



# NEWSLETTER

INTERNATIONAL LAKE ENVIRONMENT COMMITTEE FOUNDATION

— For Better Lake Management —

This Newsletter is also available in Japanese.

## OPENING OF UNEP/IETC



Artist's Impression of UNEP/IETC Shiga Office



UNEP/IETC Osaka Office

The official opening ceremony of the UNEP International Environmental Technology Centre (UNEP/IETC) was held at Osaka Guest House in Tsurumiryokuchi, Osaka on 8 April 1994. The ceremony was held to commemorate the Centre, the first UN organization in western Japan, coming into full operation with the appointment of Centre staff from that day. The Osaka Guest House is located next to the Centre's Osaka Office, and some 400 guests from both the private and public sector gathered there for the ceremony which started at 11 in the morning. The ceremony was opened with a speech by Ms. Dowdeswell, the Executive Director of UNEP, followed by messages of greetings from Mr. Yamamoto, Parliamentary Vice-Minister of the Environment Agency, and Mr. Akao, Ambassador in charge of Environmental Affairs, representing the Environment Agency and Ministry of Foreign Affairs respectively. In addition to Ms. Dowdeswell other UNEP representatives present at the ceremony included Mr. Meganck, Director of UNEP Regional Office for Asia and the Pacific, Mr. Trindade, special Representative to UNEP Executive Director and Leader of the staff team of UNEP/IETC, and Mr. Matsumura, Senior Liaison Officer of UNEP/IETC. Other distinguished guests included Mr. Yamada, Vice Governor of Shiga

Prefecture, Mr. Takada, Mayor of Kusatsu City, Mr. Nishio, Mayor of Osaka City, and representatives of Embassies to Japan.

Ms. Dowdeswell started her speech with a special tribute to the Government of Japan, the Shiga and Osaka Prefectural Governments, and Osaka Municipal Government for their efforts devoted to the institution of the Centre in Japan. She emphasized the importance of Japan's future role in international endeavours concerning global environment issues and transfer of technologies to developing countries and countries with economies in transition, stressing that the Centre was founded in this context to promote the transfer of environmentally sound technologies. She went on to mention that the activities of the Centre would be devoted to environmentally sustainable management of big cities and fresh-water lake/reservoir basins, and stated that the Centre will closely collaborate with HABITAT, two supporting foundations in Japan (ILEC and The Global Environment Centre Foundation in Osaka) as well as UNDP, the World Bank, the UN Secretariat, and other international organizations. She closed her speech by calling on Japanese guests and representatives of embassies to Japan for further support to and participation in the Centre's activities.

## *Japan Foundation Hosted European Women's Study Tour for Environmental Issues*



The European Women's Study Tour for Environmental Issues toured Japan from 27 March to 11 April, 1994. The group was invited by the Japan Foundation and consisted of 10 members including Dr. Maria Mies, Professor, Fachhoch School, Germany; Dr. Claudia von Werlhof, Professor, Institute for Politics, University of Innsbruck, Austria and other doctors, engineers and specialists on the Chernobyl nuclear accident and women's and environmental issues from Eastern Europe.

The group came to Shiga Prefecture after participating in symposia on women's environmental issues in Hiroshima and Okinawa. On 4 April, they observed Lake Biwa on environmental study boat "Mizusumashi" and toured the Kirin Brewery Co. to inspect the waste water treatment system. That evening a reception was held for the group in Biwako Hotel attended by local representatives from Shiga.

