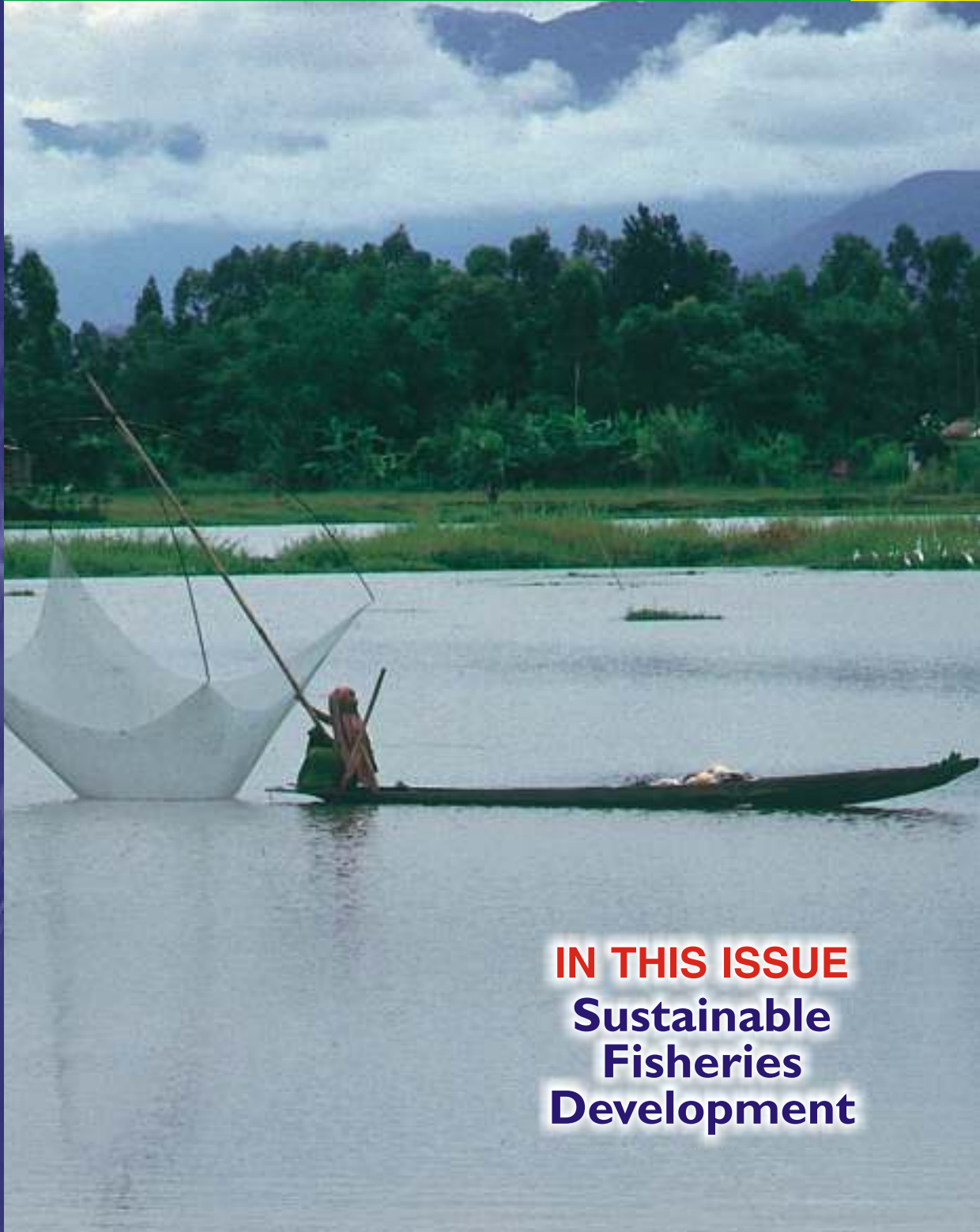




MARCH 2003 - VOL. 3

NEWSLETTER

Loktak



IN THIS ISSUE
Sustainable
Fisheries
Development



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

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

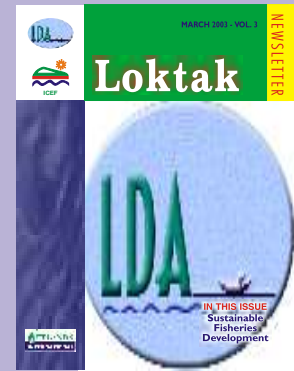
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Fishing in Loktak Lake, Manipur.
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SUSTAINABLE FISHERIES DEVELOPMENT OF LOKTAK LAKE

Fisheries is an important economic resource of Manipur contributing to approximately 3% of the state's gross domestic product. Fish is the main food of a majority of Manipuri population, particularly of the Meities and occupies a special place in traditions and livelihoods of people. Loktak Lake, the largest freshwater wetland of northeast, is an important fisheries resource of the state. About 60% of the state's fish demand is met by the Loktak lake and its associated wetlands within Manipur river basin. The lake serves as a breeding ground for a large number of riverine fishes.

High rates of population growth in the valley accompanied by insignificant growth in the secondary and tertiary sectors have led to severe stresses on the natural resource base of the state including fisheries. Over a period of time the availability of fishes and other products such as vegetables, fuel and fodder from the lake has declined causing immense hardships to the communities dependant on these resources for sustenance. There has been a significant decline in fish landing from the lake along with an increase in fishermen population, impacting the socio economic status of the fishermen communities. Changes in fishing practices, use of exploitative fishing techniques and inadequate marketing infrastructure have seriously impacted the economic gains from fishing.

Government of Manipur has initiated several programmes mainly focused on culture fisheries ignoring the potential of Loktak lake in contributing sustained yield through capture fisheries. The ownership of the lake is not clearly defined. Open access to the fisheries resources has led to indiscriminate fishing without consideration to regenerative capacity of the fish stock. The water quality of the lake has over a period of time deteriorated due to prolific growth of *phumdi* cover leaving little open water area essential for fish growth. A number of streams which aid natural restocking of the lake are under heavy pressure due to indiscriminate harvesting of fish stock. All these problems have not been



Fisher Woman proudly displays her catch

addressed in an integrated manner. The ultimate impact of all this has been on the poor fishermen who entirely depend on the lake for their livelihoods.

The implementation of Sustainable Development and Water Resources Management of Loktak Lake (SDWRML) project over last several years has helped to develop baseline information for developing strategies for sustainable management of lake fisheries. Several interventions have been made for enhancement of fish yield and diversity and livelihood improvement of fishing community through participatory processes. The activities have been implemented through participation of local communities in resource appraisal and planning. A brief description of the approach adopted and the major issues of concern related to fisheries development in Loktak Lake are discussed in this paper.

Fishing Communities and resource linkages

Broadly three groups of fishing communities viz., the phum dwellers, island communities and the lakeshore communities inhabit the lake and depend upon its resources for sustenance. Out

of a total population of 50,400 fishermen 8300 are from island villages, 40,500 from lakeshore villages and 1600 from *phum* villages. While the *phum* dwellers are entirely engaged in fishing which is their sole source of income, the inhabitants in other areas are dependent upon fisheries to varying degrees. The population in these areas in general comprises of 20% active fishermen, the rest being engaged in the allied activities.

The fishing community depends on lake and its resources for various products besides fisheries including food, fuel, fodder, thatching material, medicinal plants, raw materials for handicrafts etc. They have been severely affected by changes in lake ecosystem especially rapid proliferation of *phumdis*, as it has led to decline in fish catch, diseases and high mortality in fishes, problems in movement inside the lake, and damages to fishing gears. The situation has further aggravated by presence of aquatic weeds.

Fishing community, especially those living in the *phum* huts and the islands lack access to basic social infrastructure as drinking water supply, sanitation, health and primary education. Ownership of *Athaphum* is a primary factor determining the incomes of the fishermen, and the *phum* fishermen, a majority of which use traditional crafts and gears have the lowest incomes amongst the three groups. While men and women both do fishing, only women are involved in fish processing and marketing. In the absence of proper credit facilities, traditional fishermen, especially the *phum* hut dwellers have to resort to local moneylenders. High interest rate forces these fishermen into a debt trap and a major portion of their incomes is used in debt repayment.

Significant changes in socio economic status of fishermen have taken place in recent years. Decline in availability of food, fuel, fodder and other resources have led to immense hardships within these communities. As the number of *Athaphums* have increased, conflicts over fishing grounds have become more common. Though there has been a rapid increase in active fishermen population in the

the average annual income per household has declined.

Fish Resources and Utilization

Loktak Lake is a mixture of capture and culture fishery. Fish population of the lake is dominated by exotic major carps (42%), followed by Indian major carps (25 %). Maximum Sustainable Yield for Loktak using Logisitic Model (catch / day) has been estimated to be 1102 MT / annum. The present production is estimated to be 1237.56 MT/annum. Annual fish landing in Loktak lake has been found to vary between 1358 - 1685 MT/ annum during 1999 -01. It has declined at an annual rate of 2.72% during 1991 - 2001 (1790 MT in 1991 to 1358 MT in 2001).

A total of 53 species of fish representing 17 families have been recorded from Loktak Lake of which 27 species are common and 20 are rare. Six species have been found to be vulnerable. *Clarius gueripinnus* is a new record from Loktak Lake. Loktak Lake serves as a breeding ground of common carp and murrels, and KLNP & 5 other scattered areas along with Toubul - Mayang Imphal road are preferred by these species for breeding.

