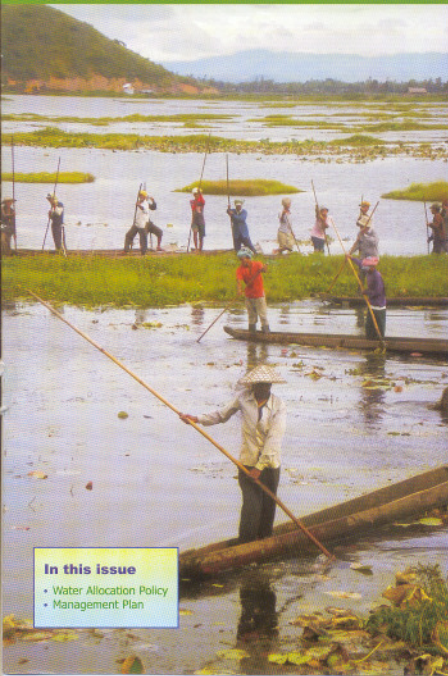


# Loktak

NEWSLETTER

August 2008 Vol. 4



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- Water Allocation Policy
- Management Plan



**WETLANDS**  
**INTERNATIONAL**



## Loktak Development Authority

The LDA is a registered society constituted by the Government of Manipur in 1987 under the Societies Registration Act, 1860. LDA was reconstituted under The Manipur Loktak Lake (Protection) Act, 2006. The Chief Minister is the Chairman of the Authority and the Project Director its Member Secretary.

The members of the Authority include state ministers, members of legislative assembly, secretaries/head of concerned state government departments and experts. The LDA is under the aegis of the Department of Forests and Environment, Government of Manipur.



## Wetlands International

Wetlands International is a non-profit organization governed by a global Board comprised of member country delegates, wetland specialists and representatives of international organizations. Partnership is at the heart of Wetlands International, and strong links exist with other international conservation agencies such as IUCN, WWF, and BirdLife International. Global and regional programmes are supported by over 120 government agencies, national NGOs, foundations, development agencies and private sector groups.



"LOKTAK" is the jointly published newsletter of the Loktak Development Authority and Wetlands International South Asia

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August 2008

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The editorial panel welcomes contributions of articles and information

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Athaphum strips being towed to the lake shore

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Imphal  
July 30, 2008

## CHIEF MINISTER MANIPUR

### MESSAGE

It gives me immense pleasure to learn that the Loktak Development Authority (LDA) Manipur and Wetlands International have brought out a Newsletter which provides information on the specific interventions carried out and achievements made for wider dissemination to policy planners decision makers and overall people of Manipur.

Loktak Lake, lifeline of Manipur has played a great role in the ecological and economic security of the region of ages. The increasing pressures on the lake and its catchments have led to degradation of Lake Ecosystem thereby affecting the livelihood security of large population dependent upon the wetland resources for their sustenance. The proliferation of phumdis in the lake area and thinning of phumdis in the Keibul Lamjao National Park (KLNP) have reduced the capacity of the lake to sustain biodiversity and support rich fishery resources upon which people of Manipur depend for their livelihoods.

I congratulate LDA and Wetlands International for publication of the newsletter which will keep all the concerned agencies and the people informed about the progress of the restoration measures undertaken to rehabilitate the lake.

  
30.7.08

(O. Ibobi Singh)

Water management  
in Manipur River  
Basin needs to  
harmonize human  
uses with ecological  
purposes.

## **Stakeholder endorsed water management plan for Loktak**





Itai Barrage

Loktak and associated wetlands are multifunctional systems providing the base of ecological and economic security of the state of Manipur. They provide fish and vegetables, moderate floods, improve water quality, support rich biodiversity, and are inextricably linked with culture of the society. Water forms the basis of functioning of wetlands and thereby water management assumes central role in ensuring conservation and wise use of these biotopes. However, changes in water regimes over the last few decades have posed a major threat to these wetlands endangering life and livelihoods of dependant communities. Loktak Development Authority and Wetlands International, in their overall efforts for sustainable lake management have underlined the need for a stakeholder endorsed water management planning outlined in this article.