A symposium entitled "On the Shores of Lake Biwa - A Gathering of Women" was held at Otsu Prince

Hotel sponsored by the Japan Foundation, co-organized by ILEC and with the cooperation of Shiga Prefectural Government. (see photo)

Ms. Emi Uehara, Advisor to Shiga Prefectural Governor, gave a welcome address, followed by a message of greetings from Dr. Margarita Mikhailenko, Director of Medical Programme Chernobyl Global Security Fund. Keynote addresses included "Water Environment and Culture in Shiga" by Dr. Yukiko Kada, Senior Researcher of Lake Biwa Museum project Office of Shiga Prefecture, "Outline and Role of Lake Biwa Conference" by Ms. Mitsuko Hayashi, Secretary-General of Lake Biwa Conference, and "Approach of Ecological Co-operative Union" by Ms. Sumiko Yamaji, Director of the Shiga Ecological Co-operative Union. From the European Group, speeches were made on "the Ecosystem from the View Point of Women," by Dr. Maria Mies, "Principle of Cooperation System in Co-operative Union with Consumers" by Dr. Mary Mellor, Principal lecturer in Sociology, Department of Applied Social Science, University of Northumbria at Newcastle, UK, and "Ecology - Co-existing with Nature" by Dr. Claudia von Werlhof. Following these speeches, a discussion was held with eleven representatives from Shiga.

The lecturers were all women and 90 percent of the audience were also women. ILEC also exhibited panel boards concerning its activities , a profile on the UNEP International Environment Technology Centre and environmental education project.

## *The 4th Training Course in Lake Water Quality Management*

The 4th annual "Training Course in Lake Water Quality Management" for developing countries was held mainly in Kusatsu, Japan from January 24 to March 24, 1994, jointly convened by ILEC and Japan International Cooperation Agency (JICA).

The course included both of lectures and study visits. Also included in the course is the Lake Biwa Case Study Discussion. The scientific know-how and

technologies of universities, institutes, and companies are necessary and useful for the progress. All the participants (12 participants from 11 countries) were impressed by Japanese advanced technologies of analysis and monitoring, environmental education at compulsory levels, and comprehensive basin management represented by Lake Biwa Case Study Discussion.

# *Approach Paper on Indian National Lakes Conservation Plan*

by B.P. Singh (Additional Secretary to Government of India & Ramsar Regional Representative for Asia)

## **Introduction**

Lakes constitute an important component of our fresh water systems. Many of the lakes in different parts of the country have been found through the natural process, while several others are artificial.

These water bodies provide habitats and breeding grounds for a variety of birds, fish and other aquatic life both faunal and floral. The lakes and other wetlands (shallow water bodies) serve as important life-support systems by helping in flood control, recharging of ground water and regulation of the hydrological regime.

## **Problems**

Due to pressures of human activities, a number of lakes are shrinking or getting polluted beyond the point of recovery. Encroachments, siltation, weed infestation, discharge of domestic sewage, industrial effluent and surface run-off carrying pesticides and fertilizers from agricultural fields are among the major threats. The symptoms of pressures due to encroachment and incursions are already experienced in the form of decrease in migratory bird population, fish and other fauna, poor water quality and prolific growth of obnoxious weeds (eutrophication).

## **On-going programme**

For conservation of the wetlands (including lakes) and for creation of consciousness in this regard, the Ministry of Environment & Forests has already launched a scheme. Under this scheme, catalytic support is given to the state Governments for activities like weed control, desalting and catchment area treatment. The wetlands that have so far been covered through this scheme are Kolleru (Andhra Pradesh), Wular (Jammu & Kashmir), Chilka (Orissa), Loktak (Manipur), Bhoj (Madhya Pradesh), Sambhar (Rajasthan), Pichola (Rajasthan), Ashutamudi (Kerala), Harike (Punjab), Ujini (Maharashtra), Sukhana (Chandigarh), Sasthamkotta (Kerala), Renuka (Himachal Pradesh), Kabar (Bihar), Narasalvor (Gujarat) and Kanjli (Punjab).

## **Proposed National Lakes Conservation Plan (NLCP)**

The National Lakes Conservation Plan (NLCP) will be to augment the on-going programme on wetlands

and to undertake large scale conservation activities in the selected lakes, including those which are not covered under the existing programme. The National Lakes Conservation Plan will be, to begin with, concentrated on urban lakes and, at a later stage the scope of activities will be expanded to include rural water bodies.