Loktak Lake previously served as breeding and spawning grounds of *Osteobrama belangiri* and some other migratory fishes. Fishes from Chindwin - Irrawady system constituted around 40% of capture fisheries of the lake. However, the population of riverine fishes in Loktak Lake has drastically reduced and twelve species recorded earlier, were not observed in the present study. This may be primarily attributed to construction of Ithai barrage, which has led to blockages of their migratory pathways and subsequent disappearance. The downstream survey carried out confirms the absence of fish migration through Manipur River. Moreover, natural recruitment of Indian major carps has also stopped due to absence of flow in lake water.

Fishermen of Loktak primarily use two types of fishing crafts made from trees as *Artocarpus chaplasi*, *Cedrella tuna* and *Phoebe* spp are used in Loktak Lake viz, dug out canoes made from a

single log and plank built canoes made from joint planks. These canoes lack stability during rough weather conditions. Very little modernization has taken place in traditional fishing crafts. There are about 4080 crafts used for fishing and navigational purposes in the lake. Several types of fishing gears are also used in the lake including gill nets (mesh sizes ranging from 15 - 140 mm), multi pronged spear , dip nets , lift nets, cast nets , scoop nets, hooks and gorges, traps, drive in nets etc. Among the fishing gears, gill nets are most efficient.

There are several traditional forms of net, trap, hook / line fishing practised in Loktak lake. With the construction of Ithai barrage and inundation of large area of agricultural lands, there was a rapid increase in number of fishermen as well as changes in fishing techniques. One of the most significant changes was rampant increase in number of *athaphums*. *Athaphum* fishing involves two broad set of activities, *Phum Thaba*, the construction of circular *phumdi* enclosures and *Phum Namba*, the harvesting phase. As the incomes from *Athaphum* operation are significantly higher than any other forms of traditional fishing, there has been a rampant increase in their number in the lake. Production of *Athaphums* alone at presents accounts for more than 30% of the total production from lake and the number of *Athaphums* has increased 14 times during the period 1990 - 99 (217 in 1990 to 3019 in 1999). *Athaphums* are one of the primary reasons of rapid proliferation of *phumdis* in the lake.

Ima Market, Oinam



period 1990 - 99 (217 in 1990 to 3019 in 1999). *Athaphums* are one of the primary reasons of rapid proliferation of *phumdis* in the lake.

There are 11 fish markets in and around Loktak Lake, of which 6 are on the western side, 3 on the eastern side, 1 in southern side and 1 in island villages. Moirang is the largest market, accounting for 29.6 % of the total fish catch, followed by Bishenpur (14.06%), Thanga (13.9 %) and Mayang Imphal (9.6 %). These four markets account for around 70% of total fish catch. Of the 11 markets around Loktak, none have storage facilities and there is only one boat landing jetty..

Threats to lake fisheries

Consultation meetings were held in 11 villages in and around Loktak Lake for identification of problems of lake fisheries. The major threats as identified by the communities are:

- Proliferation of *phumdis* and other aquatic vegetation leading to deterioration in water quality and overall decline in fish population
- Increasing number of *Athaphums* contributing significantly to *phumdi* proliferation and conflicts amongst fishermen
- Increasing number of fishermen leading to pressures on lake resources particularly decline in fish catch and incomes
- Declining population of riverine fishes like *Pengba*, *Khabak*, and *Shareng* due to obstruction in migratory pathways by Ithai barrage
- Use of imported crafts and gears with small mesh sizes contributing to decline in fish stock
- Catching of fish brooders especially in spawning season leading to decline in fish population
- Increased pollution from rivers and agricultural runoff leading to diseases and high mortality in fish population

Realizing the problem of Loktak Lake fisheries, sustainable fisheries development component of the SDWRML project was developed with a primary objective of improving livelihoods of fisher community of Loktak Lake while maintaining ecological processes and functions of the lake ecosystem and enhancing fish resources.

Community based Fisheries Management

A community based approach has been adopted for sustainable fisheries development with emphasis on empowerment of impoverished community, promoting equity in access to and control of resources, sustainability and system orientation through identification of needs and priorities of local communities and sharing of authority and responsibility of resource management according to institutional arrangements understood and agreed to by all parties. The various steps undertaken for implementation of community based fisheries in Loktak Lake are briefly highlighted below.

Participatory Planning

Identification of community needs and aspirations for sustainable fisheries development have been carried out through participatory rural appraisal exercises and structured questionnaire surveys. Based on this assessment, detailed village level microplanning has been done with the communities and interventions implemented through community groups. Needs and aspirations of communities as identified participatory rural appraisal exercises conducted in 14 lakeshore villages, 11 island villages and *phum* dwellers and structured questionnaire surveys in 32

lakeshore villages, 13 island villages and census in *phum* dweller villages are as follows:

- Control of *phumdis* proliferation which had led to decline in fish catch, diseases and heavy mortality in fishes, and problems in movement inside the lake. The situation has further aggravated by presence of *Salvinia* and *para grass*
- Control use of *Athaphums* in consultation with local communities and development of alternate income generation programmes for the *Athaphum* owners
- Enhancement of fish population in the lake through adequate restocking facilities
- Revival of endangered and rare species especially *Pengba*
- Provision of improvised crafts and gears to the communities at subsidized rates
- Provision of ice plants for fish preservation
- Development of alternate income generation schemes for marginal fishermen
- Improvement in sanitation facilities
- Implementation of fisheries regulation and demarcation of lake

Prioritization of problems as identified by the

communities was undertaken. The problems broadly relate to depletion in fish resources and productivity leading to direct impacts on livelihood security of the fisher community. The other problems related to impoverishment of fisher community were linked with lack of appropriate regulatory regimes and institutional structure. The various interventions required to address these problems are briefly outlined below:

Fisheries resources development

Enhancement of fish yield and diversity

Capture fisheries in case of Loktak Lake have received little attention. Enhancing fish diversity and yield in absence of ownership of the territorial rights, ownership and regulatory regimes, enhancement of fish yield and diversity is extremely difficult. The strategy adapted for enhancing fish diversity and yield focused on:

- Production of fish seed yield for economically important and threatened species through construction of new hatcheries and strengthening of privately owned hatcheries
- Establishing community groups to coordinate activities for developing and implementing of MoUs
- Releasing 50% of fish seedlings into the lake and utilize the remaining for their own use

Based on the above criteria community owned hatcheries have been set up in 9 villages around the lake including two large Chinese circular hatcheries at Toubul and Mayang Imphal with a production capacity of 20 lakh spawn per operation and 7 mini hatcheries production capacities of 2 lakh spawn per operation. The hatcheries are being run and maintained by the communities after adequate training and technical support.

Improving harvesting techniques and infrastructural development

The use of appropriate craft and gears is an important aspect of increasing the fish yield derived from Loktak. Presently, most crafts and gears used in the lake are traditional and the yield from the lake is proportionately low. An

Athaphum Fishing in the Lake



anticipated increase in fish production may not be utilized to its optimal level with the current level of efficiency. Coupled with this is the lack of adequate infrastructure to develop and maintain better and efficient crafts and gear. The measures proposed for improvement of harvesting techniques under NEC project are:

- Identification of better boat building materials including the timber used, and treatment to be adopted
- Construction of a boat building yard
- Fabrication and design of fishing gear based on survey of gears and using natural and synthetic fibres
- Selection and popularization of suitable fishing gears of appropriate mesh sizes to be determined by the communities based on ecological parameters
- Landing and docking centers for fish vessels and for treatment, preservation, maintenance and storage of nets

Livelihood improvement of fisher community

Integrated fish farming and income generation programmes

A large number of fish farmers along the periphery of Loktak practice fish farming and agriculture. Integrating the two systems can significantly increase the yield and incomes from the crop. Integration of other farming systems including piggery, poultry and duckery can be high revenue options with the wastes from the latter forming the basic nutrients in the fish farm.

Under the project, fish cum duck farming has been undertaken in 16 villages and paddy cum pisciculture in 3 villages. All these projects operate under a MoU under which the beneficiary, after one year of operation shall provide equal number of ducklings and fish fingerlings to another beneficiary jointly identified by the project and the community groups.

Fish cum piggery projects have been implemented in 9 hill villages. Under this programme, piglets and fish fingerlings have been provided to the local communities under an MoU by which the beneficiary group, after an year, shall provide equal number of fish fingerlings and piglets to another group jointly identified by the group and the project. Training to the communities on integrated farm management has also been provided

An economic assessment of benefits derived from implementation of alternate income generation schemes revealed that while fishery cum piggery project yielded an additional income of Rs. 32,000 per group, fishery cum paddy project an additional income of Rs. 25,000 per beneficiary and fishery cum duckery project an additional income of Rs. 22,000 per beneficiary.

Eco friendly pen culture in Loktak is also being taken up in collaboration with the state Fisheries Department at two sites near Thanga island and two sites in Hubidak portion of the lake. Rectangular pen ranging 50 ft X 20 ft - 100 ft X 40 ft shall be introduced in the first trial operation using synthetic nylon nets. Combination of grass carp and common carp will be introduced in the pen.

