos-Bora, Chief, Research and Development Division, Laguna Lake Development Authority, Philippines:

Overview: This presentation highlighted implementation of ILBM for several lakes in the Philippines (Laguna de Bay; Taal Lake; Giaconda lakes; Lake Lanao). It also discusses the lack of systematic evaluation of the strengths of each of the six ILBM governance pillars. A summary of the key points for each of the waterbodies discussed is presented in the following section.

Laguna de Bay
• A highly-populated basin containing many jurisdictions (27 towns; 3 cities), each with different political figures;
• The Laguna Development Authority (LDA) was created to mitigate the management of the lake and its basin. It subsequently had many management successes, leading to improved public participation, awareness and reduced fishing traffic in the area;
• The successes of the LDA have been attributed largely to innovative programs and laws that gave the authority the legal capability to fine, regulate and distribute permits;
• All six ILBM governance pillars were consciously developed during the ILBM process, although the strength of each pillar must be examined systematically.

Taal Lake
• Being a crater lake, it is a major tourist attraction, being considered oligotrophic before agriculture became an issue in the area;
• Based on the impetus generated by environmental lawyers and NGOs, the lake basin is now managed by the Protected Area Management Board (PAMB), which was developed as part of an Act providing for the establishment and management of National Integrated Protected Areas;
• In response to ILEC-hosted workshops, preparation of master lake basin management plan, utilizing a drainage basin perspective, is taking place during 2010 to 2020.

Rinconada lakes
• The lakes are managed by local, but segregated, governments;
• Stakeholder forums, using ILBM as a lake basin management platform, were convened in an attempt to facilitate better cooperation in managing the lakes.

Lake Lanao
• This lake is one of the 17 most ancient lakes in the worlds (2-20 million years old), and has religious significance to the citizens of the area;
• The lake contains many endemic fish and invertebrates;
• Previously-developed master plans for lake basin management did not involve basin communities and, as a result, failed to achieve their goals;
• A series of dams constructed along the tributaries, and which supply 65% of the energy needs for the entire region, have resulted in decreased biodiversity;
• In response to NGO and citizen demands, ILEC hosted a workshop in the Lake Lanao basin to discuss ILBM possibilities. Although only about 40 participants were expected to attend, more than 100 people, including military members, participated in the workshop;
• The above-noted workshop lead to creation of the PAMB in the area, stimulating dialogue with the provincial government and local NGOs, as well as the National Power Corporation;
• Finalization of a Master Plan for the Lake Lanao basin, preparation of lake briefs, and further interactions with ILEC on ILBM issues are ongoing.

It was noted in this presentation that, although all the lake basin governance pillars were in place, some of the pillars are weak, while others are strong. A systematic evaluation of this phenomenon is in order. Further, a more national perspective is necessary for the Philippines, especially in relation to PAMB.

Presentation 3: Sustainable Development and Management of Lakes and Reservoirs in Malaysia

Dr Fatimah Yusoff. Professor and Director, Institute of Bioscience, University Putra Malaysia (UPM)

Overview: This presentation highlighted the steps taken in Malaysia to better manage its lake systems, utilizing ILBM as a management platform. Noting this approach requires political will to be successful, a National Plan has been created with the hopes for its prompt implementation.

Based on a national study that concluded that more than 62% of Malaysia’s 90 lakes are eutrophic, a national strategic plan was developed in an attempt to generate political will for addressing lake issues in Malaysia. This political will was deemed to correspond to the “heart-ware” element previously introduced in the previously-noted presentation by Dr. Masahisa Nakamura, highlighting the basic elements of ILBM.

The ultimate goal is to manage and conserve all lakes and reservoirs in Malaysia on a sustainable basis. To achieve this goal, efforts were directed to developing a national strategic plan, as well as creating awareness of the situation regarding Malaysian lakes. The relevant steps included:

• Preparation of Lake briefs for eight lakes (subsequently presented and critiqued by an ILEC expert committee);
• Development of an action plan directed to preparing lake briefs for all 90 lakes in Malaysia;
• A National Plan, based on the ILBM pillars, that addresses such issues as: (i) lack of a lake management policy and legislation (ii) lack of enforcement; (iii) unclear institutional roles and responsibilities; (iv) stakeholder conflicts; (v) lack of awareness; (vi) inadequate research efforts; (vii) poor information exchange; (viii) inadequate funding; etc;
• Development of actions directed to achieving the goals of the National Plan, including establishment of a short-term national committee on lake management; eventual development of national lake basin policy, with appropriate legislation, establishment of roles and responsibilities for lake development and management; creation of stakeholder awareness; education and training of stakeholders; and development of a conflict resolution mechanism.

Getting political will to back this plan is a fundamental requirement, since land and water issues are state matters in Malaysia. Other challenges to be addressed include long-term investment needs; stakeholder (bottom up) activities; and addressing such serious problems as overfishing, invasive species and poor infrastructure management.
Presentation 4: Lake Chapala and its Basin (Mexico): Summary of Experiences and Lessons Learned

Alejandro Juarez-Aguilar, Director, Corazon de la Tierra, A.C. Guadalajara, Mexico.

Overview: This presentation discussed the implementation of an ILBM framework within the Lake Chapala basin in Mexico. Because of the fragmented, uncooperative sectorial actions in the basin, the participation of Civil society Organizations (CSOs) appears to be the most efficient way at the present time to stimulate proper lake basin management, utilizing a “bottom up” grassroots effort to raise awareness and strengthen collaborative participation of local governments, organizations and citizens. This local ILBM-based approach is being used to stimulate needed lake basin management activities on the part of the national government.

Lake Chapala is the largest natural lake in Mexico, which discharged water to the downstream Santiago River until such outflow became mechanically controlled. Approximately 15% of Mexican population lives in the Lerma-Chapala basin. Mexico City gets part of its drinking water supply from this basin. An interesting feature of the lake is that its primary outlet to the Santiago River is located very close to its inlet (Lerma River), which intensifies water pollution problems. At the same time, the lake basin is a biodiversity hotspot in Mexico. It is noted that NGOs within Mexico are instrumental to the political process. Accordingly, Corazon de la Tierra and other associated groups undertook development and implementation of the ILBM approach in 2006 for the Lake Chapala Basin. Five master plans for managing the Lake Chapala basin were previously prepared, but not implemented because of inadequate social support, due at least in part to the fact that lake basin stakeholders were not involved in the development of the plans.

Implementation of ILBM included a grassroots-level education program to promote basin-wide cooperation. The results of this multi-year effort include the following:

- Establishment of community-based programs;
- Increased stakeholder participation, as a result of visible benefits arising of cooperation;
- Three workshops convened at the basin (2008, 2009 and 2010) achieved involvement of seven of 19 Lerma-Chapala sub-basins, attracting high media attention, major stakeholder involvement and resulting in creating a much more visible structure that pushed forward the federal government involvement, to send representatives to subsequent activities involving management of the Lerma-Chapala basin.

For the period 2011-2012 several actions have been selected, being these:

- Translation of ILBM handbook to Spanish.
- Structuring of an ILBM network, directed specifically to strengthen sub-basins working groups.

Similar to the Philippine experience, the relative strength of the six ILBM governance pillars was an issue for the Lake Chapala basin management efforts. To evaluate their utility, a monitoring program was established during the workshops to determine the extent to which ILBM has been implemented, being undertaken with the use of a questionnaire in three Lake Chapala sub-basins. Local citizens, NGOs, government representatives and others in involved sectors jointly analyzed each of the six pillars. The results of this analysis included;
• Determining means of evaluating the effectiveness of each governance pillar, utilizing a quantitative scale;
• Identifying the pillar(s) that each relevant organization or stakeholder would be most effective at improving;
• Improved collaboration to more completely answer the questionnaire.

One other interesting feature about considering of Lerma-Chapala basin ILBM process its that a federal entity, the National Institute of Ecology was involved in the processing since early stages.

Presentation 5: ILBM Challenges for Three Russian Lakes: Ilmen, Chudskoe/Peipsi, and

Dr. Nick Aladin, Professor, Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia

Overview: Russia and central Asia contain many large lakes experiencing many stresses. Although ILBM is needed in Russia, ILEC has not been able to effectively interact with local populations in order to better understand their lake basin management needs. This issue requires resolution before ILBM can be effectively developed and implemented in Russia. To this end, this presentation summarizes the lake briefs prepared for three Russian lakes.

Lakes within Russia are typically state-controlled, being the responsibility of the Ministry of Natural Resources. Key points derived from the lake briefs prepared for these three lakes are as follows:

Lake Ilmen
• An important tourist area, the lake drains into the Baltic Sea;
• The basin has historic significance, being a region in which previous Russian kings and emperors hunted, as well as being a gathering place for political parties;
• The lake catchment area contains large forested areas, and has been well-studied by researchers in nearby universities;
• Two distinct limnological features of the lake are its relatively low dissolved oxygen content, and its low water transparency;
• The lake also has an extensive fishery, although it also experiences illegal fishing and poaching activities;
• The lake has three influent tributaries, and one outflowing river, the latter being dammed for use by the Volkhov Hydroelectric Power Plant;
• Intensive commercial fishing in the lake has resulted in declining fish catches;
• The lake is exhibiting rising temperatures, possibly as a result of global warming;
• Management of the lake basin has recently assumed a higher political visibility, due to changing environmental awareness in the basin.

Chudskoe/Peipsi
• This transboundary lake system (Estonia and Russia) is comprised of Chudskoe and Peipsi Lake, as well as Teploe Lake, which connects both of them;
• The lake basin has significant historical and religious significance, with the lake itself being the site of the famous “Ice Battle” in the year 1242;
• The lake basin population is over 1.1 million people, with over 40% of the basin being agricultural land;
• The lake basin is an important transport area, as well as being used for military testing purposes;
• The largest pollution point sources in the basin are municipal wastewater treatment plants;
• The lake is influenced by groundwater interactions;
• Increasing growths of blue-green algae are an important issue arising from increasing temperatures and eutrophication.