With a view to check over-exploitation of our water resources which ultimately reduces the assimilative and self-purifying capacity of most water courses, the Ganga Action Plan (GAP) was initiated in 1985. The experience of the GAP in improving the water quality of the Ganga will be useful in replicating the works in other major rivers of the country. This is proposed by undertaking a National River Action Plan (NRAP) which will have a thrust on pollution abatement, soil conservation, research, monitoring, etc.

As most of the lakes in India are of the oxbow type originating from changing river courses, the rivers taken up for studies under NRAP will have direct linkage with the oxbow type of lakes in question, which will be undertaken under NLCP as most of the activities are common and accordingly even funding and implementation can be tied up and shared at later stages. Intra and Inter-govt. linkages would also be strengthened to achieve the desired results.

The activities under NLCP will include the followings:

- Formulation of perspective plans for conservation based on resource surveys using remote sensing technology and Geographical Information System (GIS).
- R&D studies on floral and faunal bio-diversity and related ecological aspects.
- Prevention of pollution from point and non-point sources.
- Catchment area treatment.
- Desilting and weed control.
- Other activities depending on location specific conditions, such as an integrated developmental approach, including interface with human populations.

In order to create an information base for future conservation action, it is essential that information of lake ecosystems should be readily available. Under this

programme, National Lake inventories can be made and conservation activities encouraged. Remote Sensing Technology and GIS can also be used for evaluating the status of degradation in larger and deeper lakes which will be covered under the National Lakes Conservation Plan. The ground-truth data available on the status of these lakes can be compared by such technologies to get the exact status of the lake which will be undertaken for conservation and management.

Pollution causing point sources and non-point sources would be identified and rectifications made accordingly. The Central Pollution Control Boards and State Pollution Control Boards can be associated with water quality monitoring studies, both in lakes and rivers. Afforestation related activities will be undertaken for catchment area treatment.

Soil conservation is an important element in river and lake management. Desilting and weed control measures can be undertaken in collaboration with number of agencies at the State and Central level engaged in such activities. NRAP and NLCP will consider integrating all such efforts.

India has a large network of Research Institutions/Universities/Departments conducting research on various aspects of lake ecosystems. The Zoological Survey of India and the Botanical Survey of India are repositories of information on fauna and flora in the country. The Wildlife Institute of India has been conducting research studies on conservation of wildlife. The Bombay Natural History Society has been involved in wetland research. The Salim Ali Centre for Ornithology (SACON) has been set up by the Ministry at Coimbatore for ecological research and ornithology. The Inland Fisheries Research Institute and the Institute of Brackish Water Aquaculture under the Ministry of Agriculture have been involved in investigating various aspects relating to fisheries.

Besides, enough data has been gathered from several projects funded by Ministry of Environment & Forests under the Wetland Programme on different aspects. The available data on these lakes can be collected and as the need arises further studies will be undertaken for those lakes which have not been covered so far. The research inputs will provide relevant information on various limnological parameters.

#### **Conservation Needs**

Lakes are often seen as the main target for

development because of their fertile soil and supply of fresh water. Under this programme, conceptual base for National Lakes Conservation Plan and strategies for planning can be developed. Preparation of the National Lakes Conservation Plan will promote sectoral lake conservation strategies and reduce threats to lakes posed by developmental projects. Lake conservation components can be included in developmental projects and national legislation linking lake conservation and sustainable development. Eventually, it is proposed to formulate a National Wetlands Action Plan for consideration of various types of wetlands such as mangroves, estuaries and mudflats, sea grass Beds, coral reefs, freshwater swamps , river basins and reservoirs and dams.

The programme will be implemented in two phases covering urban lakes in the first phase and the rural lakes in the second phase. The urban water bodies are subjected to serious forms of environmental degradation and pollution due to increasing population, growth of human settlements and industrial activities. Clearing up of these water bodies should therefore receive priority under the programme. The lakes in the urban areas are of great socio-economic importance particularly in regard to their recreational and aesthetic values. Some of these lakes are also a source of drinking water. Due to heavy population pressure and inflow of sewage and urban wastes, these lakes have become eutrophied and deterioration of water quality, algal blooms and decrease in biological diversity are quite apparent in majority of these lakes. These lakes need immediate attention for conservation.