Post Harvesting and Value Addition

Fish being a highly perishable commodity requires good handling and infrastructural facilities for longer storage. The increased yield of fish requires storage facilities with adequate capacities. To maintain the freshness of fish it is the important that the process of freezing is initiated as soon as the fish are caught. The transport of fish to other areas is equally important. Other methods of preservation are also necessary for surplus fish catch. Demonstration of dryers for fish and vegetables is being taken up in the extended phase of the project. Loktak Development Authority has proposed several activities for financial support under extended phase of ICEF project and North East Council. The activities proposed are:

- Provide ice boxes for carrying fish and short term storing
- Ice plant for ice supply
- Provide instant quick freezing and adequate storage facilities
- Use of carrier vessels for disposal of fish catch by fishermen while still fishing

Smoked Fishes of Loktak





- Facilities for transport of fish with insulated vans
- Fish drying and salting yards

Improvement of marketing channels and infrastructure

Lack of adequate marketing channels for fishermen has always assisted middlemen and intermediaries to exploit the fishermen. The fishermen seldom get a fair share of their sells, viz the price sold at market places. It is essential to improve the marketing channels for the benefit of fishermen community. The following activities are being taken up in the extended phase of SDWRML project:

- Assessment of the type of intermediaries involved in the marketing network
- Assessment of revenue systems in force, royalty by cooperatives, royalty and auction, tender, lease and other types of fishing
- Development and strengthening of community owned fishermen cooperatives for better value realization to fishermen
- Establishment of basic and hygienic fish markets through community efforts

Institutional development and capacity building:

Regulatory Regimes

Fisheries Department, Government of Manipur, has notified Manipur Fisheries Rules, 1998, which stipulate rules for lease of government fisheries, licensing system, outright leasing system, sale of government fisheries by auction and general rules for fisheries. The general rules for fisheries prohibit introduction of new species without permission of government, check quality of fish at any place, and transportation of fish. The rules also indicate that use of fishing gears with mesh sizes smaller than the prescribed limit would be penalized as appropriate under rules. These rules are applicable to all waterbodies notified by the fisheries department.

Takmu and some other specific areas under Loktak Lake have been notified by the Fisheries Department while the ownership of the lake is not clearly defined and hence rights to fishing and accessibility is open. This seems to be one of the possible causes of over fishing and indiscriminate catch of all sizes without allowing replenishment of the stock. The extension of the rules already framed to entire Loktak Lake seems to be of little use for establishing regulatory regimes for maintaining fish diversity and optimum yield due to lack of trust of communities in the government and enforcement of the rules. Besides it would be expensive to strictly enforce the regulations taking into consideration of the economic situation of the state and cooperation extended by the communities to the government.

Community based regulations would be extremely important to ensure sustainable fisheries development taking into consideration the following:

- Gears and mesh size regulation in different fishing / breeding / spawning grounds
- Encouraging use of boats made locally
- Stock availability
- Maintenance of closed season
- Utilization of trash fish
- Use of biodegradable material for fishing

Empowerment of fisher communities

Community based management essentially involves empowerment of communities with adequate technical and financial resources at their command to enable them to develop and implement action plans which are ecologically and economically viable and socially acceptable. Based on extensive socio economic surveys and PRAs in representative villages, self-help groups were identified within fishermen communities. These SHGs have been extensively involved in planning and implementation of activities relating to enhancement of fisheries resources, strengthening of traditional farming methods, and micro credit development.

A scheme of strengthening traditional fish farms was implemented in two lakeshore villages on the eastern side, Komlakhong and Laphupat Tera. Fish fingerlings were provided to fishermen groups with redundant fish farms, as per a MoU under which the group released 50% of the fingerlings produced in the lake. The revenue generation through the activity formed the seed money for micro credit operations within the fishermen group

Community based hatcheries have been set up at eight locations to produce fish seedlings 50% of which could be shared within the community and the rest released into the lake. MoU has been developed to ensure equitable sharing of benefits and pooling for resources. Similarly, MoUs framed by the community for integrated farming projects under implementation in 9 villages specify pooling of resources and equitable sharing of benefits.

Capacity building

Capacity building of fisher community through training and imparting of skills for scientific fisheries is an important component of the project. 8 Training workshops have been conducted for fish farmers with the primary objective of imparting modern techniques of pisciculture for enhancement of fish yield, on the following issues:

- Lake fisheries development
- Hatchery management and seed production
- Induced breeding technique and circular hatchery management
- Integrated Fish cum duck farming
- Aquaculture techniques
- Integrated fish cum pig farming

More than 500 fishermen have participated in these training workshops
Awareness generation

Several awareness generation programmes have been undertaken for Loktak fishermen to facilitate development of a common vision regarding lake fisheries and increase their participation in conservation and development of Lake and its resources. Two workshops for fishermen on " Improvement of Loktak

ecosystem" and " Role of women in conservation and development of Loktak Lake " were held in which 140 fisher folk including 47 women participated. Various issues pertaining to Loktak ecosystem and livelihoods of fishing community were discussed in the workshop, and three village level committees were formed for implementation of resolutions which included reduction in pollution, control of Athaphums, control use of polybags in lake, and assist formulation of community endorsed fisheries regulations.

Loktak Day and World Wetland Day are also celebrated in collaboration with local NGOs, CBOs, Ngami Lups and several activities organized to emphasize on close relationship of communities with the lake and the need for co-existence.

Fishermen of Loktak Lake actively participated in the workshop on Management of Phumdis in Loktak Lake , held in Imphal during 22 - 24 January 2002. Several initiatives have been taken up as a follow up of the workshop. As a result of consultative meetings, athphums have been cut in Manungpat by Ngami Lup Moirangthem as an initiative to control spread of Athaphums in lake.

Evaluation and monitoring

A result based management involving critical analysis of activities in relation to objectives and goals has been adopted using performance indicators to monitor the changes. The

ultimate objective is to monitor the benefits accrued to fisher community while maintaining the health of the ecosystem. The community based evaluation and monitoring is being gradually developed in case of Loktak Lake to ensure conservation and sustainable use of fish resources which forms the base of economy of the people living in and around the lake and overall contributing to the state economy.

Key issues for deliberation in the workshop

Sustainable fisheries development of Loktak Lake is essentially related to providing sustained benefits to the fisher community by ensuring regenerative capacity of fish stock and maximizing benefits through appropriate storage, marketing and value additions. It involves integration of all the factors responsible for production, consumption and economic development related to fisheries management of the lake ecosystem. All the actors involved in the process should be organized and coordinated by the communities without external controls to ensure equitable sharing of benefits across the value chain. The key issues related to sustainable development of fisheries that may be addressed are:

- Determining sustainable fish yield and enhancing diversity
- Enhancing fish migration and protection of fish breeding and spawning grounds

- Control of adverse fishing practices
- Post harvesting and marketing mechanisms for maximising benefits to fisher communities
- Improving livelihoods of fisher community
- Income generation programmes and value addition
- Lake ownership and territorial rights
- Awareness generation and capacity building
- Policy and community based fisheries regulation

The participants of the workshop representing the fisher community from various regions of lake, as well as the experts invited from within the state and outside may deliberate on the various issues including above helping in development of a comprehensive action plan for sustainable fisheries development.

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Woman Fishing in Loktak



COMMUNITY BASED FISHERIES MANAGEMENT AND ITS APPLICATION IN LOKTAK LAKE

In his article "The Tragedy of the Commons" written thirty-four years ago, Garrett Hardin argued that the eventual fate of all resources held "in common" is over-exploitation because access is unrestricted and there is lack of incentive among individuals towards resource protection [1]. However, critics now assert that Hardin's thesis does not properly distinguish the type of property regime susceptible to such a process, arguing that it applies not to "common property", but to "open-access" regimes [2]. Common property is now generally defined as a system where "the resource is held by an identifiable community of users who can exclude others and regulate use" as opposed to "open access" which is characterized by an "absence of well-defined property rights" and can lead to people "free riding" and over-exploiting a resource [3].



Fishing Gears

A simple example of an open-access system could be a natural lake or coastal fishery, where fishermen continue fishing as long as the returns from fishing can cover the cost. Overall the society loses what it should gain from such resource use. The management of the resource becomes all the more difficult as external factors adversely affect the fisheries and in turn the community, which derives its sustenance from the resource. The open access regimes are usually disastrous for the poor, who heavily rely upon the commons for their livelihood.

What is CBFM and how it works?

Community-based fisheries management (CBFM) is essentially empowering the community to manage their resources on sustainable basis and conserve the natural wealth for posterity. The limitations/inefficiencies in fisheries management in developing countries (especially in their coastal waters) have led to the development of CBFM. In India and in some of the neighbouring Southeastern Asian countries the pioneering efforts of the FAO executed Bay of Bengal Programme for Coastal Fisheries Management (BOBP) in implementing CBFM on pilot-basis have been very successful. The success of

BOBP activities in Phang Nga Bay in Thailand is widely recognised and considered as a role model on CBFM.

Conventional fisheries management involves regulations, which aim at renewing resource abundance (closed season, closed area, gear restriction) and control on fishing effort (limited access, fishing quotas, taxation, etc). Monitoring and enforcement costs are high and it is difficult for governments, especially in the developing countries to afford such costs. Governments, who manage the resources often, have difficulty in understanding the complexity of fisheries and of communities that fish them. Fishers also do not like to be enforced unless they understand the rules and regulations. Enforcement is otherwise also expensive. In such circumstances the CBFM appears to be more practical and cost-effective. CBFM in the long run may help in improving efficiency, equity and cost-effectiveness of fisheries management.

Fisherfolk are slowly coming around to accept that management is not an imposition by the government but an individual and collective responsibility of all stakeholders, producers and consumers alike. Awareness building has brought about this change in attitude: management is an integral part of sustainable exploitation and not an unnecessary imposed burden. (Emerging Trends and Prospects in Fisheries Management - Bay of Bengal Programme, FAO of the United Nations, March 1998)

The basic principles of CBFM are participation of fishermen in (a) planning and decision-making; and (b) implementation, control, surveillance and evaluation of management activities. It has been generally observed that when fishermen themselves help design management, a high rate of compliance can be expected. There will be no need for external enforcement of regulations; consequently, the enforcement will be both effective and cost-effective. Further, it is now widely recognised that in a close-knit fishing community, social sanctions are far more effective than legal sanctions.