**Ladago**

• This is the second largest Russian lake;
• The lake basin is a general source of pride for Russians, being famous for the “Ice road” during World War II;
• Many cultural boundaries surrounding the lake reflect its history;
• Considered oligotrophic in the 1970s, the lake has degraded during the second half of the 20th Century to a mesotrophic state, resulting in natural protection measures being implemented in the basin;
• The lake is well-studied by academicians, particularly in regard to its biodiversity;
• Extensive commercial fishing has resulted in reduced populations of valuable fish populations; as well as ‘genetic pollution’ of wild salmon as a result of artificial breeding practices;
• Water pollution resulting from excessive phosphorus loads since the 1970s has affected the lake biota, as well as being problematic for the population in the basin that use the lake as a drinking water supply;
• Small hydroelectric dams in the Lake Ladago basin affect the lake’s fish populations.

Although completion of the ILBM Lake Briefs represents a positive step, it is clear that more effort is needed to better management these lake systems. Another relevant observation is that, although the Lake Ladoga riparian countries are often the only countries involved in lake management efforts, all the countries in its basin should be involved in such efforts.

**Day 2 (3 November)**

**Presentation 1: Indian Experiences of Integrated Lentic and Lotic Basin Management**

Dr. Sandeep Joshi, Chief Executive Officer, Shrishti Eco-Research Institute (SERI), Pune, Maharashtra, India

Overview: In addition to an understanding of the chemical and biological processes occurring with a lake system, it also is important to understand the historical progression of these processes in regard to optimal lake basin management. Armed with such knowledge, it is possible to utilize approaches such as eco-technology, a topic receiving increased attention within the management context because of its low energy costs and its effectiveness. In highlighting the implementation of ILBM in India, this presentation also discusses the use of eco-technology for restoring waterbodies.

There are twenty four major river basins within India. There is increasing interest in restoring all of them, as well as the few natural lakes in India. Recent efforts relevant to this goal include the cancelation of dam construction along the Ganges River. Weekly garbage collection also has begun in some locations. Further, public participation at all levels is, and will continue to be, an important facilitating factor in effective lake basin management efforts.
Two separate water basins (Ujjani Reservoir; Ahar River) are discussed herein, as examples of efforts undertaken thus far in pursuit of water management goals.

Ujjani Reservoir

- A combination of significantly increasing urban and rural pollution loads has led to declining lake water quality over time;
- Nearby municipal wastewater treatment plants are only being used at 45% capacity, and are only serving about 10% of the basin population, resulting in raw sewage inputs into the lake, and creating about 500 t of methane emissions per year;
- Increased water hyacinth growths have become a major problem, being addressed only with manual removal from the lake for approximately the past seven years;
- Municipal wastewater treatment plant construction activities are currently being funded by local governments;
- Water treatment methods being utilized in the lake basin include eco-technological approaches such as “green bridges,” a form of eco-technology that facilitates bacterially-mediated removal of organic pollutants from the water, and phyto-remediation with local aquatic plants;
- Evaluation to date suggests that “green bridges” have increased dissolved oxygen levels in the water column, reduced COD levels in downstream waters, and reduced heavy metal concentrations, within a 7 day period, with regulation of pH being the only controlling variable.

Ahar River

- The river basin is an important tourist destination;
- The river, which receive municipal wastewater inputs, exhibits problems similar to those exhibited by Ujjani Reservoir;
- Management actions deemed necessary to address river problems include basin reforestation, removal of dams, construction of six “green bridges,” and removal of water hyacinth;
- Public participation in Ahar River restoration projects has resulted in the translation of local knowledge into scientific knowledge, as a means of facilitating the inclusion of this information and data into current data bases;
- Local stakeholders have taken leading roles in monitoring the “green bridges” and the condition of the river.

It is thought that additional preventive measures, including lifestyle changes, will be necessary in the future to remediate important river issues, and that the root cause of the problems should be addressed before the reservoir water enters the river. It is not thought, however, that the implementation of only eco-technologies will be sufficient to completely address the issues. Nevertheless, they have stimulated interest within the basin community, facilitating dialogue between interested parties and politicians. The ILBM framework will be important as a means of further breaking institutional and political boundaries, noting that municipal governments remain very segregated. Further, addressing non-point source pollution will be a major component requiring attention in order to achieve overall river basin management goals.
**Presentation 2: Participatory Aquatic Environmental Education Program for School, Local and Tribal Communities in Some Watershed Areas of Chiang Rai and Mae hongson Provinces, Northern Thailand**

Dr. Chitchol Phalaraksh, Associate Professor, Chiang Mai University, Thailand

**Overview:** Public participation and stakeholder involvement is one of the six governance pillars within the ILBM framework. Thus, education projects (both formal and informal) can play a crucial role in lake basin management. This presentation focuses on a study that implemented water-based environmental education programs in a hill country region in Thailand. The general theme is formal and informal education facilitating stakeholder participation, which in turn fosters education for sustainable development, with the ultimate goal of integrated watershed management. It also reports on the effects of these programs on the behavior and overall participation of the citizens in the area regarding lake basin management.

The hill country tribes in Chiang Rai and Mae Hong Son provinces were chosen for this study for various reasons, as follows:

- The presence of the headwaters of important rivers in northern Thailand;
- The prevalence of soil erosion and flooding downstream related to conversion of forests to agricultural lands in the region;
- The prevalence of poorly-designed, poorly-situated concrete dams in the area that hinder downstream water movement during the rainy season;
- The presence of community leaders that could promote knowledge/information exchange, and encourage synergetic cooperation.

The study included:

- An area survey to determine the locations of the relevant streams and dams;
- Community outreach;
- Implementation of formal and informal educational programs in which participants were given basic knowledge regarding water resources, including environmental theory, water properties (physical; chemical; biological), monitoring, and human impacts on water systems;
- Distribution of, and training about, basic water monitoring equipment provided to each community;
- Formulation of an indicator-based “Participatory Evaluation Index” designed for this project, for the purpose of evaluating the efficacy of public participation.

Resulting behavioral changes attributed to this study included:

- Biogas generation from pig farms (supported by an NGO for income without agriculture), which it is hoped will prevent deforestation for agriculture, as well as facilitating the production of electricity;
- Forest restoration and conservation, including the donation of land by basin inhabitants;
- Construction of ecologically-friendly check dams that would allow mimicking of natural water flows.

The hope for the future is to expand the area of coverage, and ideally result in better water quality and management of the upstream portion of the study basins. Further, the links between educational activities and social and economic issues are often lost in management efforts, and this study should help highlight these inherent interconnections.
Presentation 3: GEF Transboundary Water Assessment Programme (TWAP)

Dr. Thomas Ballatore, Daiichi University, Fukuoka, Japan

Overview: National borders are not established around water basins. Thus, the inherent complexity in managing water basins becomes even more difficult when transboundary issues also must be considered. The Global Environmental Facility (GEF) provides funds for developing countries to collaborate with bordering countries to manage water basins for sustainable use by all basin countries. The GEF has, in the past, been a useful financial tool for applying the ILBM framework to transnational lakes. With GEF funds, the United Nations Environment Programme (UNEP) requested ILEC to develop a global-scale assessment to identify ‘high-risk’ transboundary lakes basins, in order to assist the GEF in setting funding priorities. This request was part of a larger Transboundary Water Assessment Programme (TWAP) involving five different water media (lakes, rivers, groundwater aquifers, large marine ecosystems, open oceans). This presentation highlights the procedure used by ILEC to perform this assessment, including observations regarding the difficulty of defining ‘priority’ lake basins in this manner.

The methodology proposed by ILEC to address transboundary lake basins includes the following components:

- Cross-referencing remote sensing and land elevation data, a global lakes inventory, and demarcation of national borders, in a Global Information Systems (GIS) format, as a means of identifying transnational lake basins;
- Cross-referencing publically-available global databases for use as indicators for assessing the state of a lake and its basin, including assessment of the physical state of a lake and its basin, the socio-economic status of the basin population, and information and data on the six ILBM governance pillars;
- Utilizing surveys for the identified transnational lakes, as a means of confirming satellite-based and other database information, including a series of in-depth questions to facilitate a better understanding of a lake and its basin.

Interconnections between other water systems are very important in considering lake basin management needs and goals, noting that what happens in other waterbodies typically has the greatest impacts on the lakes (lentic water systems) in a drainage basin. The goals is to ensure this methodology incorporates this hydrologic and socio-economic reality, thereby being an important contribution to future global water fora.

Presentation 4: Interstate Commission on the Potomac River Basin: Promoting Cooperative Solutions to Watershed Problems

Dr. Cherie Schultz, Director for CO-OP Operations, Interstate Commission on the Potomac River Basin, Rockville, Maryland, USA

Overview: A comprehensive basin-wide approach to water system management that emphasizes scientific research and communication between stakeholders is a major goal of the ILBM framework. Efforts directed to managing water quantity in the Potomac River Basin embodies this goal. This presentation summarizes the relevant activities in the Potomac River Basin, including the key factors believed to have facilitated its management success.

The Potomac River basin is considered a particularly important water basin for several reasons, including:
- The US capital is located within the basin, thereby enhancing its historical importance;
- It being a major water supply for Washington, D.C.;
- Its importance as a natural and recreational water resource;
- **The Potomac River is considered the most free-flowing river in the eastern United States.**

Relevant information on the historical progression of the state of the river, as well as the political responses that led to the creation of the Interstate Potomac River Basin Commission (ICPRB) and establishment of its mandate, is summarized as follows:

- That the river was used as a conduit for raw sewage, as well as industrial wastes and acid mine drainage, in the early-twentieth century, was a primary reason for the creation of the ICPRB by the US Congress in the 1940s, although lack of regulating authority limited its ability to implement effective solutions the problems and long-term needs of the river basin;
- Although the ICPRB encouraged cooperation and dialog concerning the river’s water quality problems, the Potomac River was still declared an ‘open sewer” by the Washington Post newspaper in 1951;
- A ‘top-down’ approach, facilitated by formation of the US EPA, and passage of the US Clean Water Act, was a major impetus to improved river basin water quality;
- Studies by the Army Corps of Engineers in the 1960’s and 70’s predicted the basin population would rapidly increase, and one early study recommended that 16 major reservoirs to be constructed along the course of the river;
- Signing of the Low Flow Allocation Agreement (LFAA), in which all the relevant basin political entities (including Maryland, Virginia and Washington, D.C.) would share water in the event of water shortages in 1978.
- Creation in 1979 of the ICPRB Section for Cooperative Operations on the Potomac (CO-OP) that would serve as a technical resource and facilitate needed communications on river basin water quantity issues
- Creation in 1980 of a task force of elected officials, technical and citizen advisors, as a means of facilitating decisions regarding cost-sharing and other cooperation needed for the managing the river basin;
- Promotion of a ‘systems approach’ by ICPRB via utilization of an easy-to-use model that demonstrated that the needed water resources could be supplied without the construction of the many dams previously cited as being necessary by the Army Corps of Engineers, instead requiring only one major and one small reservoir.
- Signing of the Water Supply Coordination Agreement, in which the three major water suppliers of the Washington, DC metropolitan area agreed to optimize the use of available resources by operating their systems cooperatively during periods of drought, with technical, coordination, and administrative assistance provided by ICPRB’s CO-OP Section.

