LOKTAK

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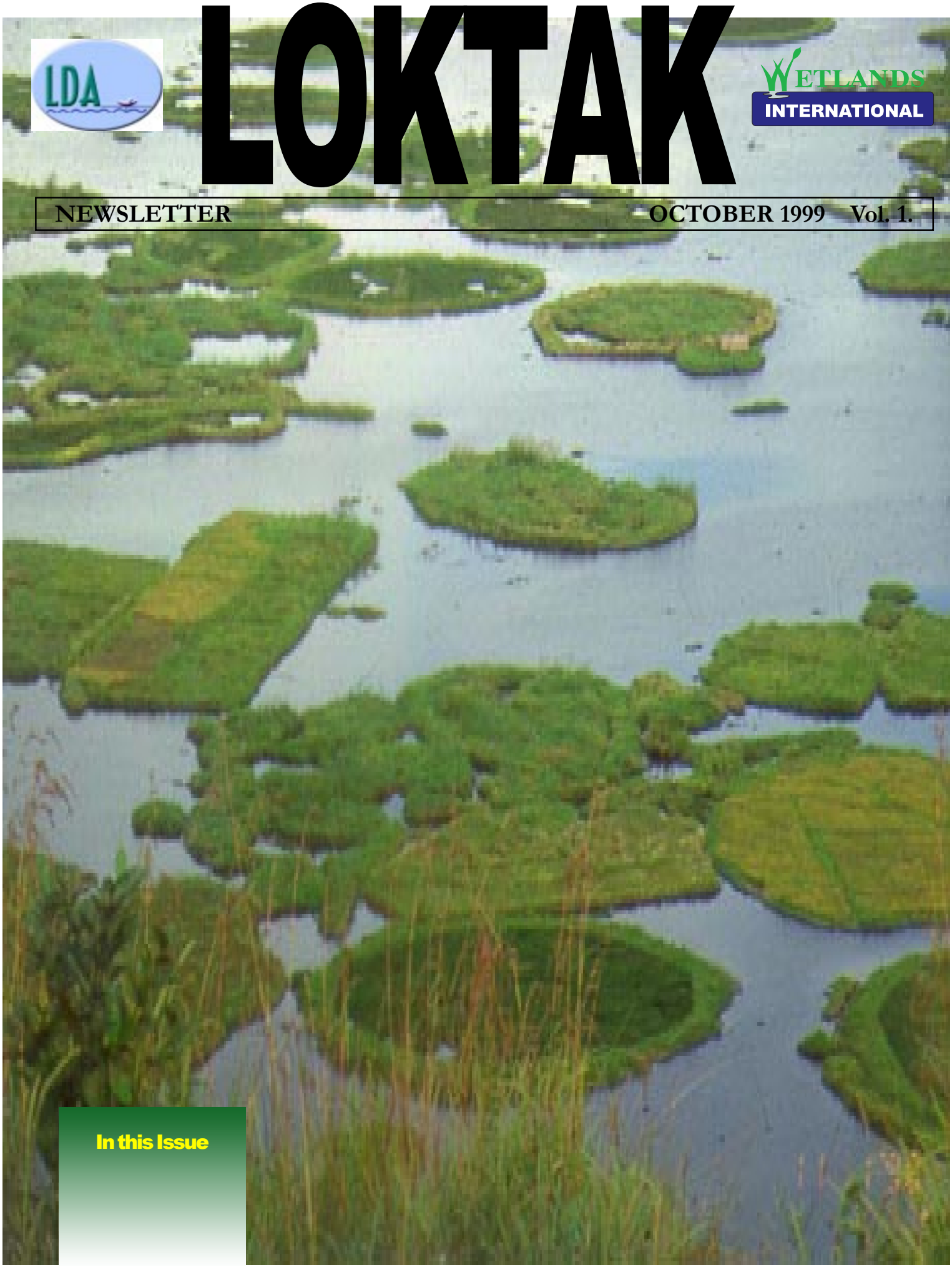

In this Issue

Restore and develop Loktak Lake resources and biodiversity for present and future generations through participatory processes, research and conservation activities

The LDA is a registered society under Sec. 20 of the Societies Act XXI of 1860. The Authority was reconstituted by the Government of Manipur in July 1987. The Chief Minister or his nominee is the Chairman of the Authority and the Project Director is the Member Secretary and also Executive Head of the Autority. The members of the Authority include several Ministers, MLAs, experts, Secretaries/Head of Departments of the State Government concerned with Loktak Lake. The LDA is under the aegis of the Department of Irrigation and Flood Control, Government of Manipur.

To sustain and restore wetlands, their resources and biodiversty for future generations through research, information exchange and conservation activities worldwide.