Loktak lake and the need for CBFM?

Fisheries management has so far relied on "hindsight". Foresight has been generally lacking. Unlike large-scale fisheries, small-scale fisheries at the national level are difficult to manage, mainly for the following reasons:

- Limiting the effort of small-scale fishermen means lower incomes and fewer job opportunities for them.
- Doing away with the practice of open access to fishery resources, and imposing management curbs, often leads to serious economic and social problems for fishing communities. But if

the open-access condition remains untouched, resources get depleted, economic returns fall, and community stability is endangered. access to fishery resources, and imposing management curbs, often leads to serious economic and social problems for fishing communities. But if the open-access condition remains untouched, resources get depleted, economic returns fall, and community stability is endangered.



Community Fishing with bagnets

Loktak has been traditionally managed by the local communities, which mainly include fishermen. However, these fishers have little access to land or to other livelihood options making them dependent of fishing. The main problems of fisheries in Loktak are the overexploitation of fish stocks resulting in reduced fisherfolk catches and incomes; degradation of the fisheries habitats caused by siltation; water abstraction for power generation; waste discharge; eutrophication; and difficulties in implementing enforcement measures.

One of the major challenges of sustaining fisheries of Loktak lake is through optimum exploitation of the resources and judicious integration of ecological and economic aspects. To achieve this, better management awareness is urgently needed on the part of all stakeholders for sustainable management of the lake. Also needed is a systematic implementation of management measures with the full cooperation of the community. In other words, a pro-people, pro-environment fisheries management programme to consume and replenish the fisheries resource and enhance the quality of life of the fisher community.

The CBFM programme in Loktak is expected to increase conservation awareness in government, community, and the private sector. It will aid in recovering the lake ecology and improving fish catch. In addition, the CBFM will allow the community to keep a close watch on the resource and its condition, and address management needs so that the resource will continue to be healthy and productive. The participation of the stakeholders in the activities will give a sense of ownership and pride.

Requirements of CBFM

CBFM is designed to manage both the fishery resources and the fishermen. Successful CBFM relies on good institutional environment such as laws and regulations, which are beyond community's control. If these environments are CBFM friendly, success is more likely. CBFM also relies on traditional knowledge and wisdom of the local community who make their living from fishing and allows them to apply the knowledge on management of the resource once the right has been granted.

The issues to be looked into while dealing with the implementation of CBFM include the nature of the resources, the technologies used to exploit these, arrangements for property rights associated with different exploitation and management strategies, and the effectiveness of informal and formal rules within the present management scheme. Without an appropriate supporting institutional framework, the success of CBFM can be questionable. Where local institutional framework is weak, additional costs are needed to strengthen and build up community management capacity. Without strong local organisation, it can take a long time in developing local capability and participation in fishery resource management.

Several pre-requisites must be fulfilled to implement CBFM. Some of important ones are devolution of management authority to the community; establishment of territorial boundaries; and incentives and motivations to fishermen to set up local management systems.

When the management of fisheries is delegated to fishermen, care should be taken to ensure a fairly equitable sharing and distribution of benefits among fishermen. Masamichi Hotta has suggested that "Fishing by rotation" is one way to achieve this objective- fishing spots are rotated among fishermen so that all of them get to fish in the most fertile areas. A "pooling system" that distributes all fishing earnings in an area equally among fishermen of that area is another method. This is practised in Japan [4]. Further, the community-level organisations entrusted with fisheries management responsibility should be economically and socially viable. Else, fishermen will not trust the organization. CBFM should also be integrated into the State's legal framework, because community-based organisations need legal recognition for their decisions to be enforceable.

CBFM is unlikely to be successful in community where the fishing resource cannot be exclusive to the community. Without exclusivity at the beginning, the community cannot be assured of the right over the resource, thus reducing their willingness to cooperate in adopting the CBFM. Establishment of a clear, defined fishery boundary in the area adjacent to the community is thus a basic element of CBFM. The merit of demarcating waters for the exclusive use of fishermen is that it gives fishermen incentives to establish self-regulating systems - they own a wealth-producing property. Compliance is built on trust. Control over resources by fishermen would make a management regime feasible - they will be motivated to preserve their resource.

fishermen incentives to establish self-regulating systems - they own a wealth-producing property. Compliance is built on trust. Control over resources by fishermen would make a management regime feasible - they will be motivated to preserve their resource.



Collecting Vegetables from Loktak

Implementation of CBFM

Recognising that fisheries management has not worked out as planned by the government, many governments today are willing to adopt the CBFM, involving more consultative and participatory mechanisms. In implementation of CBFM, the following aspects play an important role and should be considered [5]:

- Benefits and beneficiaries from CBFM.
- Needs and capacity of the community
- Needed changes, in physical and capacity, at the community level.
- Key persons and community level and their roles.
- Roles of supportive agencies, both government and non-government.
- Appropriate outreach programme, empowerment and extension.
- Investment on building up community capacity in effective management.

CBFM is usually implemented in two phases, as explained below:

(i) *The promotional phase*

This is basically an information gathering phase and on the basis of a SWOT (strength, weakness, opportunity, threat) analysis, CBFM concepts are identified. The information thus gathered and analysed is then disseminated to relevant government officials, especially the fisheries officials at all levels. Subsequently, seminars and workshops are conducted to enhance the understanding of CBFM among stakeholders and to explain their individual roles in the implementation of CBFM.

(ii) *The implementation phases*

During the implementation stages, several activities are carried out. First, the government has to identify the development programmes that could promote collective activities by all or a majority of the stakeholders. This is important, because success in CBFM depends on getting the stakeholders to work together, thus creating a sense of co-ownership to that programme or project.

stakeholders. This is important, because success in CBFM depends on getting the stakeholders to work together, thus creating a sense of co-ownership to that programme or project.

To facilitate the integration of community groups into the fisheries management programmes, step-by-step guidance on the implementation of ecosystem-based fisheries and watershed management is essential. Importantly, the Guidelines will provide community-based groups with a template of integrating the needs of the communities into a framework for supporting sustainable fisheries and watershed management.

The Guidelines will describe how to develop a shared vision for the future, to determine the primary factors constraining progress towards sustainable fisheries, to identify indicators of progress, and to develop a focussed plan of action that includes the priority activities that will contribute directly to fulfillment of the long-term vision for the future.

The Government Agencies e.g Loktak Development Authority in this case will provide support on community empowerment including supporting framework, laws and regulations, awareness generation and financial support need to be taken must be negotiated and agreed. Local fishermen, as stakeholders, will have to be effectively involved in decision-making. Management plans for fisheries will be drawn up and decided by the local fishermen and follow bottom-up approach. Actions and changes that take place must be agreeable at community level. Effective involvement of local fishermen can be further increased if the benefits to be received from CBFM can be transparent, quick and proportionate to their contributions. CBFM can be an answer to an effective fisheries management in Loktak lake provided capacity is built at all levels.

Bibliography

1. Hardin, G.1968. "The Tragedy of the Commons". Science, 162. pp.1243 - 1248.
2. Berkes, F. 1996. Social Systems, Ecological Systems, and Property Rights. Chapter 5 in Rights to Nature. Susan Hanna et al (eds.). © Island Press, Washington, DC and Covelo, CA. For book information or ordering, 1-800-828-1302.
3. Berkes, F., D. Feeny, B. J. McCay and J. M. Acheson. 1989. The Benefits of the Commons. Nature, Vol. 340 13 July. pp. 91-93.
4. Hotta Masamichi, 1997. International Experience in Coastal-Based Fisheries Management- Success and Pitfalls. In: Report of the Workshop on Smart Partnership for Sustainability in Fishing Sector. Bay of Bengal Programme, BOBP/REP/81. pp. 14-16.
5. Ruangrai Tokrisna, P. Boonchuwong and P Janekaring, 1997. A Review on Fisheries and Coastal Community-Based Management regime in Thailand. ICLARM, Penang, Malaysia. pp. 1-38

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PROBLEMS FACED BY FISHING COMMUNITY OF LOKTAK LAKE

Loktak is the largest freshwater lake in the north-eastern region of India occupying an area of 286 sq. km. Based on its rich and unique biodiversity, as well as socio economic importance, the lake was included in 1990 as a Wetland of International Importance under Ramsar Convention.

The lake has been facing serious problems after construction of Ithai barrage across Manipur River for hydropower generation by N.H.P.C. These problems have directly or indirectly responsible for affecting the lives of people living in and around the lake, particularly one lakh fisherman, who depend upon the lake resources for sustenance. The problems faced by the fishermen due to the degradation of the lake along with some measures required to be undertaken for improving livelihoods of the people are briefly discussed in the paper.

Problems Faced by the Fishermen

Construction of Ithai barrage

The construction of Ithai Barrage across Manipur River for hydropower generation, degradation in its catchment area, discharge of pollutants from 34 rivers and streams entering the lake and proliferation of *phumdis* have enhanced the problems for fishermen community. The construction of barrage has

Transportation of Fish Catch



seriously affected migratory routes of economically important fish species which used to migrate in millions from Myanmar through Chindwin river. The lake used to be the breeding ground for a number of fish species. Now the route is blocked for forever and no migration of fish takes place into the lake. As a consequence of this, fish production has drastically reduced.