The main factors in determining that the predicted reservoir construction in the Potomac River Basin to meet future water demands was not needed included:

- The use of a ‘systems approach’ and models to facilitate communication, and to inform policy makers;
- Communication and cooperation between basin stakeholders;
- Political backing by the federal and local governments.
There is now a history of 30 years of cooperation in the river basin since the creation of the Co-Op Section in the ICPRB. This entity now is responsible for coordination of water withdrawals and reservoir releases during periods of drought and for long-term water supply planning. Increased consumptive water use must be a future consideration, as well as management of reservoir sedimentation. It also is possible that the issue of “sustainable flows” will need to be considered in future management plans.

**Presentation 5: Watershed Payment for Ecosystem Services (PES): A Mechanism for Integrated Watershed Governance**

Ms. Hebin Lin, Ph.D. Candidate, Kyoto University, Japan

**Overview:** Sustainable financing remains a major issue in regard to water basin management. Payment for Ecosystem Services (PES) has been used in several instances around the world to attempt to deal with this problem, demonstrating significant potential as a tool within the ILBM Framework. This presentation describes PES and its characteristics, including how this approach has been, and can be, implemented.

Although the use of PES has been advocated by some UN agencies, information on its definition and application is scarce. This research project investigated watershed-based PES mechanisms that have been employed globally, as well as attempting to highlight the rationale, issues, application and practical challenges inherent in developing a useful PES methodological framework.

The general rationale for PES programs is essentially incentive-based, with the goal being to remove the incentives that can result in people degrading their surrounding ecosystems. Although this goal may be driven by actual market values or perceived values, the overall objective is to find agreement among basin stakeholders, thereby facilitating a “win-win” scenario regarding natural resource use. This can be facilitated with either a ‘polluter pays’ or ‘beneficiary pays’ scenario. The government also can be a major factor. One additional element for consideration is that PES also can be non-fiscal in nature (e.g., in the form of labor or trade).

Two examples of PES implementation using different mechanisms, both of which remove the incentive for environmental degradation by making conservation a more profitable approach, are as follows:

1) A fisherman cooperative in Nepal agreed to give upstream farmers a portion of their gained fishery-based profits in exchange for the upstream farmers changing their agricultural practices to reduce downstream water pollution;
2) The Costa Rican government used fuel tax money to pay local citizens to stop deforestation activities.

This research also investigated common issues within PES, including:

- The use of market values to determine the value of a given ecosystem service;
- The most efficient use of PES in dealing with externalities, dimensional concepts (e.g., property rights), economic theories, and governance mechanisms (e.g., least-opportunity costs).

There remain challenges in the PES process, however, that must be addressed for its effective use in management activities. One is that communication regarding PES, including its strengths and limitations, is difficult, thereby hindering consensus on its use. Several PES programs in India, for example, failed because people were not convinced they would receive promised benefits. Education and proper enforcement are key components to consider in addressing such hindrances.
**Presentation 6: Livelihoods, Dietary Styles and Nutrition in Laos**

Dr. Masako Horikoshi, Shiga University, Japan

**Overview:** Lifestyle studies are often not major components within the ILBM process, but nevertheless remain important considerations. Because lake basin stakeholders use these ecological systems for their livelihoods, their lifestyles must be considered when attempting to manage the systems. To this end, this presentation focuses on a study of the lifestyle and dietary habits of specific mountain villages in Laos.

The methodology of this dietary study included two interviews conducted in 41 houses in Dongkhouay and Phonvillay villages in the Vientiane Province in Laos. Cameras also were distributed to obtain pictures of typical and festival meals in the villages. The first interview, conducted in 2009, focused on the kinds of food being eaten by the interviewees, the frequency with which they ate, and how many people ate per day and per meal. The second interview, conducted in 2010, focused on irrigation systems, the use of fermented fish and bamboo for food, and the regions’ self-sufficiency.

The interview results were as follows:

- Nutrition in the study region primarily comprised sticky rice, as well as abundant fruits and vegetables (including bamboo);
- Protein is derived largely from fish, crustaceans, frogs, insects, small mammals and birds;
- The involved communities were self-sufficient in regard to food sources, especially compared to Japan and Thailand;
- The daily activities of the interviewed communities revolved around creating well-balanced diets for themselves, although the population nevertheless exhibited some deficiencies in calcium, fat, and iron;
- Burned field agriculture is important for the Laotian food supply;
- The community lifestyles in the mountainous study area depended on forests and fish populations;
- Because the community only cuts down very small parts of the surrounding forests, the forests typically recover within five years with minimal damage (although this may become an issue in the future).

**Day 3 (4 November)**

**Presentation 1: ILBM Approaches From a Transboundary Perspective Case: Governance Policy Framework for Lake Victoria**

Matano Ali Said, Principal Programme Development Officer, East African Community, Lake Victoria Basin Commission

**Overview:** The Lake Victoria Basin Commission (LVBC) has been managing the basin with a holistic and comprehensive framework since its inception. Although ILBM is a relatively new concept for the LVBC, it has nevertheless been fairly mainstreamed within the programs implemented to date. This is evidence of the sound logic inherent in the ILBM framework, as well as its applicability in multiple contexts. This presentation highlights management of the Lake Victoria Basin to date, as well an evaluation of the state of the lake governance structure, compared that in the ILBM framework.
The Lake Victoria Basin exhibits several important characteristics, as follows:

- It is strategic, in terms of integration, because it is a common resource, thereby being a potential vehicle to facilitate cooperation between the basin countries;
- It is located at the upstream end of the Nile River Basin, and has only one outlet;
- It is an important fishing ground for local citizens;
- There is a highly-developed road structure within the basin;
- The basin catchment area is about three times larger than the lake surface area, and it has a water Catchment area about three times bigger than the area of the lake.

The major basin problems are anthropogenic in nature, including: (i) overfishing; (ii) upstream (mountain) deforestation from slash-and-burn agricultural practices; (iii) over-obstruction of basin tributaries; (iv) water hyacinth growths; and (v) inputs of untreated liquid wastes. These problems have resulted in serious ecosystem degradation in the region.

Accordingly, a treaty of integration was signed by three partner states (Tanzania; Uganda; Kenya), directed to development of a basin management framework. It also established the Lake Victoria Basin Commission (LVBC), which was given the mandate of facilitating, promoting and coordinating all relevant basin activities, including agriculture, land use, water supply and others. This mandate became an integral part of the treaty, which was essential to its success.

The LVBC subsequently began undertaking actions meant to lead to holistic lake basin management, including:

- Development of a shared vision aimed at sustainable lake basin management;
- Creation of a framework in which the economic, social and ecological issues were considered top priorities, and the creation of six thematic areas (land use and degradation; water quantity and balance; declining fisheries and biodiversity; governance of environmental resources; population; demography);
- Development of a governance structure facilitating policy generation;
- Subsequent inclusion of Rwanda and Burundi which, although not riparian countries, are nevertheless within the Lake Victoria Basin;
- Attempted resolution of mismatched policies arising because of the transboundary nature of the basin area.

The LVBC undertook an evaluation of its programs looking at the six ILBM governance pillars, in order to assess how its management efforts compared to the ILBM Platform. It found that it was moderately successful in regard to all the governance pillars, excepting for technology and adaptive research, these elements requiring further attention in the future as a means of reducing management “guesswork”.

**Presentation 2: North American Transboundary Cooperation: Canada and the United States**

Dr. Walter Rast, Professor, Aquatic Resources Program, and Director, International Center for Watershed Studies, Texas State University.
**Overview:** Transboundary water issues can be dealt with in different ways, even within the same country, depending on the context. This presentation describes two important cooperative agreements that regulate and deal with transboundary issues in North America.

Two separate governmental-level cooperative efforts within the US government manage its transboundary waterbodies. The water systems on the northern US border are the responsibility of the International Joint Commission (IJC), which was established by the US-Canada Boundary Waters Treaty (BWT) of 1909. The southern US border water systems are under the responsibility of the International Boundary and Water Commission (IBWC), established by the US-Mexico Treaty of 1944.

**International Joint Commission (US and Canada)**

Major characteristics of the International Joint Commission (IJC) include the following:

- It was created as an independent advisory body for the US and Canadian federal governments, focusing on transboundary water issues between the two countries;
- It consists of six commissioners (three from each country) appointed by the President and Prime Minister, respectively, of the US and Canada;
- Upon their appointment, the commissioners are to no longer represent their national interests, but rather act in an independent personal capacity to facilitate the transboundary goals of the Boundary Waters Treaty of 1909;
- Although primarily an advisory and study body, the IJC does have the authority, if requested by the two governments, to make binding decisions, although the use of this power has never been requested by the two governments;
- The recommendations of the IJC are highly visible via media coverage, ensuring they are appropriately considered by the two riparian federal governments;
- Although the IJC has a mandate to regulate transboundary river flows, it also has a major focus on water quality concerns, centered primarily around the requirements of the US-Canada Great Lakes Water Quality Agreement.

Major roles of the IJC include:

- Making decisions on water allocations that affect water levels or flows on either side of the US-Canada border;
- Performing studies requested by the two federal governments, if they are unable to resolve specific transboundary issues on a face-to-face basis);
- Enhanced public participation and education, including public hearings involving stakeholders, to discuss allocation and study issues, as well as review of IJC reports.
- Overseeing the implementation of, and monitoring compliance with, the requirements of the Great Lakes Water Quality Agreement;

The IJC has been relatively successful in stimulating workable policy formulation related to the US-Canada border. An example was the anoxia conditions in Lake Erie attributed to municipal wastewater discharges from Detroit, Michigan. The response of the US and Canadian governments to this situation was the development and signing of the Great Lakes Water Quality Agreement (GLWQA) in 1972, which
made restoration of the Great Lake a binational priority throughout mandated water quality standards, which were themselves recommendations of the IJC.