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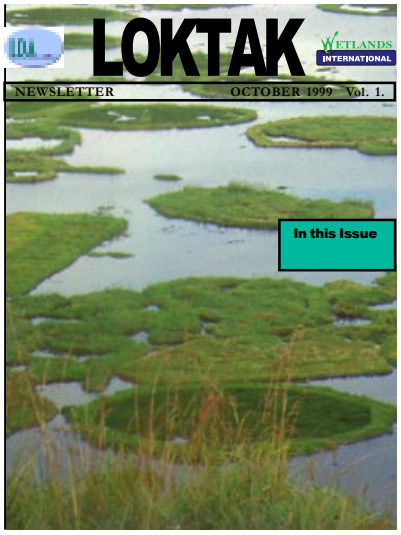

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October 1999

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The editorial panel welcomes contributions of articles and information
The deadline for receipt of materials for the issue is 10 December, 1999

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Phumdis in Loktak Lake, Manipur. Photo : Alan Ferguson

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LOKTAK LAKE IN PERIL

Loktak Lake is considered as the lifeline of the State of Manipur due to its importance in the socioeconomic and cultural life of the people. It is the largest natural freshwater lake in the north-eastern region of India and plays an important role in the ecological and economic security of the region.

A large population living in and around the lake depends upon the lake resources for their sustenance. The staple food of Manipur is directly linked to Loktak Lake. The lake is rich in biodiversity and has been designated as a wetland of International Importance under Ramsar Convention in 1990.

Physical Features

The lake is oval in shape with maximum length and width of 26 km and 13 km respectively. The depth of the lake varies between 0.5 to 4.58 m with average depth recorded at 2.7 m. There are 14 hills varying in size and elevation, appearing as islands, in the southern part of the lake. The most prominent of them are Sendra, Ithing and Thanga islands

The characteristic feature of the Loktak Lake is the presence of floating islands locally called ***phumdis***. They are a heterogenous mass of soil, vegetation and organic matter at various stages of decomposition. They occur in all sizes and thickness, occupying about two-third of the lake area. Southern portion of Loktak Lake forms the Keibul Lamjao National Park which is a continuous mass of floating ***phumdi*** occupying an area of 40 sq. km.

Loktak Lake and its catchment MAP & PHOTO: ROBSON IVAN

Loktak Lake basin can be considered as a sub-basin of the Manipur River basin. It has direct catchment area of 980 sq. km. and indirect catchment of 7157 sq. km. Out of the direct catchment area of 980 sq. kms. of the Loktak Lake, 430 sq. kms. is under paddy cultivation; 150 sq. kms. under habitation; and 400 sq. kms. under forests. The elevation varies from 780 m at the foothills adjoining the central valley to about 2068 m above mean sea level at peak.

Human Settlements

There are 55 rural and urban settlements around the lake with a total population of about 100,000 people. The natural levees of Manipur River and its tributaries are densely inhabited. The houses are made on stilts right into the marginal areas of the lake. A large number of fishermen live on the Thonga, Karang, Ithing and Sendra islands. Further, a large population of fishermen lives on some 688 floating huts of which many have been converted into permanent dwellings. It has been estimated that about 4000 people live in these floating huts for fishing activities. Apart from the people living in the close vicinity of the lake, it has been estimated that about 1,21,000 people live in 546 hill villages. These people are largely under the control of tribal chieftains and practise shifting cultivation.

Hutments on phumdis PHOTO: ROBSON IVAN

Phumdis and Islands PHOTO: C.L. TRISAL

Biodiversity

The Loktak lake with its numerous floating lands covers a variety of habitats which sustains rich biological diversity. The aquatic macrophytes comprising 233 species belonging to emergent, submergent, free-floating and rooted floating-leaf types have been reported in the lake.

The macrofauna comprises of a number of vertebrate and invertebrate species inhabiting the water, Keibul Lamjao National Park, phumdis, islands and other habitats. A total of 425 species of animals (249 vertebrates and 176 invertebrates) have been identified from the lake. The invertebrates include 16 species of annelids, 150 species of arthropods and 10 species of molluscs. The vertebrate fauna comprises 6 species of amphibia, 106 species of birds and 32 species of mammals. The total faunal diversity is likely to be much higher as many species have not been properly described. Of these, 35 species (5 mammals, 3 birds, 9 reptiles, 3 amphibians, 12 fishes, 2 molluscs and 1 annelid) which were reported to be abundant in the past, have declined and are now disappearing gradually. The fauna includes some rare (e.g. the reptile *Python molurus*) and endangered species (e.g. *Muntiacus muntjak* and *Cervus eldi eldi*). At least one species of bird is reported to have completely disappeared.

Loktak lake provides refuge to thousands of birds which belong to at least 116 species. Of these 21 species of waterfowl are migratory, most migrating from different parts of the northern hemisphere beyond the Himalayas. These migratory birds spend their winter (October to March) in and around the lake. In recent years it is believed that the waterfowl population, specially that of the migratory birds has gradually declined. Hume (1988) has recorded 57 species of birds in Loktak lake alone during February. Singh (1971) also states that large number of waterfowl including several species of ducks and geese visit Loktak lake, although a proper census was not undertaken.

Birds in Loktak Lake PHOTO: SALAM RAJESH

Keibul Lamjao National Park is the natural habitat of the most endangered mammal, the brow-antlered deer (*Cervus eldi eldi*) which is represented by about hundred individuals. Locally known as Sangai, this sub-species of deer was reported to be completely extinct in 1951, but a survey conducted under the auspices of IUCN revealed that a few animals existed in the park. Sangai are specially adapted to this floating habitat, with their characterstic hooves unlike other deer species which help the animal walk conveniently over the floating islands.