Proliferation of *phumdi*

In the last twenty years, the lake is at risk from rapid proliferation of *phumdis*. *Salvinia* sp and Paragrass contribute substantially to the formation of *phumdis*. Formation of *phumdis* has covered more than 70% of the water surface area, thereby blocking the pathways of fishes. Frequent movement of *phumdi* according to wind direction also destroys the fishing equipment, put into water for fishing. During late 70's the fishermen community used to push down the *phumdis* and water hyacinth of Loktak Lake through Khordak channel to the downstream of Manipur River. This process has been completely stopped for last more than two decades due to construction of barrage.

Athaphum menace

After the conversion of the wetland with fluctuating water levels into a reservoir and blockage of migratory routes of economically s

important fish species, the fish catch has drastically declined. Since the water level of the lake remained constantly high, the fisherman had to resort to modified *Athaphum* fishing practices. They started initially using the poison material to catch the fish but this was stopped through the efforts of local NGOs during early 1990s. The modified *Athaphum* practice was carried out throughout the year as compared to earlier practice carried out only during winter season prior to construction of Ithai Barrage. The number of *Athaphums* has phenomenally increased during last one decade and is now spread throughout the lake. The lake has now more than 3019 *Athaphum* which facilitate proliferating of *phumdis* in the open surface area.

Navigation and transportation problems

The movement of *phumdis* according to wind direction not only destroys the fishing equipment but also blocks the navigation and transportation waterways. The inhabitants of island like Karang have to spend a lot of time to cross the lake particularly during rainy season when the wind direction drifts the *phumdis* rapidly. Similarly problems are faced by the phum hut dwellers living in the middle of the lake.

Health hazards

The contamination of water due to increasing population and direct discharge of human wastes in the water body has enhanced the bacterial load. Water quality particularly during rainy season is highly contaminated and leads to outbreak of waterborne diseases like diarrhea, jaundice, cholera and cold fever etc. this has seriously affected the economy of the fishermen community.

Extinction of indigenous food plants

Loktak Lake used to be source of food plants like *Heikak* (*Trapa natans* var. *bispinosa* Linn.), *Tharo* (*Nymphaea pubescens* Wild), *Thambal* (*N. nucifera* var. *rubra* Roxb), *Thangjing* (*Euryale ferox* Salisb), *Ikaithaibi*, *Ishing kundo* (*Ludwigia claveliana* Gomez de la Manza) etc. which served as main vegetables for the local population. Population of most of these plants have retreated because of changes in water



Fishermen in Loktak

level.

Decline in availability of firewood

Most of the fishermen families use firewood for cooking and smoking fish. They used to collect firewood like *Tou (Phragmites Karka)*, *Khoimom (Saccharum munja)*, *Singut (Narenga porphyrochoma)* and *Singnang (Eryanthus Proceous)* etc. from the lake. Since the declaration of Keibul Lamjao as National Park in 1977, the fishermen were prevented from collecting fuel from this area. The fuelwood scarcity was further compounded by disappearance of plant species used by the community as fuelwood due to high water levels of the lake.

Lack of trust in government agencies

The relation between the Department of Fisheries and fishermen communities needs to be improved as the communities lack trust in the government policies and programmes. Appropriate measures need to be taken to restore the good relationship between local communities and government agencies for overall welfare of the fishermen communities.

Lack of policy and regulatory measures

The Government of Manipur has not so far developed any policy and legislation for conservation and management of Loktak Lake. Many unwanted activities like practice of *Athaphum* fishing, indiscriminate use of nets and other harvesting equipment, construction of fish ponds within the lake, and other such activities need to be regulated.

Inundation of agricultural lands

Flooding of agriculture land and fish ponds during the rainy season due to high water level maintained at 768.5 m for power generation is a common problem of the communities. This has led to migration of people and changes in their occupations.

Measures for improvement of livelihoods of fishermen

The following suggestions may help to solve the problems of fishermen to some extent:

- Scientific studies need to be carried out to restore migration of economically important fish species from Myanmar to Loktak Lake.
- restore migration of economically important fish species from Myanmar to Loktak Lake.
- Ithai Barrage should be opened to push down the *phumdis* and the Loktak Development Authority's efforts to remove *phumdis* by mechanical means should be strengthened.

Phum Fishermen



- Awareness should be given to *Athaphum* owners to minimize the environmental impacts caused by rapid increase of *Athaphums* within the lake
- Special arrangements for navigation and transportation between Karang and Thanga Island be made using powerful motorboats
- Awareness relating to health hazards due to degradation of lake environment should be given to the local communities. Primary health centres around the lake need to be improved to control the outbreak of waterborne diseases
- Activities such as construction of improved *chulhas*, bio gas plants and plantation of fuel wood on the island hills need to be promoted for meeting the demand of fuelwood by the local population
- Control of encroachments and hazardous fishing activities through appropriate policy and supported by strong legislative measures. All the concerned agencies like Loktak Development Authority, Fisheries Department, Revenue Department, Department of Forests and Environment, Irrigation and Flood Control, National Hydro-electric power Corporation and NGOs should effectively coordinate and develop a comprehensive policy to conserve biodiversity and ensure wise use of wetland resources.

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ECOLOGICAL APPROACH FOR ENHANCING FISHYIELD OF LOKTAK LAKE, MANIPUR

Introduction :

Loktak lake, the largest fresh water wetland in the north eastern India is considered as a lifeline of the Manipur state. The lake has been the main source of fish production in the state since the time immemorial. Fisheries of Loktak lake is the combination of capture and culture systems. Before 1950, capture fishery of Loktak Lake contributed about 60% of the total fish production of the state (Tombi Singh, 1993). Migratory fishes from Chindwin - Irrawady system of Myanmar used to contribute about 40% of capture fishery of the lake (Tombi Singh, 1993). Earlier major bulk of the fish catch was contributed by the indigenous carps. However, during the past three decades it is dominated by the Indian major carps and other exotic carps.

Capture fishery of Loktak Lake hardly received any support from legislation for its conservation, harvesting and marketing. Introduction of some exotic species in the system has indirectly affected population of some endemic minor carps. Absence of any natural recruitment of major carp, excepting common carps, in the lake reflects directly on the present low level fish production. Over exploitation, indiscriminate fishing methods, extensive growth of phumdis and weeds are responsible for decrease in fish yield of the lake. Construction of barrages across the Manipur River has also consequently brought changes in species composition.

FISH DIVERSITY OF LOKTAK LAKE

54 fish species belonging to 18 families have been recorded from the lake. Out of these cyprinidae family represents highest (25 nos) numbers of species. For the first time 2 fish species *Clarias guerripinus* and *Aplocheilichthys panchax* have reported from the lake. Out of the 54 species, 28 species are common and available throughout the year while 26 species are rare and seasonal in presence. *Clarias guerripinnus* appears in the lake since 1999 in the lake. Entry of *Clarias guerripinnus* a highly carnivorous catfish is expected to be from the peripheral fish farms during flood. Occurrence of this highly carnivorous species poses a big threat to the survival of the other smaller fishes in the lake.



Fisherwoman operating a bagnet

for the past four years from capture system based on market landings is about 1,500 MT (including minnows). Average annual fish production from the peripheral fish farms (about 3900 Ha) constructed after commissioning of Ithai Barrage due to inundation of the agricultural fields is about 5850 tones. Capture and culture systems of the lake contribute about 50% of the total fish production of Manipur State. Exotic major carps and Indian major carps occupied the first and second position during four years fish landing. Although breeding of the major carps have not been recorded in Loktak Lake except *Cyprinus carpio*, landing of these species in high percentage is perhaps due to the escapement of these species from the peripheral fish farms during flood. Fish potential of the lake has been estimated adopting Ryder Model (1965) which is based on Morphoedaphic index (MEI) and found to be about 93kg/ha/annum.

HARVESTING INFRASTRUCTURE & FISHING METHODS:

Several types of fishing gears are used in Loktak lake. The main fishing gears include gill nets (mesh size ranging from 15 mm - 140 mm), multi-pronged spear, dip nets, lift nets, cast nets, scoop nets, hooks and gorges, traps,

most efficient. Two primitive types of fishing craft made from the trees such as *Artocarpus chaplasi*, *Cedrella tuna* and *Phoebe* spp. are used in Loktak lake. These are (i). Dug out canoe made from a single log & (ii). Canoe made from jointed planks. These canoes lack stability during rough weather conditions. Very little modernization has taken place in the traditional fishing craft. There are about 2800 canoes being used for fishing and navigation purposes in Loktak lake.

Different fishing methods are being practiced in Loktak lake. Most of the fishing methods of the Loktak lake are more or less similar to the general technique practiced in other places, although there are slight modification from the common technique to suit the local condition. Important fishing methods are groping / hand picking, stranding, fishing with wounding gears, line fishing, fishing with traps, fishing with nets, fishing with stupefying devices etc.

Phum fishing, which is very extensively practiced in Loktak Lake, is a characteristic feature of Loktak lake. It is a two-phase operation. Number of Athaphums (Phum circles for fishing purpose) has increased considerably after the construction of Ithai barrage. As per remote sensing imageries,



in 1990 to 3019 in February 1999. At present, there are about 3200 phum circles in Loktak lake covering an area of about 10.5 Sq. Kms. Extensive practice of this fishing method reduces open water area of the lake. Moreover, isolated and abandoned cut pieces of phumdi proliferate faster than thick phumdis. Fish production from athaphum contributes about 39% of total capture fishery yield of the lake (558 MT).