### **Lake management in the past**

Loktak and associated lakes are floodplain wetland systems of Manipur River. Connectivity of the lake regimes with the river ensured fluctuating water regimes. With the onset of monsoon, these wetlands swelled to form a large expanse of water, accommodating and mitigating floods. Migratory fishes from Irawady through the Chindwin River used to

breed in these wetlands supporting a large population of fishers. As the monsoon receded, the wetlands used to shrink exposing nutrient enriched lands suitable for seasonal agriculture. Natural water level changes ensured health of *phumdis* within Keibul Lamjao National Park (KLNK). Lower lake levels during the lean season allowed adequate regeneration time for the *phumdis* as they touched the lake bed and were enriched by the nutrients from the bottom sediments. Water quality of the lake was maintained through exchange of water between river and the lake.

Communities' use of the Loktak and associated lakes were harmonized with their fluctuating regimes. Agriculture in the shallow peripheral areas were restricted to a single crop devoid of any chemical fertilizers and pesticides and without much alteration to the natural land profile. *Athaphum* fishing (a form of fishing using *phumdis* as enclosure) was a seasonal practice restricted to lean season. The channels were cleared annually to maintain natural flows and reduce waterlogging. The central zone remained open water area with vegetation restricted to northern and southern zones. Extent of *phumdis* was maintained through their regular burning, cutting and flushing into Manipur River alongwith the outflowing waters of Khordak channel.



## What went wrong?

The current water management has overlooked the significance of seasonally fluctuating water levels and its relationship with multiple values of Loktak Lake, and instead focused on limited objectives with insignificant stakeholder engagement. In 1967, the Government of Manipur commissioned an ambitious Loktak Multi-Purpose Project to control flooding of Manipur River and reclaim shallow areas for agriculture. It was proposed to divert lake waters for irrigating 30,000 acres of agricultural land and generating 70,000 KW of hydro-power. Loktak and associated lakes offered an excellent opportunity for achieving this objective by acting as a natural reservoir of water for hydropower generation and irrigation. In 1984, the National Hydroelectric Power Corporation constructed a barrage at confluence of Manipur and Khuga Rivers entailing storage of water in the lake through regulation of its water levels. Water was diverted to a 105 MW hydro-power generation station at Leimatak through a water conductor system constructed adjoining Ningthoukhong on the western periphery of the lake.

Construction of Ithai barrage converted naturally fluctuating lake into a reservoir. Lake levels which had a natural variation of 3 m with maximum in August and minimum in May, were gradually restricted to less than 2 m (Figs 1 and 2). More importantly, with the barrage operated to ensure maximum availability of water round the year, natural flushing and circulation was restricted. The situation was further compounded by construction of water control structures across all the major upstream tributaries of the Manipur River (Imphal, Sekmai and Thoubal Barrages and Maphou, Singda and Khuga Dams) changing the inflow patterns to the lake, particularly reducing the lean season flows (Map 1).

Changes in water management brought about significant impacts on lake and its resources.

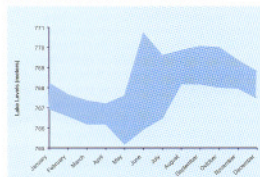


Fig 1: Loktak Lake Water Level fluctuations (1956 – 1966)

Assessments carried by LDA and WISA highlighted the following impacts of hydro-power centric water management:

- Inundation and flooding of 6,350 ha of agricultural lands within the lake margins and surrounding areas
- Reduction in population of riverine fishes due to blockages in migratory pathways
- Loss of livelihoods inducing communities to indulge in harmful fishing practices, particularly *athaphum* fishing contributing to rapid proliferation of *phumdis*. The overall area under *phumdis* within Loktak increased from 54% to 74% of lake area during 1989-2002
- Reduction and degradation of critical habitat of Sangai deer to 8 sq km in 2003 due to changes in water circulation leading to accelerated acidification within KLNLP. Changes in overall composition and proportion of cover and fodder plants preferred by the deer species, further aggravated by stunting of shelter plants.
- Decline in water quality of the lake due to poor circulation and flushing patterns leading to impacts on health of communities