Sangai deer - *Cervus eldi eldi* PHOTO:

Identification of Threats and their Impacts

Based on the analysis of various issues confronting Loktak Lake, the root-cause problems can be traced to loss of vegetal cover in the catchment area and construction of Ithai Barrage. The degradation of the catchment area has led to the problems of siltation and increased flow of nutrients. The serious implications of construction of Ithai Barrage have led to:

- changes in hydrological regimes thereby affecting ecological processes and functions

Shifting cultivation-Jhum PHOTO: TH. MANIHAR

e wetland;
- inundation of agricultural lands and displacement of people from flooded lands;
- loss of fish population and diversity; and
- decrease in the thickness of ***phumdis*** in the Keibul Lamjao National Park thereby threatening the survival of *Sangai* deer


Ithai Barrage PHOTO: ROBSON IVAN

The above root-cause problems have led to the following:

Siltation - Jhum cultivation, extensive deforestation and unscientific land use practices in the catchment area are responsible for deposition of approximately 336,325 tons of silt annually in the Lake.

Weed Infestation - The proliferation of ***phumdis*** and aquatic weeds have led to the reduced water holding capacity, deterioration of water quality, interference in navigation, and overall aesthetic value of the Lake.

Decrease in Power Generation - The decrease in water holding capacity due to siltation, weed infestation and proliferation of ***phumdis*** has reduced power generation capacity of the Lake.

Loss of Biodiversity - The populations of migratory and resident waterfowl has declined during the last few decades due to poaching and changes in ecological character of the wetland. The habitat of ***Sangai*** deer in Keibul Lamjao National Park (KLNP) is also threatened due to habitat degradation.

Decrease in Fisheries Production - Over-exploitation, indiscriminate methods of fishing, extensive growth of ***phumdis*** and weeds are responsible for decrease in fisheries' production. Construction of Ithai Barrage across Manipur river has interfered with the migration of fishes from Chindwin-Irrawady river system of Myanmar and consequently brought changes in the species composition.


Indigenous fish PHOTO: ROBSON

Flooding - The construction of Ithai Barrage and decrease in absorption capacity of the Lake has resulted in inundation of the peripheral, agricultural and settlement areas.

Pollution - Inflow of organo-chlorine pesticides and chemical fertilizers used in the agricultural practices around the Lake, municipal wastes brought by Nambul river that runs through Imphal, soil nutrients from the denuded catchment area and domestic sewage from settlements in and around the Lake are responsible for deterioration of water quality.

The other issues of concern are:

Lack of community involvement in the conservation and development programmes; encroachment pressures on lands created from dredged and excavated material; and fish pond encroachments into the Lake (related ton decline in fisheries); absence of policy and regulatory mechanisms at the government level for conservation of the Lake and its resources; inadequate technical and managerial skills and coordination among different agencies concerned with Loktak Lake management resulting in the emphasis on sectoral approaches leading to conflicting interests; absence of baseline data on hydrology, siltation, ecology, socioeconomic aspects, catchment area, flora, fauna, etc. and their interrelationships; ineffectiveness of implementing agencies at different levels and lack of appropriate strategies and ineffective implementation of developmental programmes

Lake Management

Government of Manipur constituted Loktak Development Authority in 1986 "to check deterioration of Lake and to bring improvement in the areas of power generation, fisheries, tourism and slitation control." Several experts were engaged by Loktak Development Authority to advise on the management of the Lake. It was observed that the data, in general, was lacking to develop sound strategies for the sustainable development of lake. Moreover, local communities which depend on lake resources were not adequately involved in planning and management processes.

The main activities carried out by LDA include survey and demarcation, procurement of equipment for desiltation and deweeding (dredger with accessories, harvester, hydraulic excavator, bulldozer), removal of silt, removal of phumdis, control of water hyacinth through release of weevils, construction of silt detention structures, afforestation of critical catchment area by plantation of appropriate species of plants and fruit-bearing trees and soil conservation through engineering measures.


Dredging operations PHOTO: TH. MANIHAR

The LDA is currently involved in developing strategies for conservation and management of the lake by integrating social and ecological dimensions for sustainable management of Loktak Lake. The approach emphasizes shifting the current focus from deweeding and desilting operations to a more preventive approach focusing on erosion control, water regime management and community involvement for management of the lake for multiple objectives. It involves expanding the role of LDA from its focus on engineering operations to integrated water management. The overall approach is to build technical and managerial capabilities in the LDA to address the issues of water management and sustainable utilisation of the lake's resources. The active participation of the local communities will be encouraged in planning, collection of data and developing management strategies.

A project on Sustainable Development and Water Resources Management of Loktak Lake funded under India – Canada Environment Facility (ICEF) is under implementation involving local communities, NGOs, research institutions and various State Government agencies concerned with the Loktak Lake. New initiatives are being developed under this project to integrate social, economic and ecological dimensions. LDA is working in close collaboration with Wetlands International – South Asia (WISA) to build technical and managerial capabilities to address the various issues of the management of Loktak Lake on sound ecological basis. The implementation of the project would help socioeconomic uplift of the people by enhancing the lake resources and overall environmental quality of the lake.