FISHERIES RESOURCE ENHANCEMENT

Stock Enhancement:

- Fisheries resource enhancement of Loktak lake is aimed on the line of improving capture fisheries yield along with encouraging culture base capture fishery on a sound ecological basis. Although there is no specific breeding grounds in the lake for the major carps except in KLNP which is a protected area. Fish stock of the lake especially common carp and murrels could be improved to some extent by protecting brooders and restricting catching of juveniles through awareness campaigns.
- Food and feeding habits of important species have been investigated to understand their feeding behavior so that these species could be restocked in the lake for enhancing fisheries resource. As the lake is a complex eco-system, fish which can utilize the food chain available at different niches of the lake will be restocked in the lake. However, due consideration will also be given for reviving the stock of those endemic carps which have almost disappeared from the lake. As an immediate measure, two large size circular fish ide of

hatcheries having production capacity of 25 lakh spawns per operation each have been constructed at Toubul village in the western side and Mayang Imphal in the eastern side of the lake. Construction of seven other circular mini hatcheries have also been completed at Phoubakchao, Laphupat Tera, Sagram, Thanga, Naranseina, Keinou and Shantipur all along the periphery of the lake. Production of fish seeds of commercially important and rare species is in progress.

Need for control of water pollution:

Loktak lake has a direct catchment area of 980 sq km and indirect catchment area of 7159 sq km. 34 small streams directly discharged in the system and indirectly connects with 2 rivers namely Imphal and Khuga through two link channels Khordak and Ungamel. Inflow of organo-chlorine pesticides and chemical fertilizers used in the agricultural practices around the lake, municipal wastes brought by Nambul and Moirang rivers that runs through Imphal and Moirang towns, soil nutrients from the denuded catchment area and domestic sewage from the settlements in and around the lake are responsible for deterioration of water quality and eutrophication of the lake.

Phum fishing leads to reduction in open water area. It also hampers the growth of submerged aquatic flora besides causing unnecessary deposition of stone, bamboo, logs etc. at the lake bottom. It is estimated that about 264 MT of feed is applied annually in the lake for phum fishing. Unconsumed fish feeds also contribute in water quality deterioration. This fishing method supplements to the deterioration in the water quality of the lake. Hence,



Fish Landed from Loktak

pollution of the lake.

One of the ecological approach for indirect control of nutrient which plays an important role at the primary trophic level is to enhance the stock of phytophagous fish species like silver carp (*H.molitrix*) considering the species composition of the lake without affecting population of other species at different tropic levels. As the lake is infested with submerged weeds, enhancing the stock of grass carps (*C.idella*) in a sustainable manner can control the vegetative growth of some of the submerged aquatic flora.

Introduction of Eco Friendly pen and cage culture:

Fish culture in pen and cage in loktak lake could be introduce on trial basis at some areas which is less prone to strong wind action and less floating stray phumdis. The most suitable species combination is the mixture grass carp and common carp. Fingerlings not less than 15 cm in size will be introduce in the pen. No supplementary feeding except aquatic weed will be given. This technique may be indirectly helpful in the control of excessive growth of weeds.

Need for rehabilitation of Phum Hut dwellers:

Presence of phum hut dwellers (733 huts by 2001) in the lake is also a great concern for change in ecological condition of the lake. It may be very difficult to enforce any legislation for the control of human activities in the lake whenever the phum huts are present in the lake. Thus, rehabilitation of the phum hut dwellers becomes a very essential task for the management of the lake.

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Fisherman making a Box Trap

HIGHLIGHTS OF PROJECT IMPLEMENTATION

Project implementation during February 2002-February 2003 primarily focused on economic utilization of phumdis, extension of demonstration projects in hill and lakeshore villages, and strengthening of community based institutions. Regular monitoring of hydrological and meteorological parameters, water quality, vegetation, fish and fisheries, socio economics was also carried out. As a follow up of the workshop on Phumdis Management held in January 2002, a detailed programme on economic utilization of phumdis has been developed in consultation with several research agencies. Several community initiatives for phumdi removal were also facilitated by the project during the reporting period. Details of activities undertaken under each component are as follows:

CATCHMENT AREA TREATMENT

- Formation of Watershed Committees

40 watershed committees have been formed in the hill villages with the primary objective to facilitate community in taking a lead role in watershed management. The committee shall look after planning, implementation and evaluation of watershed development activities to ensure effectiveness, usufruct sharing of benefits from interventions, and sustainability. It shall also assist in building a revolving fund to meet the micro credit needs of the communities, maintain the afforested areas and strengthen the income generation programmes. Elaborate MoU has been developed and signed between the committees and LDA highlighting role and responsibilities of the two parties.

- Treatment of prioritized microwatersheds

Following measures were undertaken during the reporting period for treatment of 16 prioritized microwatersheds identified through landuse /land capability studies, remote sensing and ground truthing surveys:

- Afforestation in 500 ha with eight native species selected by the local communities. The species vigorous coppicers a mix of fast and slow growing, and will yield firewood, fencing material, small timber, vegetable, fiber etc.
- Aided regeneration in 120 ha
- Horticulture in 150 ha, with banana and pineapple inter-cropped with Parkia Roxburghii. Field investigations have



Afforestation in Lake catchment

Rs. 6,000 - 8,000 per month (except in Dec / Jan) for every Ha of banana plantation and Rs. 1,00,000 - 1,30,000 per annum for every Ha of Pineapple. Horticulture therefore has given strong economic incentives to the communities to abandon low revenue options as jhumming.

Strategies for developing micro enterprise based on value added horticulture produce are also being developed under the project to ensure higher revenues to the hill communities.

WATER MANAGEMENT

- Flood mitigation through community initiative

High siltation and choking of feeder and link channels by phumdis leads to frequent flash floods in adjoining villages. One of the key recommendations of the workshop on phumdis management in Loktak Lake was to clear the feeder and link channels to facilitate flushing of phumdis and reduce flash floods. Through a series of consultation meetings, a microplan for clearance of 6 km long Naoremkhong channel was developed with active support of Samusang Shantipur Youth Club and Shamusang Shantipur Mahila Mandal and during the last year 3 kms of channel was cleared of phumdis with voluntary labor contributed by the communities. This has significantly reduced floods in the villages Shamusang, Shantipur, Toupokpi and Khuman



Cleaning Naoremkhong Channel

SUSTAINABLE FISHERIES DEVELOPMENT

- Toubul hatchery handed over to communities

The Chinese circular hatchery constructed under the project at Toubul was formally handed over to the Toubul Welfare Committee in September 2002 in a function organized at Toubul and presided by the Hon Minister (LDA), Mrs. Leima Devi. During last year, the hatchery produced 30 lakhs spawns of Lebeo gonious and Labeo rohita species.

- Construction of Eight hatcheries in Lakeshore vil lages

Construction of one large circular hatchery at Mayang Imphal and mini hatcheries at Phabakchao, Laphupat Tera, Sagram, Keinou, Shantipur, Narensaina, and Thanga has been completed and production of common carp seed is under progress. A training programme on maintenance and operation of hatcheries was also organized for the fishermen

- Construction of boat landing j etty at Thanga



Hatchery at Keinou

A wooden boat-landing j etty with a landing capacity of 50 boats has been constructed at Thanga, an island village with a significant fishermen population and a major market for island villages and phum hut dwellers.

- Introduction of pen cage culture in Lakeshore vil lages

Design and site selection for eco friendly pen culture in Loktak was taken up in collaboration with the state Fisheries Department at two sites near Thanga island and two sites in Hubidak portion of the lake. Rectangular pen ranging 50 ft X 20 ft - 100 ft X 40 ft shall be introduced in the first trial operation using synthetic nylon nets. Combination of grass carp and common carp will be introduced in the pen.

COMMUNITY PARTICIPATION AND DEVELOPMENT

Extension of additional income generation

programmes in the hill villages

- Based on the experiences of implementation of integrated fish cum piggy project in Sadar Joute and Bungte Chiru, the project was extended in 6 more hill villages, Loibon, Aimol, Sadu Chiru, Molnom and Nungang. Memorandum of Understanding has been signed between the community groups and LDA, as per which the groups have agreed to provide equal number of fish fingerlings and piglets to another group, jointly identified by the project and the communities. The project has also tied up with the state veterinary department to provide training to the communities on maintenance of integrated farming projects.



Integrated farming at Bungte Chiru

- Handlooms and handicrafts projects being implemented through women groups has been extended to 12 villages. Under this programme, yarn has been provided to women groups as seed assistance for manufacture of traditional clothes and revenue generated from the sale of clothes forms the seed money for micro credit operations within the group. During the last year, the women's group at Bungte Chiru produced more than 400 clothes and each member earned more than Rs. 1200 as an additional income from the activity.

Collective Action on Phumdi clearance

As a follow up of the workshop on management of phumdis in Loktak Lake held in January 2002, several initiatives were taken up through community mobilization.

- Large volumes of phumdis were removed from Moirangthem Maya through manual clearance. Ngami Lup of Thanga Moirangthem took the lead in the activity. Based on the success of this initiative, Ngami Lups of Komlakhong and Phaubakchao have also decided to undertake similar activity in their adjoining regions.
- 3.5 kms of Naoremkhong channel was cleaned by the communities of Shamushang, Shantipur, Toupokpi and Khuman Yangbi.

these regions.

- 69 ha of phumdis were removed from Khordak and Ungamel channels with community assistance.

- The Ngami Lup Moirangthem cut Athaphums in Manungpat as an initiative to control phum fishing in Loktak.

Celebration of Loktak Day and World Wetland Day

- Loktak Day was celebrated on the full moon night of October at Komlakhong and Thanga Villages. Activities were organized by Loktak Celebration Committee, a federation of NGOs and Loktak Development Organization. Several cultural programmes highlighting the close relationship of communities with Loktak Ima (the goddess of bounty) were held on this occasion.