**International Boundary and Water Commission (US and Mexico)**

Major characteristics of the International Boundary and Water Commission (IBWC) include the following:

- It was established with the signing of a 1944 Treaty between the US and Mexico, which was directed largely to overseeing the agreed water allocations between the two countries regarding the Rio Grande and Colorado-Tijuana River;
- It is generally responsible for boundary demarcation, water allocations, sanitation, water quality and flood control for the benefit of both countries along the border;
- Nevertheless, its primary focus is on water quantity issues, including the binational operation of several dams in the international reach of the Rio Grande;
- In contrast to the IJC, the IBWC is the culmination of a number of earlier mandates, conventions and treaties between the US and Mexico;
- The IBWC commissioners are appointed, respectively, by the US and Mexican presidents, but are operational under different entities within their respective governments, being more closely guided by the mandates of their respective governments than are the IJC commissioners.

**FIELD TRIP**

The remainder of Day 3 was devoted to a field trip to several sites, including: (i) Adogawa-Cho (illustrating an artificial river for the spawning of Ayu (sweetfish)); (ii) Ota, Shinasahi-Cho – the UOJIMA project; and (iii) Lake Biwa.

**Day 4 (5 November)**

**Presentation 1: Integrated Management of Lake Biwa and Yodo River Basins**

Dr. Masaki Hirowaki, Shiga Prefecture

**Overview:** A common issue in attempting to apply the ILBM Framework is the need to consider that conflicting interests within drainage basins can create tensions between different basin stakeholders. Accordingly, this presentation highlights the policies and programs introduced in Japan to balance the different interests in the Lake Biwa and Yodo River basins, as well as the programs that were subsequently implemented to halt the degradation of the lakes’ resources.

There are many factors that must be considered in attempting to create a holistic management plan for the Lake Biwa-Yodo River system, including the following:

- Lake Biwa is the largest lake in Japan, having approximately 460 influent tributaries and only one outflowing river (Seta River);
- The lake serves as a flood buffer for the downstream Yodo River;
- There are six prefectures located within the combined water system;
- There are more than 50 indigenous species in Lake Biwa;
• The upstream portion of the system comprises a mountainous region and agricultural fields, while the downstream end is primarily urban in character, in the presence of a megacity at the downstream end (Kyoto-Osaka-Kobe) with a population of more than 20 million people;
• Over fourteen million people depend on this water system for their water supply, and it is estimated that half the downstream population drinks water recycled 5 times;
• There is an ongoing conversion of existing agricultural land to urban areas;
• The lake also has religious significance;
• Conflicts have arisen between upstream and downstream users because of the construction of an upstream weir;
• All water management components are controlled by a specific water sector, making cooperation difficult.

The Lake Biwa Development Plan (LBDP) was developed to deal with several water issues involving this lake-river water system, including the following:

• Upstream and downstream flood control and water supply needs;
• Water degradation from point and nonpoint-source pollutants;
• Lack of comprehensive basin-wide management plans.

The LDBP created a ten-year (later renewed for a 25-year period) comprehensive management plan. Among its components was the need to send more water downstream, while also implementing an upstream regional development plan, with both components being funded by the national government and local downstream water users. The plan includes activities addressing flood control, effective water use, and conservation of Lake Biwa.

Implementation of the LDBP has already produced several benefits, including:

• Increased water supply for Shiga, Osaka and Hyogo;
• Creation of properly-functioning municipal wastewater treatment plants, serving over 80% of the Shiga area, as well as 15 other cities and 11 towns;
• Construction of a major dike system for flood control, leading to a dramatic reduction in the number of homes inundated during storm events.
• Construction of a currently widely-used irrigation system.

Factors contributing to the success of the LBDP including national government coordination, the support from special national legislation, a long-term planning framework, and special financing arrangements (including national government subsidies, and fund transfers from the downstream to upstream portions of the Lake Biwa basin).

Another plan implemented to address Lake Biwa basin concerns was the Lake Biwa Comprehensive Preservation (Mother Lake 21) Plan. It focused on maintaining and improving water quality, improving soil recharge capacity, preserving the natural landscape, creating a 50-year goal and 10-year action plan, and raising public awareness and activism.

New challenges facing the management of the Lake Biwa-Yodo River system include the following:

• lakeshore degradation (loss of reeds, wetlands, and fish spawning sites) because of dike construction;
• Nonpoint-source pollution;
• Excessive growths of water plants;
Drought and flood conditions (especially related to climate change impacts);
Increasing cormorant populations, causing degradation of islands within Lake Biwa;
Increases in exotic fish populations.

The following activities have been implemented to attempt to deal with some of these challenges, as follows:

- Advertisements encouraging the use of green products;
- The Fish Cradle Project, which attempts to compensate for lost fish spawning habitat with the construction of artificial canals;
- Restoration of lakeshore areas through re-inundation;
- Laws regulating pleasure boat uses, prohibition of 2-cycle jet skis, and prohibition of exotic fish releases into the lake basin.

An integrated lentic and lotic basin management approach must be adopted in the future, including the involvement of local stakeholders and water users, and state and national governments. The goal is to decentralize management efforts, thereby allowing stakeholders to become more involved in the management process.

**Presentation 2: Water Reform in Australia and its Lessons for the World**

**Integrated River Management of Lake Biwa and Yodo River Basins**

Dr. Manabu Kondo, Shiga University, Japan

**Overview:** A potential useful management tool for ILBM application is water trading, which has the potential to both regulate water use and create funds. To this end, this presentation focuses on the history of water rights and water trading as implemented in Australia.

The main points comprising this study include the following:

- Water trading began in the early-1980s in the southern part of the Murray-Darling River Basin, but did not become of major interest in formulation of Australian water policy until about 1989;
- Implementation of water trading paved the way for permanent trading and eventual water pricing reforms, basin cap implementation and, in turn, formation of Catchment Management Authorities Act (NSW) in 2003.
- After the maturation of water trading, the National Water Initiative (NWI) was created to deal with large national-scale problems (e.g., climate change);
- The NWI subsequently produced the National Water Commissions Report, which analyzed the economic, social and environmental impacts of water trading over ten years, with the major issues focusing on the impacts of water trading versus other factors (drought; climate change variability; commodity prices; demographic changes), and the predicted results being significant benefits related to including water trading in water availability calculations, as well as in the nation’s GDP;
- The water trading system led to water salinity issues, although this has been addressed with a Basin Salinity Management Strategy, as well as site water use licenses to offset the salinity impacts.

Water trading has been a useful tool for ILBM in Australia, due partly to the following factors:

- The capability of regulators to limit the total quantity of water that can be used, through limited dissemination of permits and water shares;
- The use of trading zones, in which water is transferred from one basin to another as a means of compensating for drought conditions in the latter;
- Securing water rights specifically for environmental flows.

**Presentation 3: Monitoring of Water Quality in Lake Biwa**

Dr. Naoko Hirayama, Shiga University, Japan

**Overview:** Scientific backing and monitoring are critical underpinnings of a good management program, being the means by which managers can determine whether or not specific implemented programs are producing the desired results, as well as allowing for updating and revision of the programs (including the governance elements) with new information and data. To this end, this presentation focuses on the monitoring program implemented for Lake Biwa.

Lake Biwa is an important drinking water source in Japan. There are 13 drinking water treatment plants in the Shiga Prefecture, each with its own monitoring programs, the individual origins of which date between 1930 and 1985. The Osaka Prefecture also monitors the lake. The drinking water monitoring sites are concentrated in the southern portion of the lake basin, since this is the site for primary drinking water abstractions.

The ongoing monitoring programs are characterized as follows:

- It comprises lake surface and sub-surface measurements of physical conditions, water quality and microorganisms;
- A total of 28 surface water sampling sites are located in the northern portion of the lake basin, 19 in the southern portion, and 2 in the Seta River;
- The lake surface water sites are sampled monthly;
- Lake sub-surface water monitoring is done monthly at 10 different depths at 6 sites, 3 being located in the northern section of the lake, and 3 in the southern section portion;
- All the data collected by each responsible party have been shared since 1971.

It is noted that monitoring of Lake Biwa really began in 1911, with fish and plankton monitoring efforts. ILEC has made this approximately 100-year data base available online via Internet. Some of the monitoring data, however, are not useful for activities such as trend analysis, nor are they necessarily as precise as current water quality standards.

**Presentation 4: Watershed Modeling of Lake Biwa and Asokai Bay**

Dr. Yoshihisa Shimizu, Research Center for Environmental Quality, Kyoto University

**Overview:** The Potomac River Basin presentation made earlier highlighted the potential importance of model assessments and predictions to inform policy makers. Such tools are important for making...
scientific information usable and accessible for individuals and agencies working within the context of each ILBM governance pillar. This presentation highlights two models being developed to inform policy makers and basin stakeholders of the potential impacts of land use and lifestyles on Lake Biwa and Asokai Bay water quality.

Climate change is predicted to have global impacts, including changing general precipitation patterns in many locations. Thus, high-resolution models capable of making accurate predictions are needed to help identify and prevent water-related disasters (e.g., floods; droughts). Major challenges to be addressed include:

- Predicting future disasters and hydrological changes;
- Impacts of future human settlements;
- Transboundary or shared water (river and lakes) issues;
- Groundwater exploitation;
- Incorporating human dimensions within lake basin governance activities;
- Education needs;
- Integrated watershed management to help prevent climate change disasters.

The goal of this study was to develop a high-resolution model, with predictive capabilities, for Lake Biwa. Asokai Bay, located within the Lake Biwa Basin, was chosen as a study site because it contains a natural bank (Amano Hashidate) that partially isolates the pollution from its influent tributary, thereby allowing the accumulation of pollutants. Significant problems associated with this bay include eutrophication, and the release of hydrogen sulfide, both of which can impact the bay area ecotourism possibilities.