Th. Manihar, Project Director,
Loktak Development Authority
Imphal, Manipur

SUSTAINABLE DEVELOPMENT OF LOKTAK LAKE

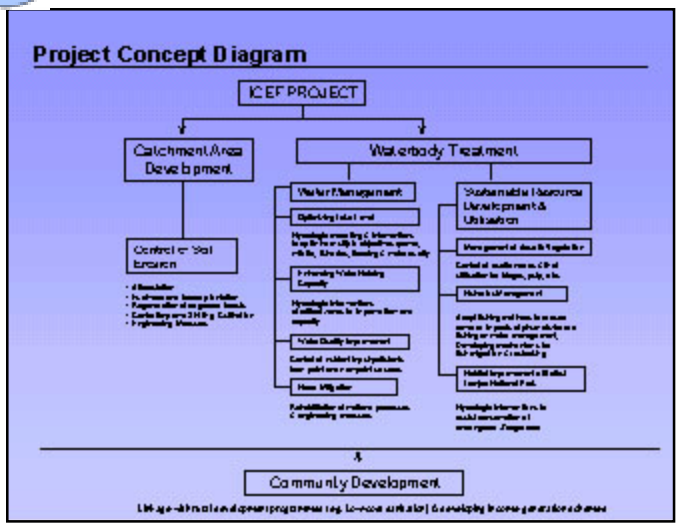
The United Nations Conference on Environment and Development (UNCED) focussed the world's attention on the requirements of sustainable development of the natural resources. Sustainable development is an intergenerational concept. It involves providing maximum benefits to the people of present generation while maintaining its potential for meeting the needs of the future generations. Sustainable development emphasizes integration of social, economic and ecological dimensions in the resource management. The concept seems easy to understand but difficult to practise.

The wise use of wetlands, as highlighted in the Ramsar Convention, is very closely related to the concept of sustainable development. It involves essentially conservation of wetland ecosystems while ensuring benefits to the local communities, particularly weaker sections of the society on a long-term basis. Regina Conference held in 1987 defined wise use of wetlands as their sustainable utilization for the benefit of mankind in a way compatible with the maintenance of the natural properties of the ecosystem. It clearly indicates that overall purpose of the management of wetlands is not only protection of wetland biodiversity and other resources but also their rational use for the benefit of the humankind. The wise use can be applied either at specific wetland sites or at the regional levels taking into consideration all the wetland types and their resources.

A few case studies carried out at global level, including India, have addressed the issues of sustainable development of wetland ecosystems, but in general, integration of ecological aspects with community participation and socioeconomic aspects is lacking. Realizing this a project on Sustainable Development of Loktak Lake has been undertaken by Loktak Development Authority in collaboration with Wetlands International - South Asia.

The Approach

The approach followed essentially involves assessment of lake resources, threats and pressures on the resources and their integrated management for the benefit of the stakeholders particularly local communities while ensuring conservation of Loktak Lake. Developing institutional mechanism and regulatory regimes for effective management of the lake is crucial for sustainable management. Sustainable



Development and Water Resources Management of Loktak Lake project addresses all these issues. The goal of the project is to improve water management of the Loktak Lake and sustain its resources for the benefit of the local communities on a long-term basis. The salient features of the project are outlined in the concept diagram and briefly discussed.

Resource assessment

The important component in the sustainable development that eventually determines its effective implementation is the assessment of the resources and establishment of accurate baseline data. Currently, data that is available on Loktak Lake in relation to resources and their utilization pattern is sparse and outdated. Therefore, it is necessary to develop methodology and collect data on different aspects of the lake ecosystem.

The hydrology of Loktak Lake is complex and there are several issues which need to be investigated thoroughly for formulating sound strategies for water management. While on one side ***phumdis*** are proliferating fast resulting in choking of the lake, there is a decrease in the thickness of ***phumdis*** in Keibul Lamjao National Park which is threatening the survival of Sangai deer. In the absence of baseline data, several assumptions are made as the causative factors for the degradation of the lake ecosystem particularly in the KLNP area. The role of ***phumdis*** in the hydrological functioning particularly, water holding capacity, water balance, maintaining the desired thickness in the park and their proliferation in the Lake has to be precisely determined. To address these problems, it is crucial to undertake specific studies for water management of the Lake on scientific basis.

Similarly, data regarding several aspects of catchment area, biodiversity, fish diversity, wildlife, community structure, nutrient and silt loading etc. are lacking. The data on all these aspects will be collected under the project using appropriate assessment techniques.

A monitoring laboratory has been set up at Ningthoukhong with facilities for analysis of water quality, hydrology, biological characteristics, fisheries assessment, changes in landuse, lake zonation etc. Based on the data collected and the threats encountered, a database will be built which could be used for planning and management by the concerned stakeholders.

Integrated Management

Catchment Area Treatment

New initiatives are being developed for regulating flow regimes including soil, water and nutrients from the catchment area. Participatory approaches are followed for understanding needs of the local communities. Processes are being developed to involve local communities through Participatory Rural Appraisal exercises in selected villages of the hill areas. The village community particularly women are involved in raising nurseries of appropriate species having both economic and ecological importance. Saplings are raised and then afforested by local communities in their own private lands. They take care of the afforested areas and it is expected that tree cover once fully developed will provide them the economic benefits. While it is not possible to take afforestation in the entire catchment area, demonstration projects are being initiated in selected areas. This can be replicated to other parts of the catchment area depending upon the success and needs.

The forest wing of LDA provides technical assistance in the afforestation programmes and undertaking small scale engineering measures like contour trenching, vegetation contour bunding, gully plugging etc. to control soil erosion in the catchment area.