Awareness Generation Meeting at Phaubakchao

- World wetland day was celebrated on 2 February 2003 at Phaubakchao village on the eastern side of Loktak lake in association with local NGO LPFFLOA. On this occasion several events highlighting the close association of the communities with Loktak lake were organized including boat race, painting competition, display of wetland products, awareness generation meeting organized by project staff, poster displays and cultural programmes.

Consultation meetings with Fisher Communities

Consultation meetings were held in 11 villages in and around Loktak Lake for identification of problems of lake fisheries, needs and aspirations of fisher community, strategies for sustainable fisheries development, and development of community based fisheries regulations. Key problems identified by the fishermen include:

- Proliferation of phumdis and other aquatic vegetation leading to decline in fish population, damages to crafts and gears, and obstruction in navigation
- Increase in number of athaphums which contribute significantly to phumdi proliferation and conflicts amongst



Fisheries consultation meeting at Komlakhong

- Increase in number of fishermen leading to pressure on lake fisheries, decline in fish catch and incomes
- Decline in population of riverine fishes like Pengba, Khabak, and Shareng due to obstruction in migratory pathways by construction of Ithai barrage
- Use of imported crafts and gears, which have small mesh sizes (13 - 35 mm) contributes to decline in fish stock
- Catching of fish brooders especially in spawning season leads to decline in fish population
- Increased pollution from rivers and agricultural runoff leading to diseases and high mortality in fish population

Various suggestions were made for improvement of lake fisheries including:

- Lake restocking for increasing fish catch
- Regulation of use of crafts and gears and mesh sizes
- Declaration of closed seasons in some parts of lake
- Protection of fish breeding grounds
- Removal of athaphums
- Restriction on catching of brooders
- Discourage culture of carnivorous fishes like Thai Mangur in lake periphery
- Development of alternate income generation schemes for fishermen including integrated farming, handlooms
- Enhanced awareness amongst the fishermen on issues related to lake fisheries amongst fisher community
- Improvement in fish marketing infrastructure

Survey and assessment in hill villages

Socio economic surveys were carried out in 27 hill villages with a primary objective of community characterization and understanding their socio economic profile.



implemented by various agencies. Data generated through the survey is very useful in microplanning for catchment area development

PROJECT MANAGEMENT

- Third Project Management Committee Meeting

The third Project Management Committee (PMC) meeting was held on 20 September 2002 at Imphal under the Chairmanship of Mr. Saichhuana, Additional Chief Secretary, Government of Manipur. Major recommendations of the meeting included demarcation of the lake boundary, control of encroachments in and around the lake, state ownership of the project activities and development of an optimal barrage schedule in consultation with NHPC. The committee reviewed the progress of activities of the project and recommended its extension by two years for successful completion of the activities outlined in the

- Third Scientific and Technical Advisory Group Meeting

The third meeting of the Scientific and Technical Advisory Group was held on 20 September 2002 under the Chairmanship of Prof. Purushottam Khanna, Director SIES - Indian Institute of Environmental Management, Navi Mumbai. The project team made detailed presentations on progress of project activities. Key recommendations of the meeting included detailed analysis of spectral signatures for classification and zonation of lake vegetation, development of an optimal barrage operation schedule, development of a neural network model, economic utilization of phumdis and other plant resources and demonstration project on treatment of sewage from Imphal city through utilization of duck weed reed bed system. The STAG also evaluated the project extension proposal prepared by the project team and recommended extension by two years.

- Fourth Scientific and Technical Advisory Group Meeting

The fourth meeting of the Scientific and Technical Advisory Group was held under the chairmanship of Prof Purushottam Khanna, Director, SIES -IEM, Navi Mumbai on 3 February 2003 at WISA office, New Delhi. Key decisions taken in the meeting included discussion with NHPC on feasibility of evolving an optimum barrage operation schedule, commissioning of an Environmental Impact Study to assess impacts of lowering of lake water levels, laboratory feasibility studies for utilization of phumdis for biogas production, and inclusion of North East Council representatives in the forthcoming STAG meetings. The committee also examined the budget and workplan for the extended period and suggested inclusion of phumdi extraction costs and feasibility study for Loktak Lake interpretation center in the proposed activities, these were subsequently included in

Economic Utilization of Phumdis

Rapid proliferation of *phumdis* in the recent years is a cause of concern due to its impacts on the lake eco system and on the livelihoods of communities dependant upon the lake for sustenance. Under the SDWRML project series of investigations were carried out on different aspects of *phumdis* to design strategies for *phumdi* management. An extensive consultation process was also initiated under the project to understand the community perspective of the problem and traditional methods of *phumdi* management. The communities made several key recommendations for management of *phumdis* in the recently held workshop in Imphal in January 2002.

Several investigations have been carried out under the SDWRML project to explore the feasibility of *phumdis* utilization. Initial investigation highlighted that *phumdi* had a great value as biofertilizers and when mixed with rice bran ash could be used as a carrier of biofertilizer agents. The investigation on the potential of *phumdis* for utilization as pulp, fuel briquette, energy, bio-fertilizer, vermiculture, potting material, compost and other uses is being examined involving leading scientific organizations in the country. Several organizations having experience in these areas have been approached to advice on utilization of *phumdis* for value added products and establishing demonstration projects. The various organizations contacted so far are: Indian Institute of Environment Management, Navi Mumbai; BAIF Development Research Foundation, Pune; Department of Agriculture and Food Engineering, IIT, Khargpur; Vivekananda Institute of Biotechnology, Nimpith, Kolkata; Development Alternatives, Tata Energy Research Institute, Hi-Tech Agro Products Pvt. Ltd., Department of Science and Technology, and Indian Agricultural Research Institute from New Delhi. ICEF approached ASTRA Indian Institute to Science, Bangalore, to seek their technical advice on the utilization of *phumdis* for biogas.

During the project extension phase, *phumdi* based biogas plants, fuel briquettes and biofertilizer plants shall be set up after thorough scientific investigations and community involvement.

Workshop on Management of Phumdis in Loktak Lake

A workshop on management of phumdis in Loktak Lake was held from 22 - 24 January 2002 at Officer's Club, Imphal with the main objective of developing strategies for management of phumdis of Loktak Lake through participatory processes involving local communities, scientists and other stakeholder groups. Seven sessions were held to deliberate on various issues of phumdis in relation to hydrology, ecology, fisheries, wildlife, and socio economic aspects. Overall 168 participants representing fisherfolk, phum dwellers, agriculture farmers, National Hydroelectric Power Corporation (NHPC), state govt. departments, community based organizations, women groups, NGOs, youth clubs, village development committees and experts from academic / scientific institutions participated in the workshop. Specially invited representatives of Botanical Survey of India (BSI), Center for Water Resources Development & Management (CWRDM), Indian Council for Agriculture and Research (ICAR), and Zoological Survey of India (ZSI) also participated in the workshop. Based on the deliberations in the workshop, following recommendations emerged:

1. The Ithai barrage should be opened during two periods viz. January to April and June to September to facilitate release of phumdis, sediments and polluted water from the lake to downstream regions of Manipur river. It was highlighted that south easterly winds blowing during January to April will help in pushing out the phumdis from Lake to Khordak channel. Opening of the barrage during this period will thus help in removal of substantial amounts of phumdis from the lake. Similarly, greater flow of water during monsoon supplemented with opening of the barrage will facilitate pushing phumdis out of the lake through the Khordak channel and also mitigate floods.
2. All the channels and streams within the lake should be cleared of phumdis to enable regular and uninterrupted flow of water to and from the lake. Steps for widening and deepening of Khordak and Ungamel channels need to be taken on a priority basis to facilitate pushing of phumdis through these channels. The left banks of Khordak should be cut at Pakhang Kolu and Khuningthek to facilitate pushing the phumdis.
3. A suitable barrage operation policy should be developed and implemented in consultation with the local communities, NHPC, IFCD and other stakeholder departments to control proliferation of phumdis, water quality improvement, habitat improvement of KLNP and power generation.
4. The road across the lake, linking Mayang Imphal and Bishenpur, blocks flow of water leading to accumulation of phumdis in the northern part of the lake. In order to facilitate the movement of phumdis along with the flow of water, sufficient waterways should be created by cutting the road at suitable locations. Similarly, the road linking Komlakhong with Thanga Yangbi should be cut at suitable locations to facilitate movement of phumdis towards Khordak channel.
5. Local communities should be involved in removal of phumdis as they have long experience in phumdi removal using

dumping areas will be provided by the communities while ensuring that the phumdis removed do not enter the lake.

6. The following measures should be undertaken to prevent degradation of the KLNP habitat and protection of Sangai deer:
 - Ithai barrage should be opened during December - April to flush out polluted water from the park area
 - Low water level during lean season may be maintained
 - Ungamel channel should be improved to facilitate effective water circulation in the park to maintain the health of the phumdis
 - Phumdis should be restored in the Laphu pat area, which is an integral part of KLNP
 - Maibam Phumlak should be considered for its utilization as an additional / alternate habitat for Sangai deer.

7. Strategies should be evolved for control of fishing practices adversely affecting the lake such as athaphums and phumdao through consultations with local fishermen and providing alternate means of income generation. Improved fishing gears and crafts may be provided at subsidized rates to the marginalized fishermen as an incentive to abandon athaphum.



Workshop inaugural session in progress

8. Fisheries legislation endorsed by the local communities should be extended to the entire Loktak Lake.

9. Sustainable development of fisheries should be extended to Pumlen lake to reduce pressures on Loktak Lake. Improvement of Maramba channel should be carried out for pushing out the phumdis from Pumlen lake and examining the possibilities for restoration of migratory fish species.