A simulation model, incorporating GIS, is being created to determine the major pollution sources in the area. It was concluded that a large portion was from forest deposits, while another large portion was from untreated solid wastes from the approximately 65% of citizens in the bay basin that had decided not to connect to existing sewer lines because of the financial costs. The model currently being developed will use the concept of the “ecological footprint” to inform basin citizens of the required number of lakes (approximately 1.29) it would take to continue to ‘support’ their current lifestyles, with the hope that it will stimulate interest and actions among bay water stakeholders.

**Presentation 5: Demonstration of ‘LAKES’ Knowledge Base for ILBM**

Dr. Masahisa Nakamura, Chairman, ILEC Scientific Committee, and Professor, Center for Sustainability and Environment, Shiga University, Japan

**Overview:** The diagram of the ILBM Platform illustrated in Figure 1 highlighted four resources ILEC provides for those implementing ILBM. These resources include the Lake Brief Guidelines, World Lake database, ILBM training modules, and the knowledge mining engine “LAKES” (Learning Acceleration and Knowledge Enhancement System). This presentation focuses primarily on the use of LAKES within the context of ILBM activities.

The ILBM Lake Brief Guidelines provide a usable and rational context for assessing lakes, their basins and their resources, including both the relevant biogeophysical features and the socio-economic/governance elements to be considered. The Guidelines are useful for both a predominantly ‘top-down’ management approach, such as that practiced in Japan, as well as in situations where the national government is not significantly involved, thereby leaving necessary actions to be identified and implemented in more of a ‘bottom-up’ approach, such as practiced in Mexico. The Guidelines also assist
lake basin managers to identify the needed information and data necessary to develop an effective ILBM Platform. The process of utilizing the Lake Brief Guidelines also is meant to stimulate connections between scientists, policy makers and other stakeholders that would be useful for future lake basin management.

It also is important to recall that lake basin management is a complex, continuing task. Accordingly, it also incorporates a learning process and, therefore, must remain be sufficiently flexible to incorporate changes in policies and programs as more accurate and updated information and data becomes available. As an example, Japan initially implemented national water quality standards, with the knowledge that these standards would have to be revised in the future. The primary goal was to begin implementing needed management programs that would be revised at five-year intervals on the basis of the lessons learned during the intervening five-year periods. This approach also facilitated the involvement of lake basin stakeholders in the management process.

It also is important to be able to research previous experiences and lessons learned, in order to reduce the possibility of previous mistakes being made again. To this end, ILEC developed the ‘LAKES’ (Learning Acceleration and Knowledge Enhancement System) knowledge mining engine. This database/mining engine compiles relevant research results, reports, etc., for use by scientists and decision-makers in identifying, researching and analyzing past experiences and other relevant information and data pertinent to the development of effective lake basin management plans. In identifying a topic of interest, LAKES can guide researchers and decision-makers to specific reports and other sources containing information and data on the selected topic, as a contribution to informed decision-making.

ILEC also developed the World Lake Database in order to disseminate information and data on different lake basins around the world. This website also can be used as a research data source, including being a repository of reports and lessons learned from ongoing ILBM application to waterbodies around the world. This database is linked to the LAKES knowledge mining engine as well. In providing such resources, ILEC is facilitating more scientifically-sound and realistic lake basin management efforts.

**Presentation 6: ILBM Implementation for the Sustainability of Himalayan Lakes**

Dr. Khadka Madhukar, Programme Officer, National Lake Conservation Development Committee, Nepal.

**Overview:** Nepal is in a good position to take the lead in regard to integrated management of high altitude lakes. Of particular interest is how the Nepal lake situation, and the implications for the downstream water systems dependent on the Nepal “Water Tower” as their water source. Accordingly, this presentation highlights the experiences thus far in implementing ILBM in Nepal.

On a national scale, lakes in Nepal can be characterized as follows:

- They are highly dispersed (a total of 5,358 lakes, with 2,323 being glacial);
- They are the headwaters of many water systems in Asia;
- Many are Ramsar sites;
- Many are transboundary in nature;
- They are biodiversity hotspots;
- They are religious and cultural assets to Nepal;
- They represent the economic livelihoods for about 21% of lake-dependent communities in Nepal;
• Their basins are characterized as containing a population of poor economic status, little available technology, and unstable political situations.

Nepalese lake basins are threatened by the following issues:

• Lake drainage, sedimentation and reclamation;
• Habitat loss and deforestation;
• Hydropower generation, causing over-obstruction;
• Irrigation water needs;
• Agricultural runoff and municipal wastewater disposal;
• Overfishing and over grazing;
• Invasive species;
• Climate Change.

Although various international commitments and national initiatives have been implemented in response to these threats, they have not been cooperative or cohesive. Serious conservation efforts directed to the Himalayan lakes actually began in 2006, with formation of the National Lake Conservation Development Committee. Overall contributions to Nepal’s ILBM process as a result of these conservation actions include the following:

• Policy reviews, resulting in policy consolidation;
• Creation of a national lake conservation strategy (2009), based on stakeholder workshops (NGOs; local communities), which is currently undergoing the ratification process;
• Development of a national lake inventory;
• Identification of lakes for potential RAMSAR listing, including the Pokhara Lake cluster;
• Community support for restoring lake habitats, including establishment of the Wetlands Education Center for training students and communities;
• Generation of relevant information and updating of databases;
• Hosting of a Rupa Lake (Pokhara) conservation demonstration, which led to a community conservation plan and ILBM knowledge dissemination to more than 44 NGOs;
• Government grants were awarded for implementation of ILBM to more than 50 lakes in Nepal.

The six ILBM governance pillars have been considered in Nepalese lake management efforts, but nevertheless require further development. It has been learned, for example, that the integration inherent within ILBM requires sufficient time to deliver results, that participatory conservation of forests and water resources can effectively contribute to ILBM goals, and that more demonstrations at a more comprehensive and intensive scale are needed.

Day 5 (6 November)

Presentation 1: Use of Geospatial Technology (GIS, GPS, Remote Sensing, etc.)

Dr. Thomas Ballatore, Daiichi University, Fukuoka, Japan

Overview: GIS and other geospatial tools can be powerful resource management tools. In fact, publically-available databases have become so diverse that many issues that previously may have seemed impossible to address can now be dealt with very quickly. To this end, this presentation highlights the ways in which geospatial tools can be used by policymakers.
Obtaining information or insight into such issues as sources of air pollution, and the populations and locations of lake basins, previously could require relative intensive studies on these issues. In fact, even completing the ILBM Lake Brief Guidelines can be difficult if one lacks the tools to effectively answer the questions. The use of geospatial tools can significantly reduce the effort needed to address such issues.

Major examples of water-related, global-scale databases for such purposes include the following:

- Shuttle Radar Topographic Mission (2000) – provides land surface elevation data at an approximately 90 m resolution; this information can be very useful for countries lacking land surveys, or where such surveys would be difficult to complete;
- SWBD waterbody dataset – This NASA-derived database, which exhibits a 30 m resolution, can be used to identify all lakes around the world whose dimensions exceed 183 X 600 m.

Other data sources also are available (e.g., census data) for geospatial application, and a major ILEC goal is to provide assistance to lake basin managers seeking to utilize them. Although the use of such databases may require some training with geospatial tools, and often seem complex, they can nevertheless prove very valuable. The presenter also offered to provide tutorials to meeting participants upon request regarding how to use these geospatial tools.

Presentation 2: The Impacts to Lake Biwa Fisheries Causes by Social Changes in its Lake Basin

Dr. Hiroya Kotani, International Lake Environment Committee, Japan

Overview: Anthropogenic inputs to a lake system can result in degraded ecosystem provisioning services (as identified in the “Change in Resource Principle” portion of the ILBM Platform previously highlighted in Figure 1. This presentation illustrates this principle by demonstrating how social changes have influenced fishing yields within Lake Biwa.

Several factors related to social changes have resulted in a dramatic decrease in Setashijimi (an endemic fish), Funa, Ikechougani and freshwater pearls within Lake Biwa, including:

- Overuse of PCBs during a drought season;
- Overfishing as a result of soldiers returning at the end of World War II;
- Use of semi-diesel engines on the lake;
- Embargos on fish catches;
- Aquaculture development in the lake;
- Changes in fishing techniques, from utilization of hand-held nets to net that are dragged or else placed in the water column for extended periods of time;
- General overfishing because of increasing fishery commercialization

A better understanding of how social changes can affect the health of a lake are crucial for the effective management of a lake basin for sustainable use. Such changes should be monitored over time, so that additional time series analysis, similar to that highlighted in this presentation, can be completed.
CONCLUDING WORKSHOP REMARKS

Professor Masahisa Nakamura, Chair, ILEC Scientific Committee, and Director, Center for Sustainability and Environment, Shiga University, Japan:

Each presentation made during the course of this workshop offered important lessons and information regarding the development and implementation of ILBM. Nevertheless, a better understanding of the ILBM process is essential to better understand the hydrological interconnections inherent in ILBM, and to appreciate the nuances of its application in different environmental and socio-economic settings.

To this end, ILEC offers a two-and-a-half month training session in January of each year to train invited participants, particularly from developing countries, in the structure, function and application of ILBM. This training covers all the chapters in the ILEC Integrated Lake Basin Management (LBMI) report, as well as related topics such as GIS. Countries to which invitations to participate in the course are sent are chosen by need, with the invited members in each case then being chosen by their national governments. Nevertheless, this does not mean training sessions cannot be hosted within other interested countries for many members. The ILBM training modules are excellent resources for such purposes, and ILEC actively campaigns for such programs.

Day 6 (7 November)

This day was devoted to a field trip to several relevant water structures, activities and organizations, including: (i) Seta River weir; (ii) Seta River museum; (iii) Lake Biwa inflow canal; (iv) Kyoto outflow canal; and (v) Lake Biwa Environmental Research Institute.
Part II. International Symposium, ILBM-Governance Project  
(7 November, 2010)

This symposium, sponsored by the Research Center for Sustainability and Environment, Shiga University, and the Japan Ministry of Education, comprised both a Roundtable in the morning focusing on ILBM experiences, and a subsequent Panel Discussion in the afternoon on ILBM elements, issues and challenges. The discussion below reflects the discussions at this symposium.