Water Management

The objectives of water management include optimizing the lake level and water holding capacity, improving water quality and flood mitigation and developing mechanisms for implementation of strategies based on specific studies. In order to achieve these objectives, preparation of a rational stakeholder endorsed water management plan that addresses multiple values of Loktak Lake for power generation, agriculture, wildlife and fisheries is crucial for long-term management of the lake. The water management plan will indicate how these objectives will be achieved through assessment of water availability and its allocation for human uses and ecological values

The activities carried out under water management include water availability in qualitative and quantitative terms and water holding capacity of the lake. Loktak Lake is fed directly by 34 streams from western hills and indirectly from the Imphal, Iril, Thoubal, Sekmai and Khuga Rivers. 15 stream gauging stations, 4 meteorological stations and 10 stations for standard and automatic rainfall gauging have been identified. Hydrological equipment have been established at these stations for data collection on hydrometry. Detailed surveys were conducted to determine the cross-sections of the gauging sites at Imphal, Iril, Nambol, Nambul, Merakhong, Thoubal and Khordak rivers. Based on this survey 9 stream gauging and sediment sampling stations have been established. Collection of data is being carried out from these stations which include Salan Bridge, Khewa Bazar, Kangla Siphai, Hiyanthang Bridge, Thoubal Bridge, Khordak Bridge, Potsangbam, Merakhong and Nambol Bridge. The construction of checkdams is in operation and material has been already stacked at the identified sites.

Sustainable Fisheries Development

The objectives of sustainable fisheries development component of the project include enhancing fish yield and diversity by adopting sound improvised techniques that reduce impacts of different fishing methods and practices and by developing mechanisms for fish migration, stocking fish seed and regulating fishing in the Lake. To achieve these, specific studies are being undertaken to collect data on the fish utilization, fish resources, and impacts of fishing methods and practices. Based on the data, strategies to enhance fish yield, fish diversity and revenue for benefit of the fishermen and local communities will be developed and implemented.

PRA exercises were carried out in 7 villages. The needs and priorities of fishermen were identified and qualitative and quantitative estimation of fish species utilized was also carried out. Surveys were conducted in 10 markets in and around the lake to assess the economic gains/losses through fishing activities. Survey was conducted from September-December 1998 for identification of indigenous and exotic species.

The Lake was divided into 6 Zones viz. Takmu-Hubidak, Thamnu macha-Khullak pat, Laphupat-Khordak, Thanga-Karang Islands, Moirang-Birharipat and Ungamen pat for conducting the study on fish and fisheries. 31 species of fish were observed. A list of fishes collected during the 4 months study was analysed and compared with fish species reported earlier to assess the interval of appearance and disappearance of fish species.

A preliminary survey on migratory fish diversity in some tributaries of the Chindwin River System was undertaken. The results are under compilation. A list of different fishing methods practiced in the lake was collected visiting the households of 4 islands inside the Lake i.e. Karang, Sendra, Thanga and Ithing.

Community Participation

The community development component of the project focussed its activities on generating awareness about the project goals, objectives and its components. The main aspects dealt were assessment of community structure, socioeconomic status, resource utilisation pattern, community needs and their aspirations.

The participation of local communities in planning and management of Loktak Lake is crucial to the success of project on sustainable development of Loktak Lake. Ensuring participation of all stakeholders requires understanding of their needs and sharing of authority and responsibility for resource management according to arrangements, which are understood and agreed by all parties. The process is lengthy and requires long-term commitment from all concerned stakeholder groups. The ultimate objective of co-management is empowerment of impoverished majority, promoting equity in the access to and control of resources, greater involvement of women, sustainability and system orientation.

At present the data is being collected on socioeconomic aspects and involvement of local communities in the planning and implementation of various activities under the project. PRA exercises are being carried out to ensure participation of the local communities particularly weaker sections and women.

The output of the PRA exercises was the active participation of the people, generation of maps baseline information, increased awareness of the community, peoples' preferences and a vision for a better future.

Community based Demonstration Projects

Based on the PRA exercises demonstration projects will be implemented in the selected areas. Tentatively following demonstration projects are planned under the project:-

- Fish seed farms
- Improvised harvesting techniques
- Treatment of wastes and improving sanitary conditions
- Economic utility of ***phumdis***
- Utilization of wastes and aquatic weeds for energy generation through installation of community based biogas plants
- Alternative/additional income generation programmes to reduce pressures on the lake resources

Institutional development

The Government of Manipur has constituted Loktak Development Authority for the management of Loktak Lake. The various stakeholder groups concerned with Loktak Lake include agriculture farmers, jhum farmers, fishermen, local communities, NHPC and State Government departments. Research/ academic institutions and NGOs are greatly concerned about the management of the lake.

The authority has so far mainly focussed on the engineering measures and does not have adequate technically trained staff and necessary infrastructure for effective management of the lake. Capacity building hence is an important component of the project.

The objective under ICEF project is to build capacity within LDA primarily to undertake implementation of various activities relating to the conservation and management of Loktak Lake. This will be achieved by training the LDA staff on various aspects of lake including, catchment area treatment, water management, sustainable fisheries development, biodiversity conservation, socioeconomic aspects and wise use of wetland resources. To achieve these objectives efforts will be made to develop necessary infrastructure and equipment to carry out analysis of various components of the ecosystem and overall management of the lake resources. The overall emphasis will be human resources development to implement various activities relating to water management and sustainable development of Loktak Lake. LDA staff and other governmental agencies, NGOs, women's organisations will be given training to implement the project activities.