#### **Organizational Set Up**

At the State level, the programme can be implemented by the State Steering Committee as is being done for the Wetland Conservation Programme in the country. Apart from subject matter Departments, the Committee will also opt members from Municipal Corporations, Municipal Committees, District Development Boards, NGOs and other associated Developments/Organizations which are directly or indirectly concerned with lakes and rivers in the concerned States. The Steering Committee will also have representation from Ministry of Environment & Forests for implementation of the programme.

#### **Funding of the National Lakes Conservation Plan (NLCP)**

To begin with, the concerned State Governments will be provided support for the purpose of reconnaissance survey and preparation of detailed project documents for individual lakes. Based on such documents and perspective plans for conservation with specific commitments from the respective State Governments, funding support from bilateral and

multilateral sources will be sought, since the funds requirements will be of a sizeable order. However, for initial start-up work, funds will be made available from on-going scheme for wetland conservation. The implementation of the individual project will be on a cost sharing basis with commitments to this effect from the respective State Governments.

## *Brains of ILEC met in Japan*

### *6th General Meeting of ILEC Scientific Committee*



**ILEC Scientific Committee**

Fifteen members of ILEC Scientific Committee met in Otsu, Shiga, on 8-10 February 1994. The sixth General Meeting chaired by Professor Tatuo Kira, Director of the Lake Biwa Research Institute, had the welcoming addresses Ministry of Foreign Affairs and Environment Agency in Japan.

On the first day the progress made since the last General Meeting (June 1992) was reported. The report said that the Guidelines of Lake Management series vol.6 Management of Saline Lakes and vol.7 Food-chain Manipulation and vol.8 Emerging Issues of World Lakes were under preparation. It also said that the Data Book of World Lake Environments - Survey of the States of World Lakes - vol.5 covering some lakes and reservoirs in the former USSR would appear soon. The secretariat reported on the compact-size Data Book of World Lake Environments - Asia and Oceania. This covered the data on 65 lakes and reservoirs in Asia and Oceania recognized from the original data book series. The successful three UNEP/ILEC joint international training courses and the fifth World Lake Conference were also reported.

The four working group meetings had held on the second day. The topics were:

- (i) data collection,
- (ii) the ILEC journal,
- (iii) training materials,
- (iv) environmental education.

The data collection group discussed on the data computerization and further dissemination of it. The ILEC Journal group gave clear shape to a new management-oriented journal. The training materials group focused on the best use of existing training materials produced by ILEC. The environmental education group recommended a new Guideline book on environmental education and a short training course for teachers

The discussions of each working group were reported to the plenary meeting on the third day.

The members visited Ibaraki Prefecture after the General Meeting to observe the venue of the 6th World Lake Conference, Kasumigaura '95 (October 1995) and to take part in the Scientific and programme Committee for Kasumigaura'95.

# LAKES OF THE WORLD

## The Volta Lake - Ghana, Africa



C. Gordon (Volta Basin Research Project,  
University of Ghana, Legon, Accra, Ghana)

### Introduction

The Volta basin spans six countries, (Togo, Burkina Faso, Benin, Mali, Cote d'Ivoire and Ghana) and has a catchment of 165,700 square kilometers. The basin stretches across all the major ecological zones found in West Africa with the exception of the high rain forest. Its main rivers, the Black Volta, the seasonal Red Volta and the Oti river, flow into the Volta lake which was formed in 1964 for hydroelectricity generation (over 800 MW) and was until quite recently, the largest man-made lake in the world. From the dam, the outflow enters almost immediately into the Kpong Head pond, a smaller hydroelectric scheme which was constructed in 1981. The creation of the Volta lake acted as a stimulus for the development of limnology and freshwater ecology as subject areas in Ghana, the establishment of the Volta Basin Research Project being a case in point.