I. ILBM Roundtable

Introduction

The morning session consisted of a Roundtable discussion on the topic of ILBM in Asia, and the need for international cooperation in its implementation. As a means of providing a context for this discussion, the Roundtable discussion was begun with a summary of ILBM application experiences in South and Southeast Asia. This was followed by discussions on the part of the Roundtable participants and the general audience attending the symposium. A subsequent presentation was made on the use of geospatial tools in lake basin management efforts, also followed by discussion on the part of the Roundtable participants and the general audience.

Roundtable Participants

Co-Moderators:

- Professor Masahisa Nakamura (Co-Moderator), Chair, ILEC Scientific Committee, and Director, Center for Sustainability and Environment, Shiga University, Japan
- Professor Walter Rast (Co-Moderator), Vice-Chair, ILEC Scientific Committee, and Professor, Aquatic Resources Program, Texas State University, San Marcos, Texas

Roundtable Members:

- Dr Fatimah Yusoff. Director, Institute of Bioscience, and Professor, University Putra Malaysia, Malaysia
- Dr. Sandeep Joshi, Chief Executive Officer, Shrishti Eco-Research Institute (SERI), Pune, Maharashtra, India
- Dr. Chitchol Phalaraksh, Associate Professor, Chiang Mai University, Thailand
- Dr. Khadka Madhukar, Program Officer, National Lake Conservation Development Committee, Nepal

Presenters:

- Dr. Adelina Santos-Borja, Chief, Research and Development Division, Laguna Lake Development Authority, Philippines
- Dr. Thomas Ballatore, Professor, Daiichi University, Fukuoka, Japan
Presentation:  *ILBM Application in South and Southeast Asia -- Dr. Adelina Santos-Borja*

This presentation summarizes the experiences regarding the application of ILBM in Nepal, India, Thailand, Malaysia and the Philippines, as well as providing conclusions regarding these collective experiences. More detailed information on these ILBM experience in each individual country can be found in Part I of this Report.

**India**

- The Indian experience with ILBM began with assessment of 7 lakes, focusing on whether or not ILBM could be effectively used for lake basin management; the conclusion was that ILBM was, in fact, a very appropriate and rationale approach for managing Indian lakes;
- Several activities were begun in India in 2003, advocating ILBM as a preferred lake basin management approach, including jointly co-hosting the ILEC World Lake Conference in 2007 in Jaipur;
- Further subsequent activities, implemented in both river and lake basins, have enhanced the value of utilizing the ILBM governance pillars in managing Indian lakes, including facilitating the implementation of ecological restoration projects with maintenance and monitoring, pollution control, and water quality monitoring;
- Several activities originally initiated by NGOs and academia subsequently convinced Indian government officials of the value of examining and utilizing the ILBM Framework as the basis for managing Indian lakes and reservoirs for sustainable use

**Nepal**

- The country has strategic importance because of the presence of the Himalayan glaciers and associated lakes, which are the “water towers” of many downstream water systems in Asia;
- The lakes in Nepal are RAMSAR sites, exhibiting high biodiversity;
- The Nepal lakes also are of significant religious and socioeconomic importance;
- The ILBM approach in the region began in 2005, being the stimulus for creation of a lake inventory, a development strategy plan (being ratified), water assessment tools anchored in ILBM, and a wetlands education center being actively operated by the NGO, Action in Mountain Community;
- The current goal is to continue to support lake conservation activities, with ILBM as a forum, through publishing and exchanging information, increasing the dissemination of knowledge about ILBM, and enhancing national lake basin management capacity.

**Thailand**

- The use of ILBM began in the upper part of Thailand (Chiang Rae), utilizing environmental education as an entry point.
- The ILBM project involved a focus on watershed education, utilizing technical and ‘hands-on’ training for teachers, community members, and students, with the goal of improving the quality of life for communities in the study, as well as downstream communities;
- The project has facilitated changes in behavior in the study area, as well as reforestation, and the use of ecologically-friendly dams operated to mimic nature.
Malaysia

- A national-scale eutrophication survey conducted in 2005 indicate the poor state of more than 60% of the lakes in Malaysia;
- With ILBM as a catalyst, the preparation of Lake Briefs, and a colloquium on lake basin management, have been accomplished in an attempt to better manage these water systems;
- A common lake management vision has now been developed, and a national plan containing a management framework and an ILBM-based strategy plan have been completed;
- The immediate future goals are to work with various stakeholders in the lake basins to obtain a more holistic management approach, and raise attention regarding needed research to develop more innovative lake basin management approaches.

Philippines

- The management of Laguna de Bay has become a model for the entire Philippines, based on his basin approach (utilizing ILBM), and its governmental support (including passage of a law specifically passed to establish the Laguna Lake Development Authority);
- In contrast to Laguna de Bay, the Philippine government is not effectively managing Lake Lanao, resulting in NGOs and the local populace to utilize ILEC experience to advocate ILBM for the lake basin, including well-attended workshops held in the basin;
- The Rinconada lakes are small, but nevertheless possess significant biodiversity. Because they are managed by local governments that change every three years, their management is often not cohesive. As a result, lake basin stakeholders have expressed considerable interest in ILBM as a management framework, including convening of workshops involving all stakeholders, including the current mayor, with more workshops in the process of being convened.

It is noted that ILBM played similar roles for all these case studies, including:

- Being a platform for managing diverse lakes and rivers;
- Stimulating interest in developing lake inventories;
- Facilitating the involvement of stakeholders in lake basin management;
- Being a stimulus for cooperation;
- Influencing local and nation policymaking;
- Offering a unifying approach at different scales, and with all types of water systems.

National governments in southeast and south Asia, as well as NGOs and basin stakeholders, are accepting ILBM as a lake basin management framework. Financial support for this approach also is encouraging. As a result, a more formal network for ILBM in the region is being pursued.

At the same time, the ILBM Framework must be disseminated on the ground to stakeholders. It also needs support to be able to deliver improvements over the long term. There is a great need for learning and exposure to different means of lake basin management. To this end, ILBM represents a context-specific framework to meet this need. There is no doubt that ILBM must be up-scaled and mainstreamed. Indeed, participation in, and use of, ILBM should be pursued by people using lake basins and their resources throughout the world.
Discussion Regarding ILBM Application in South and Southeast Asia

It was noted that the previous summary presentation provided a good indication of the range of situation under which ILBM can be applied. In contrast to the top-down, sectorally-based water management approaches (IWRM; IRBM), ILBM allows for on-the-ground application, being useful in a variety of contexts. Although there are many common lake problems, the context under which they occur can dramatically influence the management approach(es) that can be utilized to address them. To this end, the above-noted broad application of ILBM allows for its use on a global scale. At the same time, we must define a balance between human and ecosystem needs in lake basin management efforts, with basin stakeholders being involved in the development and application of a management framework. ILBM facilitates such considerations.

It also was acknowledged that ILBM can be a difficult process, with the panelists describing the nature of their difficulties in lake basin management. These descriptions illustrate that ILBM continues to evolve, even as it is being applied in a number of countries around the world. It is clear that critical evaluation of the efficacy of applying and using ILBM, as evidenced in such case studies, would further this evolution, as well as helping to identify the most challenging management issue in various countries.

It was noted that the policy and institutional and policy governance pillars were the most difficult to address in lake basin management in India. In contrast, stakeholder participation, as well as the actual implementation of lake basin management projects, were the easiest considerations. The Indian experience with ILBM has generally occurred within small basins, involving various stages of action on the ground. These experiences highlight that, although policy can take a long time (multiple years) to develop and implement, but can be more rapidly implemented (a year or less) after implementation. This situation also usually also facilitates project support, and it is hoped from the Indian experience that, as it is further applied and evaluated, ILBM will be a catalyst for needed policy implementation.

The experience in Thailand is that the easiest pillar to implement is information usage and dissemination, being largely a function of university and academic research efforts that allow for easy retrieval and distribution of existing (although not extensive) lake basin data and information. In contrast, policy implementation is a difficult goal, mainly because stakeholder collaboration is not a common practice in the Thai political structure. In making these observations, it also was emphasized that ILBM experiences in Thailand have, to date, largely been educational/research in nature, rather than being applied on a national basis. For Thailand, therefore, the next logical steps are to expand the ILBM pillars to address lake basin problems on a national basis.

As an additional experience, it was noted that Nepal is experiencing glacial lake melting attributed to global warming, causing downstream flooding and siltation downstream. This was a major impetus for the use of ILBM in Nepal, not only to mitigate these problems, but also as a basis for international cooperation and communication. At the same time, Nepal is experiencing the same types of problems as India in regard to policy formulation. Policy formulation can take a very long time, due mainly to the centralized government structure. This is in contrast to facilitating local stakeholder participation in lake basin management efforts, which typically is readily achievable and within a short time period.

Malaysia contains thousands of mostly small lakes, with the biggest lake basin management challenge being the sectoral approach developed under application of Integrated Water Resources Management (IWRM). In contrast, ILBM appears to be the ideal management platform for attempting to get the national government to change this sectoral approach. And although ILBM is a relatively new concept, compared to IWRM, resulting in fewer examples of its application and impacts, there nevertheless has
been a major from the government and the involved water use sectors for its use in lake basin management. This being said, facilitating stakeholder participation on both the governmental and local level remains difficult. It is hoped that this goal will be more easily achieved with ongoing policy formulation, which also should aid in strengthening all the ILBM pillars as considered in the Malaysian context.

It was also noted that key issues to be addressed in lake basin management include conflicts and complexity. In regard to conflicts, the issue is often that people and organizations are attempting to establish specific agendas, when what they really need is a common platform, of the type embodied in the ILBM Framework, as a means of maximizing efficiency and cooperation. An organization that normally multi-tasks in regard to the multiple ILBM governance pillars would likely be more productive in regard to lake basin management efforts than if only addressed one of the pillars. Convening workshops around the world regarding the ILBM framework would facilitate this possibility.

It was reiterated that lake basin management is a complex undertaking, and must address many complicated issues, often with insufficient information and data on a lake basin scale. The application of ILBM can help address such challenges, due in part because it can help make complex management scenarios easier to understand and address and, in promoting cooperation, can also help identify the most effective lake basin management approaches. It also facilitates the empowerment of people working together to stimulate effective lake basin management actions. What is very clear is that similar lake basin management challenges are being faced by lake basin stakeholders around the world, and that ILBM provides a platform for facilitating management efforts with a greater chance of success, including consideration of climate change impacts and sustainability implications.