A lot of emphasis under the project is being given to facilitate village level institutions, self-help groups and NGOs for participatory management of the Loktak Lake.

Regulatory mechanisms

At present there is no policy framework for management of Loktak Lake resources. Several State Government departments have a stake in the lake but no regulatory mechanisms have been developed for sustainable utilization of these resources. Loktak Lake is a Ramsar site and there is an obligation for India as a Contracting Parties to maintain its ecological Character. Though Loktak Lake is an important resource, no regulations exist in the use of desired nets, method of harvesting etc.

It is proposed under the project to review the current laws, policies and enforcement issues for sustainable management of Loktak Lake.

Outcome

The five year project will result in control of soil erosion through watershed management in 11700 ha. aided regeneration in 1900 ha. of the catchment area; maintenance of hydrological regimes; increase in fish diversity and fish yield through sustainable management techniques; hydrological intervention for habitat improvement for Keibul Lamjao National Park; utilising ***phumdis*** as manure and biogas generation; formulation of overall water policy to meet the demands of various stakeholder groups.

Dr. C.L. Trisal, Director
Wetlands International-South Asia
New Delhi, India

HIGHLIGHTS OF PROJECT IMPLEMENTATION

Capacity Building

Trainers Training Workshop

A trainers training course was held from 1-8 August 1998 inviting the experts Mr. Ram Bhat and Ms. Renu Mukunda of the Asian Centre for Entrepreneurial Initiatives, Bangalore, to impart training to the SDWRML project staff and selected candidates from LDA on PRA methodology and its application in the field. About 20 participants from LDA and WISA participated in the training exercise.

PRA exercises at Thoubal Photo: C.L. Trisal

The basic features of the training module included classroom sessions and interaction among the participants to deliberate on mechanisms for participation of local communities in the project. This was followed by a visit to Thoubal village for imparting training to the trainers on procedures for practical application of the PRA. This training course marked the beginning of the successive PRA exercises.

Wetland Ecosystem Analysis and Management

The training on Wetland Ecosystem Analysis and Management was held at Imphal from 26 - 30 October1998. Overall 40 participants representing LDA, SDWRML project team, Manipur University, concerned State Government departments and NGOs attended the training course.

The objective of the training was to provide basic understanding of the structural and functional aspects of wetland ecosystem and conservation efforts made at the national and international levels for their conservation and management. The training also included a field visit to Loktak Lake where interrelation between various aspects stressed under the training was explained to the participants.

Training on wetland ecosystem Photo: Th. Manihar

Leading experts in the fields of ornithology, wildlife, ecology and conservation aspects were invited to impart training to the participants. In the concluding session of the training, the Chief Minister of Manipur presented the certificates to the participants. The opening ceremony was presided over by the Member of Human Rights Commission, Manipur State.

Modern Water Management Practices in Regulated Wetlands and Catchment Systems

A study tour to Canada was carried out from 9 to 22 November 1998 to understand modern water management practices. The project team consisted of engineers and scientists from LDA and selected agencies of the Manipur dealing with hydrology, flood control, water quality, ecology, data management, remote sensing and fisheries.

Several case studies were presented by leading experts from Canada on water management issues, particularly allocation of water for both human and ecological uses. The experiences regarding catchment area treatment and monitoring of hydrological regimes in Canadian wetlands was shared with the experts managing the wetlands. The study tour also enabled participants to understand the processes and negotiations which have been developed among various agencies in Canada for water allocation for different purposes like power generation, fisheries and wildlife.

Training in Canada Photo: Robson Ivan

The study team also attended North American Lakes Management Society (NALMS) symposium at Banff, Alberta. Presentation on Loktak Lake was also made in this symposium and the team got the opportunity to interact with leading limnologists and experts.

Hydrology and Water Quality Monitoring

Training at CWRDM Photo: E.J. James

The training course on Hydrology and Water Quality Monitoring was held from 25 January to 3 February 1999 at Centre for Water Resources Development and Management, Kozhikode. The objective of the training course was to impart

training to SDWRML Project Team, LDA staff and other concerned agencies on methodology, data collection and compilation relating to hydrology and water quality. Overall 10 Participants including members of the project team and the LDA staff were trained.

Participatory Soil and Water Conservation Techniques for Erosion Control and Runoff Management Training

Participatory Soil and Water Conservation Techniques for Erosion Control and Runoff Management training course was organised at Central Soil and Water Conservation Research Training Institute, Dehra Dun from 5 - 10 July 1999. The training course was attended by 15 staff of SDWRML project.

The training workshop deliberated on developing soil and water conservation measures to reduce flows; screening of plant species for afforestation having potential to control soil erosion and retain soil moisture efficiently while ensuring benefits to local communities in providing fuel, fodder and other products; application of water harvesting techniques at different slopes to conserve water and arrest soil erosion; techniques for watershed development and flood mitigation measures; and community participation in the soil and water conservation measures.