10. The Nambul and Moirang rivers bringing heavy loads of pollutants leading to proliferation of phumdis and deterioration of water quality should be treated on priority basis.

11. Community based demonstration projects may be set up to assess the feasibility of utilization of phumdis as compost. Agro based industries and other entrepreneurs should be invited to explore possibilities of utilization of phumdis for various purposes such as bio-fertilizers, paper pulp, biogas, gasifiers and potting material for floriculture.

12. Measures may be undertaken to control proliferation of exotic aquatic weeds such as *Salvinia* sp. in the lake, which has reached to nuisance proportions. The utilization of this species for biogas may be explored.

13. Awareness programmes should be promoted for conservation and sustainable utilization of lake resources including role of phumdis in the lake and their management.

14. Strategies may be developed in consultation with phum dwellers for their rehabilitation to minimize impacts on the lake. Alternate income generation programmes focussed on biodiversity conservation and ecotourism may be developed considering their intimate relationship with the lake.



NEWS BRIEFS

SDWRML Project Extension

The Joint Project Steering Committee of the ICEF in the meeting held in November 2002 decided to extend the SDWRML project by one year. The main aspects to be undertaken during the extension phase are:

- Economic utilization of phumdis for composting, biogas generation and fuel briquettes
- Alternate livelihoods through dryer for smoking fish and vegetables, integrated fish farming, pen / cage culture, and micro enterprise development schemes for SHGs
- Development of an optimal barrage operation policy in consultation with NHPC, local communities and other state government departments
- Sustainable fisheries development through operationalization of hatcheries and seed farms and development of community endorsed fisheries regulations
- Awareness generation through nature camps, exhibitions, workshops with media and community, development of Loktak Lake resource center and a web site on Loktak Lake
- Operationalization of a multi-stakeholder working group for conflict resolution
- Environmental Impact Assessment of changes in lake levels for flushing of phumdis and enhancing circulation in the lake
- Monitoring of hydro meteorological parameters, water quality and related parameters
- Remote sensing and GIS studies

Liaison Meeting with NHPC on barrage operations

A liaison meeting was held with NHPC on 4 February 2003 at its Corporate Office at Faridabad with a primary objective of developing a detailed barrage operation schedule, which facilitated phum flushing without affecting power generation. This shall be followed up with further discussions on the alternate barrage operation scenarios developed based on extensive data collected under SDWRML.

Prof. Purushottam Khanna joins as Chairman, Scientific and

Technical Advisory Group

After the sad demise of Dr. S. Maudgal, Prof. Purushottam Khanna has taken over as Chairman, STAG. He is currently Chair Professor & Founder Director, SIES-Indian Institute of Environment Management, Navi Mumbai. In his career spanning more than three decades, he has held several key positions as Director, National Environmental Engineering Research Institute (NEERI), Nagpur; Professor (Environmental Engineering) at the Indian Institute of Technology, Bombay (1977-87), and Lecturer/Reader at the University of Roorkee during 1967-73. He has made several pioneering research in applications of Environmental Engineering, Bio-technology, Operations Research, Ecosystems Modeling, and contributed to around 500 R&D projects, published over 300 research and conference papers. He also holds 27 international and national patents on generically different cleaner production and environment clean-up technologies. He has authored policy documents for Government of India on issues like Sustainable Development, Preventive Environmental Policy, Sustainable Energy, and Waste Utilization Policy; and has rendered extensive technical advice to the Supreme Court of India on environment related matters. He is recipient of several awards including Engineering Personality Award (1993) and Rotary International Vocational Excellence Award (2001).

SDWRML Mid Term Review

A mid term review of the SDWRML project was carried out by a team of three experts, Prof Kailash C. Malhotra (Social Scientist), Mr. Dilip Fouzdar (Water resources specialist) and Ms. Renu Mukunda (project management



Review Team at KLNP

specialist). The review was carried from February 11 to March 5 2002. The team developed a Performance Assessment Guideline for the project based on six broad areas viz Project Goal; Capacity Building;

Leverage and Sustainability; Governance; Project Management & Learning and Innovation. The team made field visits and met with local communities, NGOs and community groups to assess the implementation of the project at various levels. The team made several suggestions on the individual project components. The team concluded that the project was moving towards achieving its objectives and most of the activities were completed as per the time lines mentioned in the Project Management Plan. The team recommended extension of the project beyond its schedule by two years and development of a withdrawal strategy for the project to continue beyond 2005 without ICEF's support.

Neural Network Modeling on Loktak Lake

A project on development of a hybrid multi layer neural network based model for consequence analysis of phumdi removal and utilization on Loktak Lake Ecosystem Health and development of short, medium and long term scenarios arising out of interventions in lake is being initiated in association with SIES- Indian Institute of Environment Management, Navi Mumbai. The project is expected to be completed within a time frame of eight months.

Formulation of Management Action Plan for Loktak Lake and Associated Wetlands Integrating Manipur River Basin

The Government of Manipur has commissioned a project on formulation of a Management Action Plan on Loktak Lake and associated wetlands integrating Manipur River Basin. The project is supported by Planning Commission, Government of India. Wetlands International has been engaged for preparation of the Management Action Plan in consultation with international and national experts from various disciplines including forestry, community, socio economics, limnology, water management, ecotourism etc.



Help Conserve Wetlands

DIARY DATES 2003

8 - 9 MARCH, 2003

Workshop on Sustainable Development of Fisheries of Loktak Lake, Manipur

Contact: Director, Wetlands International - South Asia, A-127, Defence Colony, New Delhi - 11 00 24 (INDIA)

E-mail: wisaind@del2.vsnl.net.in

16 - 23 MARCH 2003

Third World Water Forum Meeting in Kyoto, Shiga and Osaka, Japan

URL: www.worldwaterforum.org

18 - 24 APRIL, 2003

5th International Workshop on Gender Equity and Micro enterprise Development, Bangkok, Thailand

Development Manager (IDMAT), Representative Office - Russia, 17/5 Ulitsa Zelenogradskaya, 125745 Moscow (Russia)

Telefax : (007) (095) 3970096

Email : anu@online.ru

23 - 26 JUNE, 2003

Conference on Bridging Scales and Epistemologies: Linking Local Knowledge and Global Science in Multi-Scale Assessments at Kunming, China

URL: <http://www.millenniumassessment.org/en/meetings/meeting.subglobal.2.htm>

17 SEPTEMBER - 28 OCTOBER, 2003

East African Wetland Management Course
Contact: Kenya Wildlife Service Training Institute, Secretariat East African Wetland Management Course, PO Box 842, Naivasha, Kenya

E-mail: kwsti@kenyawebcom

29 SEPTEMBER - 2 OCTOBER, 2003.

International Conference on Lowland River Rehabilitation, to be held in Wageningen, the Netherlands

URL: www.ncr-web.org

E-Mail: watc@riza.rws.minvenw.nl

URL: <http://www.riza.nl>

NEWS FROM WETLANDS INTERNATIONAL

● Ramsar CoP 8 Meeting held at Valencia, Spain

The 8th Conference of Parties meeting of the Ramsar Convention was held from 18 - 26 November 2002 at Valencia, Spain. The meeting was attended by representatives from 119 countries. 46 resolutions on different aspects of wetland conservation and management were adopted in the meeting. Director, WISA, Dr. C. L. Trisal introduced Guidelines on Management Planning of Wetlands at the meeting, highlighting Loktak Lake as an example. He also chaired a session on Communication, Education and Public Awareness.



CoP 8 Meeting in Progress

● Ramsar Award to President, Wetlands international

Dr Max Finlayson, President, Wetlands international, has been recognized by the Ramsar Convention for his great contributions both to the progress of wetland science and to the work of the Convention, particularly in providing leadership to the work of the Convention's Scientific and Technical Review Panel (STRP) in the ten years since its creation. In addition to his research both in Australia and abroad, he has been instrumental in the establishment of the Mediterranean Wetlands Initiative (MedWet).



President, WI receives Ramsar Award

● Ramsar Wetland Conservation Award and Evian Special Prize to Chilika Development Authority

The Chilika Development Authority has been awarded in the CoP 8 meeting held at Valencia, Spain for its outstanding achievement in restoring the Chilika Lake, designated as a Wetland of International Importance under the Ramsar Convention, in accordance with the principles of wise use and integrated management, and with a strong emphasis upon the participation of the local population and shared decision-making. Wetlands international provided key support to CDA in designing strategies for restoration of low regimes, salinity levels, economic incentives to discourage poaching, training programmes in ecotourism, improvement of socio-economic infrastructure in local villages, and education and environmental awareness initiatives. The Convention has cited Chilika Lake as an excellent example of how carefully planned restoration work carried out with the active involvement of all stakeholders can rehabilitate the ecology of a wetland and at the same time improve the socio-economic conditions of the local population



Mr. Ajit Pattnaik at a community function

● Economic evaluation of Loktak Lake

A study on Economic Evaluation of Loktak Lake has been initiated by Wetlands International with financial assistance from Ministry of Environment and Forests. The project aims to develop a resource management plan for Government and Manipur mainstreaming the values and functions of the Lake in the planning process. Specific objectives include assessment of economic contribution of products directly derived from Loktak, assessment and evaluation of user and non-user benefits, identification and characterization of stakeholders, assessment of economic efficiency of resource uses, economic assessment of workplans of various departments and identification of specific strategies for upliftment of local communities living in and around the lake.



Loktak Lake, Manipur