### Morphometry

The Volta lake has a dendritic shape with a number of important arms and branches. The overall length of this vast water body is 410 kilometers with a maximum width of 25 kilometers, it lies between 6° - 9° N and 1°W - 0° 15' E. The extreme length of the lake means that it bridges two climatic zones, the northern part of the lake having a simple peak of rainfall while the south part has a bimodal rainfall pattern. The maximum

depth of the lake is found just behind the dam, (79 meters) and the mean depth is 19 meters. The maximum operating height is 84.1 meters a.m.s.l. and at this level the lake covers an area of 8,480 square kilometers, and has a volume of 165 cubic kilometers. The change in water level of the Volta lake displays a unimodal annual cycle peaking in October - December and with a minimum in June - August. The annual drawdown is of the order of 4 meters, which, in turn creates a drawdown area of approximately 85,000 hectares. The mean annual discharge from the lake is 1,150 cubic meters per second.

### Physio-chemistry of the water mass

The lake has been classified as  $\beta$ -oligotrophic, but it should be noted that the eight main arms of the lake behave as sub-basins having their own special physio-chemical characteristics. The range of these characteristics is given in the table below, and is from various sources in the literature, unless otherwise stated, all values are in mg/l.

### Fisheries

Very little work was carried out on the fisheries of the Volta system before the Akosombo dam was built, most of the studies were taxonomic in scope and their output were specialists and geographical ranges of the species found. The diversity of the ichthyofauna of the Volta system is high, 122 fish species have been recorded in the Volta basin. After the dam was constructed there was the expected displacement of riverine adapted species by lacustrine species. The present catch from the lake has been estimated at around 40,000 metric tonnes per annum. In the initial period of inundation this figure was as high as 60,000 metric tonnes. Over the years, the number of fishermen on the Volta lake has grown steadily, from 18,353 in 1970; 20,615 in 1975 to over 80,000 in 1991. The fishery below the dam have been affected, the most obvious is that of the loss of the clam fishery lower Volta which employed 1,500 - 2,000 people, mainly women and provided an income of £100,000 (1963 Pounds).

### Disease

Onchocerciasis (River Blindness) is still a major problem in parts of the basin, causing people to move away from the fertile river valleys. The construction of the dams drowned many of the rapids that were used by the vector *Similium damnosum* (Blackfly) for breeding. The World Health Organization is conducting a major operation to eradicate the blackfly and river blindness in the basin. The method being used is based on the treatment of blackfly breeding site with larvicides such as Abate, Carbosulfan and Permethrin. There is a programme to resettle people in a number of the zones that are free from the disease.

Schistosomiasis (Bilhazia) is endemic and ubiquitous in some areas. The movement of migrant fishermen has also contributed to the spread of schistosomiasis in the lake. Changes in hydrology of the Lower Volta river caused by dam operation, affected the geomorphology of the entry point to the sea, this resulted in the loss of brackish water conditions in the Volta estuary and the consequent population explosion of the snail hosts of the disease. This situation has now been corrected by the dredging of a canal to allow sea water penetration.

### Environmental Considerations

The increased and indiscriminate use of pesticides such as herbicides and insecticides can have lasting and significant effects on water quality in the basin. The move away from the subsistence farming and inflow of medium scale capital by non-local investors presents a threat to the environment. The massive algal blooms of *Microcystis* in the Afram arm of the lake in the early 1980's can be in part attributed to fertilizer run off that caused localized eutrophication. Poor farming practices and the rampant cutting of timber and fuel woods have increased rates of soil erosion in many catchments, not only destroying valuable top soil, but increasing the sediment load of the rivers that feed the lake bringing the danger of silting up.

### Resettlement and Internal migration

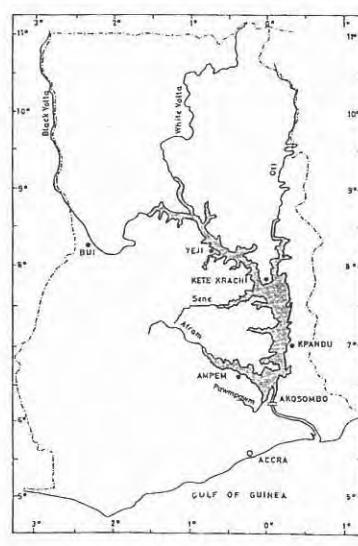
The construction of the Volta lake displaced 80,000 people; the Volta River Authority (VRA) was given the task of resettling these people. The negative changes to the down stream environment and the favorable developments, i.e. fishing and communication led to high numbers of migrants. Kete-Krachi, an upstream district, had one of the lowest population