Training of Fisher Community

Two training courses for the fisher folk were organized in June and August 1999 at Central Inland Capture Fisheries Research Institute (CICFRI), Barrackpore and Central Institute for Freshwater Aquaculture (CIFA), Bhubaneswar, Orissa . Overall 60 participants attended these training courses which included women and representatives of fisher community from Island villages, phum dwellers and lake shore villages. Of these, 20 participants were trained on culture fisheries management at CIFA and 40 on capture fisheries management at CICFRI.

The training courses broadly covered practical training for enhancing fish yield through culture and capture fisheries management techniques. They were also sensitized to the modern methods of sustainable fisheries development. The training course helped the fisher folk to understand the various techniques available for enhancing fish yield and overall management of the lake ecosystem.

Database Management

The training course on Oracle 8.0 and Developer 2000 was held from 12-28 August 1999 at New Delhi. SDWRML staff and representatives from ICEF, ICCO and MoEF participated in the training course. Overall 15 participants attended the training course. The participants were introduced to the powerful Oracle environment for development of applications related to integrated wetland management.

The training course included two days project work on a model designed by WISA taking the case study of a watershed project in Nepal, as an example. The participants were also trained in developing forms and reports using the generated inputs. The training course helped to understand the basic concepts and applications for database management.

Consultations

Preparation of stakeholders endorsed water management plan

Hydrology and water quality assessment

- Dr. E. J. James, hydrologist from CWRDM, visited the project site from 1-10 April 1998 and proposed a detailed plan for estimations of water balance based on hydrometric analysis at selected stations in the lake. The report also included a grid of stations to be established at strategic points in and around the lake for water quality assessment. The purchase and installation of hydrological equipment at selected stations was carried out under the guidance of Dr. James.
- A leading Canadian hydrologist, Mr. Duncan Hay visited Loktak Lake area from 12-30 April 1998 to advise on water management of Loktak Lake. He proposed preparation of a rational stakeholders endorsed water management plan taking into consideration water availability in qualitative and quantitative terms and water use and allocation for human and ecological uses. He also advised undertaking specific studies to understand the role of ***phumdis*** in water management and to develop hydrological models for interventions.

PHOTO: C.L. TRISAL

Canadian expert with project team

Participatory approaches for catchment area treatment

- Mr. Malcolm Cairns from International Centre for Research in Agroforestry, Indonesia, visited Loktak Lake catchment area from 24 May to 10 June 1998. The report submitted by Malcolm Cairns gives analysis of shifting cultivation taking into consideration the implementation of the Nagaland project and the Southeast Asian experiences. He proposed developing processes involved local communities in improvising shifting cultivation while conserving biodiversity.
- Dr. J.S. Samra, Director, Central Soil and Water Conservation Research and Training Institute, Dehra Dun, visited Loktak Lake from 5 – 8 August 1999. He proposed creation of self help groups, plantation of fruit trees as per the choice of the villagers, treatment of land slips/ landslides, drainage line treatment and mechanisms for cost sharing with the local communities regarding afforestation activities.

Sustainable fisheries development

- Dr. Y. S. Yadav, Fisheries Commissioner, Ministry of Agriculture, Government of India visited Loktak Lake and discussed issues of fisheries management with State Fisheries department. He was instrumental in organising a training course for fisher folk through the existing scheme of the Central Government.

Project Review Meeting

Scientific and Technical Advisory Group (STAG) Meeting

The first meeting of STAG was held on 27 April 1999 at Imphal under the Chairmanship of Dr. S. Maudgal, Senior Advisor, Ministry of Environment and Forests, Government of India. The Committee reviewed the progress of the project and provided guidance on several aspects for effective implementation of the project. The following recommendations were made:-

- Effective linkages to be developed with various organisations having common objectives for catchment area treatment
- Two to three micro watersheds should be selected to demonstrate the control of flow regime, nutrients and sediments loss by application of suitable small watershed treatment models
- Training modules developed by various organisations should be examined and suitably modified, if so required while selecting institutions for training
- Additional training programmes should be undertaken on hydrological models and implication of water quality on basic health
- LDA should put in place a mechanism for quality assurance to ensure the reliability of database
- Detailed proposal should be prepared to implement specific studies
- Population stabilization, health aspects, assessment of land capability survey and estimation of runoff and sediment load by using available mathematical models were proposed

Project Management Committee (PMC) Meeting

The first PMC meeting was held at Imphal, Manipur on 28 April 1999 at Imphal under the Chairmanship of Commissioner (IFC), Government of Manipur. The Chairman while expressing satisfaction over the performance of the project implementation during the first year wanted that a target be achieved as per time schedule. The following decisions were taken in the meeting:-

- A newsletter be published, both in local and English languages, to generate awareness about the progress of the project.
- A research team should be formed involving concerned experts and agencies after consultations by LDA-WISA to initiate activities under specific studies.
- The financial management system, as per the ICEF guideline, should be followed for reporting on the expenditure incurred regarding financial contribution provided by ICEF and LDA
- Representative of NHPC and Dr. E.J. James be included as members of PMC.

NEWS

Ms. Evelyn Lee, Counsellor, Canadian High Commission and Mr. Alan Ferguson, Former Director, India-Canada Environment Facility visited Loktak Lake from 5-8 August 1999 to review the progress of the project on Sustainable Development and Water Resources Management of Loktak Lake.