**Presentation:** *Use of Geospatial Tools in Lake Basin Management -- Dr. Tom Ballatore*

A major consideration that is applicable across all lake basin management efforts is the use of geospatial technologies and tools in informing decision-makers. These technologies and tools include the use of Geographic Information Systems (GIS), Global Positioning Systems (GPS), remote sensing, and watershed models. This presentation discusses these technologies and tools in regard to the lake basin management efforts discussed in the first part of this Roundtable, and provides examples of how they can be used within the ILBM Framework.

Japan has an extensive extent of protected areas (about 16% of its total land mass). Cross-referencing lake basins and maps of these protected areas in Japan will allow policy makers to see how many lakes are situated within the protected areas. In fact, about 77% of Japan’s lakes are within protected areas. Such information can be used for policy formulation, as well as implementation of legislation directed to protecting the lake basins.

Biomass burning is a major issue in Southeast Asia. As an example of the use of geospatial tools, access to downloadable databases of fires in the world has illustrated that, although many fires have occurred in neighboring countries, none has occurred in Malaysia over the past 7 days. Such information can not only be used within the context of Malaysian plans directed to atmospheric deposition, but also as input for international dialogue regarding the occurrence and impacts of such fires.

A question relevant to Laguna de Bay in the Philippines is whether or not major cities are actually located within its basin. Utilizing surface elevation data and satellite imagery, it is possible to determine which direction water will travel in response to gravity (moving from higher to lower altitudes), thereby
allowing for the identification of individual drainage basins and sub-basins. Using this geospatially-derived information, it was possible to change the population of the Laguna de Bay drainage basin by 4 million people, as well as determining whether or not silt loads from metropolitan areas might enter the lake.

Application of geospatial tools (particularly GIS) in Thailand would allow determination of where the national borders lie along its rivers, thereby facilitating recognition of potential transboundary water issues. Accessing geospatial data bases for Nepal would allow determination of the location of retreating glaciers, as a means of helping to identify potential downstream flooding and siltation problems. India is characterized by having hundreds of languages throughout the country, making it difficult to disseminate understandable materials regarding lake basin management. The use of geospatial tools, and particularly GIS, can be used to identify different linguistic groups on a geographic scale. Such information can assist lake basin managers to determine what language(s) to use for materials to be dissemination to specific lake basin stakeholders.

More information and guidance on the use of geospatial technologies and tools in ILBM, and the range and nature of relevant publically-available databases can be obtained from the previous discussions in Part I of this report on the Transboundary Water Assessment Programme (“GEF Transboundary Water Assessment Programme (TWAP)”) on November 3, 2010, and the discussion of the use of geospatial tools (“Use of Geospatial Technology (GIS, GPS, Remote Sensing, etc”) on November 6, 2010.

**Discussion Regarding the Use of Geospatial Technologies and Tools**

It was also suggested that ILBM can be used as an effective platform for addressing climate change impacts and mitigation. Regional changes attributed to climate change, for example, have become evident throughout the world. An example is the climate change-based threat to Himalayan glaciers and their related lakes, which constitute the “water towers” for many downstream water systems in the South Asian region. Climate change also is a socio-economic issue, noting that the work of poor populations tends to be more directly related to natural resources. Thus, when the natural resource base or condition changes, the lives of the poor also can be drastically affected. Further, enhanced flooding, mudslides and extreme climatic events (e.g., typhoons) are predicted events associated with climate change. These events can severely degrade water resources, necessitating consideration of disaster prevention and management within the context of lake basin management. The ILBM Platform (Figure 1) allows for consideration of such events within a management contexts.

It also was emphasized that an important consideration was that ILBM also constituted a form of adaptive management, a feature that is relevant in regard to climate change and the unknown hydrologic variability it may cause. To this end, it was noted that the impacts of climate change may be quite varied on a local scale. A strength of ILBM is that it is very flexible, and can be used to identify and consider such local-scale phenomena.

A consultant pointed out that a major challenge within the context of lake basin planning is need for appropriate and sustainable funding. Accordingly, the quality and maintenance of lake basins must be a consideration for basin stakeholders, corporations and governmental entities. In fact, government financing and lake basin management must be cooperative efforts in order for the latter to be effective. In response, it was noted that, as a management framework, ILBM does exist in Japan. At the same time, the current management efforts are mainly sectorally-driven, with a primary focus on water quality. The unfortunately reality at present is that we tend to forget that ILBM also focuses on the sustainable use of water, land and environmental quality and sustainability. Although there is growing support for ILBM, it is likely going to take more time for its widespread application. Such discussions as those taking place at
this Roundtable is very useful in regard to disseminating information and experiences regarding ILBM to all relevant stakeholders. The ILBM concept primarily originated within an academic arena, and has been applied in other countries, as noted by previous presentations during this Roundtable. An important question facing this audience is how are we going to apply it in Japan? To answer this question, and noting that widespread acceptance and application of ILBM will require the support of the Japanese government and other lake basin management stakeholders, ideas and suggestions from the Roundtable and audience participants are encouraged.

A final statement was that an integrated approach is a means of attempting to get all water-sector stakeholders to cooperatively and collaboratively address assessment and management issues. In fact, institutional fragmentation is a serious, yet common, condition around the world. An example is the Rio Grande basin. There is a 12-member national interagency group responsible for different activities regarding this transboundary basin. The reality, however, is that these agency representatives convene a joint meeting at six-month intervals, with each agency then making a presentation on what it is currently doing. What is missing, however, is interagency collaboration throughout the Rio Grande basin. This example of institutional fragmentation is an unfortunate reality in regard to many water systems, both nationally and internationally. ILBM offers a means of attempting to bring these different entities together in a cooperative manner, and addressing a common goals; namely, implementation of integrated lake basin management directed to sustainable use of the ecosystem services provided by the water system.

II. ILBM Panel Discussion

Introduction

Following welcome addresses by Dr. Naoki Umezawa (Director of Research, Center for Sustainability and Environment, Shiga University) and Dr. Takamitsu Sawa (President, Shiga University), this panel discussion comprised presentations on several aspects regarding integrated management of water systems, including subsequent panel discussions, and the possibility of audience participation. The presentations included a keynote address on the Potomac River Basin (USA), and subsequent presentations on Lake Biwa and Yodo River (Japan); Lake Chapala-Lerma River Basin (Mexico), Baltic Sea, Lake Victoria, and water management in South Korea. The Panel Discussion was moderated by Dr. Katsuya Tanaka (Department of Economics, Shiga University).

Panel Participants

- Dr. Cherie Schultz, Director, Co-op Operations, Interstate Commission on the Potomac River Basin (USA)
- Dr. Masaki Hirowaki, Shiga Prefecture, Lake Biwa Bureau (Japan)
- Alejandro Juarez -Aguilar, Director, Corazon de la Tierra, A.C. Guadalajara (Mexico)
- Dr. Nicholai Aladin, Zoological Institute, Russian Academy of Science, St. Petersburg (Russia)
- Matano Ali Said, Principal Programme Development Officer, East African Community, Lake Victoria Basin Commission
- Dr. Manabu Kondo, Department of Economics, Shiga University (Japan)
- Dr. Soocheol Lee, Department of Economics, Meijo University (South Korea)
Dr. Masahisa Nakamura (Chair, ILEC Scientific Committee, and Director, Center for Sustainability and Environment, Shiga University) gave some opening remarks, noting that this symposium focused on the topic of lake basin governance and policy formulation in river basin management. He reiterated that the morning session was devoted to promoting and discussing ILBM. Noting that it was difficult to manage lake basins in Japan, as in the rest of the world, the keynote speaker would discuss how a holistic approach was used to manage an important river system in the United States, including consideration of whether or not major dam construction was necessary to achieve this goal. He also noted that dam construction also was a controversial subject in Japan, and it was the intention that the keynote address would help illustrate how such issues can be approached in a cooperative manner.

Presentation: Interstate Commission on the Potomac River Basin

Dr. Cherie Schultz, Interstate Commission on the Potomac River Basin

Many of the problems being discussed in this symposium are similar for waterbodies throughout the world. In regard to the Potomac River, which is the most free-flowing river basin remaining in the United States, there was initially little regard given to the overall management of water quantity in the basin. Rather, it was left up to local institutions and stakeholders to regulate water quantity and use in the basin. There were a number of difficulties associated with this approach, which were becoming more serious over time, including inter-jurisdictional concerns involving the states of Maryland, Pennsylvania, Virginia, West Virginia and the District of Columbia. Further, the basin was impacted by agricultural practices of an environmentally-degrading nature, with a major issue being the consumptive use of the water resource.

The Interstate Commission on the Potomac River Basin (ICPRB) initially focused on water quality issues, although significant progress on this matter was not achieved until after a ‘top-down’ approach involving the application of national water quality standards promulgated by the Environmental Protection Agency (EPA). The ICPRB also has a role regarding environmental education, which has become more prominent over time.

Water quantity became an important issue in the Potomac River Basin in the 1960s, mainly became of the doubling of the population in the basin, as well as a serious drought in 1966. In response to this concern, the US Army Corps of Engineers conducted a study to determine future water demands in the basin. One result of this study was the recommendation that 16 large reservoirs be built along the river, as well as 300 other minor dams.

Subsequent creation of the ‘Low Flow Allocation Agreement’ between stakeholders in the Potomac River Basin resulted in the ICPRB emphasizing a focus on water quantity issues. A further emphasis was placed on hydrologic variability, utilizing a systems approach developed at Johns Hopkins University, and promoted by the ICPRB, which ultimately led to a shared basin vision regarding water quantity needs and issues. A major outcome of such activities and studies was that it was deemed possible to supply the needed water to stakeholders and municipalities throughout the basin with the construction of only one large dam along the river, and one small dam, in contrast to the 16 dams recommended above by the Army Corps of Engineers.

A more detailed description of this water system and its issues can be found in the presentation, “Interstate Commission on the Potomac River Basin: Promoting Cooperative Solutions to Watershed Problems,” in Part I of this report, presented on November 3, 2010.

Presentation: Integrated River Basin Management of Lake Biwa and Yodo River Basins
Dr. Masaki Hirowaki, Shiga Prefecture, Lake Biwa Bureau

The Lake Biwa and Yodo River systems are economically, culturally and biologically important to their basin stakeholders. An over-segregated government structure, however, has hindered the holistic management of these systems. Further, there is a history of upstream and downstream stakeholder conflicts involving use of the waters of these systems.