densities in the country in 1960, is at present, the fourth fastest growing district after the urban centers of Accra, Kumasi and Tema. The growth of such upstream districts can be compared with fall in population in areas in the lower Volta such as Mepe and Agorkpo. One of the primary aims of the resettlement exercise was to improve the health of the displaced people by moving them into planned villages with some basic sanitation infrastructure. The falling level of the Volta lake water over the drought period caused the fisherman to move out of the resettlement villages and construct their own dwellings by the lake side. The implication of this move, is that there are a large number of people (in the order of hundreds of thousands) whose water enters into the lake without any treatment thus presenting an unknown amount of phosphate and nitrogen loading on the lake.

### Conclusion

The Volta lake has been pivotal in the economic development of the country. Even taking into account the environmental losses in habitat, flora and fauna due to flooding, as well as the downstream effects of the dam. The benefits of the dam and lake; power generation, increase in communications through lake transport, irrigation and fisheries are arguably greater than its costs.

Parameter	Range
Surface temperature	27 - 32 °C
Conductivity	60 - 180 µS/cm
Total Dissolved Solids	70
pH	6.8 - 8.5
Sodium	1.2 - 6.8
Potassium	1.5 - 6.0
Calcium	3.4 - 10.2
Magnesium	2.4 - 7.1
Bicarbonates	20 - 70
Chloride	1.0 - 4.0
Silicon	16 - 25
Iron	0 - 0.26
Ortho-phosphate	0 - 0.5
Nitrate	0.02 - 1.00



The Volta Lake

## Forthcoming Meetings

### 14th International Symposium of the North American Lake Management Society

#### "Managing Water Resources in the 21st Century: Finding Workable Solutions"

Date: October 31 - November 5, 1994

Venue: Hyatt Orlando Hotel, Orlando, Florida, U.S.A

Host: Florida Lake Management Society

Language: English

This symposium will provide an opportunity for people of diverse interests and views to come together to discuss issues related to the management of lakes and reservoirs.

#### Contact:

NALMS (North American Lake Management Society)  
One Progress Blvd., Box 27 Alachua, FL 32615 - 9536  
U.S.A.  
TEL: (+1)904 - 462 - 2554  
FAX: (+1)904 - 462 - 2568

### BITEX Symposium/Workshop in 1994

Date: November 5 - 10, 1994

Venues: Symposium/Otsu, Shiga Japan

Workshop/Nagahama, Shiga Japan

Organizers: Lake Biwa Research Institute (Japan)  
Center for Water Research (Australia)

Language: Symposium/English and Japanese  
(simultaneous interpretation)

Workshop/English

The Symposium/Workshop will provide a forum for the exchange of information and discuss innovative and theoretical developments of science, as well as temporal and spatial change of water quality and ecosystems in Lake Biwa in relation to the physical

impact of transport and mixing, and the application of the modern water quality monitoring equipments.

#### Contact:

BITEX Secretariat c/o Lake Biwa Research Institute,  
Uchidehama 1-10, Otsu, Shiga 520 Japan  
TEL: (+81)775 - 26 - 0568  
FAX: (+81)775 - 26 - 4803

### Limnology and Waterfowl Monitoring, Modeling and Management

Date: November 21 - 23, 1994

Venue: Sopron, Hungary

Convener: Societas International Limnologiae (SIL)

Working Group on Aquatic Birds

#### In cooperation with:

The International Waterfoul and Wetlands Research Institute

The Hungarian Ministry of Agriculture, Department of Hunting and Fisheries

National Authority for Nature Conservation Lake Fertő National Park

The main themes of the workshop will relate to the managing of waterfowl populations and can assist in the development of a scientific basis of Waterfowl Management plans.

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