Dr. Arthur H. Mitchell, Executive Director, Wetlands International - Asia Pacific visited Loktak Lake from 5-8 august 1999 and discussed with the project team and Director, Loktak Development Authority about the progress of the project. He also participated in the review meeting taken by Canadian team.

Arthur H. Mitchell

The High Commissioner, His Excellency, Mr. Peter F. Walker, Canadian High Commission in India will be visiting Loktak Lake on 13-14 October 1999 to review the progress of the ICEF project on Loktak Lake.

Diary DATES

1999

October 13-17

BirdLife International World Conference
Kuala Lumpur, Malaysia
URL: http://www.kt.rim.orjp/~birdinfo/conference/

October 24

International Workshop on the Anatidae Site Network in the East Asian Flyway
Hamatonbetsu, Hokkaido, Japan
Contact: Yoshihiko Miyabayashi, Anatidae Flyway Officer, Wetlands International; E-mail: yym@mub.biglobe.net.jp
URL(Anatidae Site Network): http://www.jawgp.org/anet

October 25-30

International Conference on Tropical Aquatic Ecosystems

Nainital, India
Organised by the National Institute of Ecology jointly with National Research Center for Coldwater Fisheries (ICAR), Wetlands International - South Asia, New Delhi in association with Centre for Development Studies. Contact: Dr. Brij Gopal, Co-Chair, Steering Committee, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi 110 067, India
Fax: +91-11-616 5886, 617 2438
E-mail: nie99@hotmail.com, brij@jnuniv.ernet.in
URL: http://www.members.tripod.com/nieindia/

November 8-12

Waterbird Society 1999 Meeting
Grado, Italy
Contact: Dr. Rob Butler, Canadian Wildlife Service, Pacific Wildlife
Research Centre, 5421 Robertson Road, RR #1 Delta, BC V4K 3N2, Canada
Tel: +1 604 940 4672
E-mail: rob.butler@ec.gc.ca

November 10-16

Convention on Migratory Species, 6th Meeting of the Conference of the Parties
Cape Town, South Africa
Contact: CMS Secretariat, UN Premises in Bonn, Martin-Luther-King Str.8, Bonn, D-53175, Germany
Tel: +49 228 815 24 01/02; Fax: +49 228 815 24 49
E-mail: cms@unep.de
URL: www.wcmc.org.uk/cms

November 11-19

FishRights99 - The International Conference on the Use of Property Rights in Fisheries Management
Freemantle, Western Australia
Contact: FishRights99 Conference Secretariat Office, Petrie International, PO Box 568 Kalamunda, Western Australia 6076, Australia
Fax: +61 08 9257 2099
E-mail: petrconf@iinet.net.au
URL: http://www.fishrights99.conf.au

November 16-17

Wetlands and Remediation: An International Conference
Salt Lake City, Utah, USA
Contact: Karl W. Nehring, Environmental Restoration Department, Battelle Memorial Institute
E-mail: nehringk@battelle.org

November 21

The 4th Meeting of the MWCC
Nanchang, Jiangsu Province, People's Republic of China.
Contact: Strategy Coordination Officer - Dr Taej Mundkur
Fax: + 603-7046672
E-mail: taej@wiap.nasionet.net or

Other Projects of
Wetlands International-South Asia

Economic Valuation of Harike Wetland

The project objective is to develop a resource management plan for Harike wetland based on economic valuation analysis. The specific activities are: develop a cost-benefit analysis for assessing values of Harike Wetland resources as reflected in the market; evaluate functions and values which do not have market prices using contingent valuation; surrogate pricing or benefits transfer methodologies; assess the overall economic efficiency of various uses of the wetland's resources; evolve an ecologically and economically efficient resource utilisation pattern; allocate the wetland's resources for sustainable development; and, to assist the Punjab State Government in developing a Resource Management Policy on Harike wetland.

Harike Wetland — Photo: Ritesh Kumar

Gujarat Wetlands

The objective of the component on wetlands under the State Environment Action Plan (SEAP) is to develop an action plan based on survey, identification of problems, strategy formulation and their feasibility of implementation. The action plan will be developed over three phases. At the end of two years, bankable development projects will be implemented by GEC in collaboration with the concerned agencies.

Flamingoes in pans, Gujarat — Photo: Ritesh Kumar

Ecotourism Development in Chilika Lake

The objective of the project is to develop guidelines on ecotourism development of Chilika Lake based on assessment of tourism potential, sites of interest for ecotourism, carrying capacity of the system, biodiversity, community participation and current policies and regulations of the Government of Orissa. The project also includes organising training courses for the stakeholders for planning and development of ecotourism.

Photo: Kamal Dalakoti

Hydrobiological Monitoring Action Plan for Chilika Lake

The objective of the project is to identify key parameters for hydrology, water quality and biodiversity and establish stations to monitor changes in hydrobiological aspects on a longterm basis. The ultimate objective is to develop hydrological and water quality models for interventions to improve water management with emphasis on restoration of salinity regimes.

February 2, 2000

World Wetlands Day

An annual celebration of the world's wetlands.
Contact : Wetlands International - South Asia
Contact the nearest Wetlands International Office or Ramsar Bureau for a leaflet of suggestions for celebrating the event:
Fax : +41 22 999 01 69; E-mail : ramsar@hq.iucn.org, or check the Ramsar website: http://iucn.org/themes/ramsar