A result of this situation was the development of the Lake Biwa Development Plan (LBDP), which was designed to deal with flood control and water supply issues within the context of a comprehensive basin-wide management plan. The LBDP led to a 10-year management and use plan, based on a Special National Law.

Implementation of the LBDP has subsequently led to an increased water supply, construction of municipal wastewater treatment plants, including tertiary treatment, flood control with dikes, and construction of irrigation systems.

The Lake Biwa Comprehensive Preservation (Mother Lake 21) Plan also was implemented in the basin. This plan focused on maintaining and improving water quality, improving soil recharge capacity, and preserving the natural landscape. It also led to the creation of a 10-year and 50-year action plan, and the goal of increasing public awareness and activism regarding Lake Biwa management needs.

Continued lake basin issues include lakeshore degradation, nonpoint-source pollution, excessive growths of aquatic plants, increased frequency of droughts and floods attributed to climate change, and increased cormorant and exotic fish populations. Programs implemented with the goal of dealing with these issues include advertisements encouraging the production and use of green products, the Fish Cradle Project, lakeshore restoration (via re-inundation), lake bottom restoration, and boating regulations.

A future necessity is a lake basin management approach that addresses both its lentic and lotic waters, including involving local stakeholders, and state and national governments. This approach also must consider all lake uses and users. A major goal is to decentralize the management activities in such a manner that facilitates the increased involvement of lake basin stakeholders.

A more detailed description of this water system and its issues can be found in the presentation, “Integrated Management of Lake Biwa and Yodo River Basins,” in Part I of this report, presented on November 5, 2010.

Presentation: Creation of an ILBM Sub-basin Network to Address Governance in the Lerma-Chapala Basin, Mexico

Alejandro Juarez-Aguilar, Corazon de la Tierra

The ILBM Framework has proved to very helpful in focusing attention on, and initiating actions directed to, water management needs in the Lerma River – Lake Chapala Basin, including facilitating the provision of needed information and data, as well as its dissemination to other relevant institutions.

The Lake Chapala basin is composed of five states and over 100 municipalities, characterized as being relatively segregated. Accordingly, several ILBM workshops have since been held in the basin, with the main focus being education and dissemination of ILBM materials. Of particular importance was the work in 2008, which involved representatives of all relevant basin stakeholders, as well as attracting media
attention. Eight institutions, including the National Water Agency (CNA), as well as funding agencies, were involved in sponsoring and facilitating this workshop.

Thus far, five projects have resulted from this workshop, including the development of a comprehensive ILBM Lake Brief, creation of a lake basin information center, increased emphasis on integration within the Lake Chapala management plan, listing of basin protected areas, and translation of the ILBM handbook into Spanish (ongoing).

Subsequent ILBM workshops in 2009 and 2010 sought commitments from all relevant basin stakeholders regarding lake basin management goals. The work of many of the participants in these workshops involved at least one of the ILBM governance pillars, with a goal of the workshops being to maximize efficiency and cooperation regarding each pillar.

Another significant outcome of the ILBM workshops was the establishment of a sub-basin network for exchanging information and experiences, thereby resulting in trust that did not previously exist. The experience to date indicates that utilizing a sub-basin management approach appears to be a fruitful means of facilitating application of ILBM.

A more detailed description of this water system and its issues can be found in the presentation, “Lake Chapala and its Basin (Mexico): Summary of Experiences and Lessons Learned,” in Part I of this report, presented on November 2, 2010.

Presentation: ILBM for the Baltic Sea and Aral Sea

Dr. Nicholai Aladin, Zoological Institute, Russian Academy of Science

Although technically a marine system, the Baltic Sea represents a promising candidate for the application of ILBM, noting that it receives freshwater inputs from its surrounding basin, and subsequently empties into the ‘downstream’ marine system. The Baltic Sea is transboundary in nature, with its riparian countries comprising members of the European Union and the Russian Federation. It exhibits a high level of biodiversity, as a function of its varying salinity and related chemical and physical properties, as well as its linkage with more saline downstream water systems. In fact, the sea has exhibited a loss in marine-related biodiversity because of its currently decreasing salinity. These and other features indicate the need for ILBM as a basin management approach, as well as a means of generating consensus and trust among the basin stakeholders.

The dramatic demise of the Aral Sea, a terminal lake in central Asia, is well-known, and would likely have been prevented if an ILBM lake basin management approach had been available at the onset of its significant degradation. The Aral Sea catchment area is very large, consisting of 5 central Asian riparian countries. The lake has exhibited an overwhelming level of desiccation due to the almost complete diversion of its two major riverine inflows for agricultural irrigation purposes. The result is the dramatic shift over approximately the last 30 years from a freshwater ecosystem to a brackish system, and ultimately to a hypersaline system, accompanied by a significant reduction in the lake surface area and volume. The resulting decimation of its biological and chemical characteristics, as well as the almost complete collapse of the economic livelihoods previously provided by the lake’s commercial fisheries and other industries, are well-documented in the literature.

A promising development, however, is that a dike was recently constructed to dam a small portion of the northern end of the former Aral Sea, with funds from the World Bank. This construction has resulted in some significant improvements, including increasing water levels, decreased salinity to freshwater levels,
and rehabilitation of some of the lake’s previous biodiversity. Although the fate of the vast majority of the remainder of the lake is in doubt, it is hoped the promising situation will continue to improve the conditions in this portion of the former majestic Aral Sea.

**Presentation: ILBM Approaches From a Transboundary Perspective: The Case of the Lake Victoria Basin Commission**

Matano Ali Said, Lake Victoria Basin Commission

Lake Victoria is the second largest freshwater lake in the world in area, containing portions of 5 countries in its drainage basin. It exhibits significant eutrophication problems related to anthropogenic activities, including atmospheric deposition of phosphorus from fires both inside and outside its basin. Although the ILBM Framework is a relatively new concept in regard to the management of the Lake Victoria Basin, the governance components of ILBM are already being addressed to varying degrees within the context of former attempts to implement a basinwide management approach.

The key to successful lake basin management in the Lake Victoria Basin is a foundation built upon political cooperation in the form of an international treaty between the basin countries. This treaty has resulted in a protocol that gives the Lake Victoria Basin Commission authority to undertake relevant management actions and activities, as well as a political structure facilitating policy formulation.

Further, although the activities of the Commission are currently being funded by the basin partner states, a need for sustainable finances also exists. Another consideration is the need to develop and implement more monitoring programs within the lake and its basin.

If the ILBM Framework were significantly incorporated into the policies of the basin partner states, as well as utilized to manage the basin’s natural resources, it would greatly assist the Commission in gaining international support for needed projects, as well as facilitate creation of a comprehensive and sustainable basin management approach.

A more detailed description of this water system and its issues can be found in the presentation, “ILBM Approaches From a Transboundary Perspective Case: Governance Policy Framework for Lake Victoria,” in Part I of this report, presented on November 4, 2010.

**Presentation: Water Reform in Australia and its Lessons to the World**

Dr. Manabu Kondo, Shiga University

Although water trading began in the early-1980s in the southern part of the Murray-Darling, it was not of major interest in the formulation of Australian water policy until 1989. This implementation of water trading resulted in permanent water trading possibilities, as well as subsequent water pricing reforms and basin cap implementation. It also ultimately resulted in the formulation of the Catchment Management Authorities Act (NSW) in 2003.

Upon maturation of water trading in Australia, the National Water Initiative (NWI) was created to deal with large national-scale problems (e.g., climate change), ultimately producing the National Water Commissions Report, analyzing the economic, social and environmental impacts of water trading over ten years. A major conclusion was that there were significant benefits related to including water trading in water availability calculations, as well as in the nation’s GDP. A negative aspect of the water trading
system was resulting water salinity issues. This problem, however, was subsequently addressed with the formulation of a Basin Salinity Management Strategy, as well as site water use licenses to offset the salinity impacts with a credit and debit system.

Water trading has been a useful tool for ILBM in Australia because of its power in regulating water use, the use of water trading zones during drought periods, and the reservation of water rights specifically for maintaining environmental flows. The Australian experience with water trading was a good means of helping its economy, while also regulating water use, and appears applicable in other parts of the world.

A more detailed description of this water system and its issues can be found in the presentation, “Water Reform in Australia and its Lessons for the World,” in Part I of this report, presented on November 5, 2010.

Presentation: Water Use Charge System and River Basin Management in Korea

Dr. Soocheol Lee, Meijo University

Water pollution was a major problem in South Korea during the 1990s, being the cause of political and civil unrest. An example was phenol inputs into major rivers, causing significant health problems, and resulting in civilian protests.

As a means of addressing this problem, and others, a water use charge for water users was implemented for the 4 major rivers in South Korea, in order to provide funds for developing and restoring water resources. The water use charge, which was not inconsequential, was determined by a 9-member committee, including governors and minister, and with stakeholder input. Among other benefits, it provided subsidies to upstream basin inhabitants as a means of facilitating their ability to more readily cope with tighter upstream water restrictions, which included a restriction on the construction of new apartment buildings, and the implementation and enforcement of water quality standards for Biochemical Oxygen Demand (BOD) and suspended solids.

Other programs financed by the water charge system included the repair of agricultural machinery and agricultural field pumping facilities; amelioration of crop cultivation, agricultural marketing and distribution facilities; environmentally-friendly welfare, sewer systems, medical facilities, children’s parks, libraries and kindergartens; and educational equipment, books, tuition, and school feeding facilities.

Since the implementation of this water use charge, there has been a gradual decline in the BOD and Chemical Oxygen Demand (COD) in all 4 major rivers, and a dramatic reduction in the total phosphorus concentration in two of the rivers. Other challenges that would benefit from the application of ILBM include restructuring of Yasushi Ken watershed management, and governance trading scheme.

Closing remarks from this Panel discussion included the observation that the presentations were very diverse in content, and illustrated many important lake basin management issues. They also highlighted ideas for resolving lake basin management issues, thereby achieving the goal of this international symposium. It is clear that the solutions to global lake issues goes beyond the realm of academic discussion, and that ILBM can provide a powerful tool to address these issues.