Despite an overall decline in health of lake ecosystem, water abstraction for hydro-power generation has been on a continuous increase, even beyond the designed levels. The hydro-power pricing mechanism in place at present does not recognize lake water as an input to production process. The actual costs of hydro-power generation has phenomenally increased due to increasing environmental costs in the form of degraded habitats of KLNLP, loss of fisheries and agriculture and enhanced siltation within the lake. The current management, by not addressing lake degradation generates Rs. 4.6 worth of environmental damages for every rupee worth hydro-power produced. This is akin to subsidizing the overall hydro-power generation costs, by shifting the impacts to communities through a

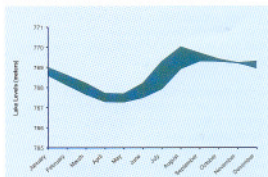


Fig 2: Loktak Lake Water Level fluctuations at Thanga (2000 – 2003)

gradual and continuous degradation of resources and livelihoods. As the upstream water abstractions for irrigation, domestic use and hydro-power within Manipur River Basin would increase, the inflows to the Loktak and associated lakes would gradually diminish, particularly during the lean seasons when water demands for all these purposes are the highest. Ultimately this would constrain the overall economic development of the entire basin, jeopardizing its ecological and economic security.

### The way ahead

Conservation and management of Loktak mandates a strategic shift in water management balancing human needs with multiple values of the lake adopting a stakeholder driven process. Landscape approach needs to be adopted for land use planning linking hydrological processes for biodiversity conservation and sustainable use of resources. Water use within the Manipur River Basin for ecological purposes ( eg. restoration of KINP, improvising water quality , restoration of natural fish recruitment) needs to be harmonized with human purposes for hydro-power, agriculture and domestic use. This rationalized water use plan should form the basis of operation of Ithai and other upstream and downstream hydraulic structures to enable allocation of water for multiple purposes and maintenance of multi functionality of wetlands. This approach recognizes the crucial role of hydro-power within the economy of the state, but proposes optimizing its generation levels in a manner that does not conflict with other functions and values of the lake and livelihoods of communities.

Conservation International(US) and Wetlands International have initiated a spatial corridor conservation planning for biodiversity conservation linking hydrological processes connecting the hotspots within Chindwin-Irrawady corridor.

Center for Ecology and Hydrology (UK), Wetlands International and Loktak Development Authority have jointly outlined a process for achieving a stakeholder endorsed water management plan. This involves setting up a decision making structure involving all key stakeholders at various levels which could participate and define water management objectives and operation rules for the barrages adopting the following sequential steps:

- stakeholder led assessment of sectoral water demands: Consultations with all concerned stakeholder groups to identify and define water demands and conflicting interests



Map 1: Loktak and associated lakes within Manipur River Basin

- b) assessment of water flows and demands for human and ecological purposes
- c) estimation of overall availability of water within the basin through collation of data and modelling; defining water demand for maintenance of biodiversity and lake processes and functions
- d) development of flow scenarios: generating three to four flow scenarios based on the water management objectives identified to provide range of options available for consideration of the stakeholder groups (Refer Box 1 for an example)
- e) evaluation of scenarios for selection of preferred option; assess ecological, and socioeconomic outcomes of the flow scenario implementation and evaluate tradeoffs in monetary terms for ranking of options
- f) design and implementation of barrage operation rules
- g) monitoring and evaluation of the outcomes of barrage operation against identified water management objectives to support review and adaptation

### **Your views and comments are important!**

Successful implementation of water management plan requires active participation of all stakeholders, from decision makers and policy planners at various levels to local communities. In order to have your views and opinions incorporated in the planning process, you are requested to provide comments on water management planning in general, the approach adopted and intended outcomes.

Please email us at: [chgojendro@yahoo.co.in](mailto:chgojendro@yahoo.co.in) and [wisaind@del2.vsnl.net.in](mailto:wisaind@del2.vsnl.net.in)





### Box1: Defining scenarios for lake level management – an example

Defining scenarios for Loktak Lake involves addressing multiple objectives. An initial exercise has been attempted by Center for Ecology and Hydrology (UK), Wetlands International-South Asia and Loktak Development Authority to develop a lake level scenario addressing multiple water needs for hydro-power generation, minimizing flooding, maintenance of KLNHP habitat, ensuring fish migration, enhancing water quality and allocating water for agriculture and domestic uses. The following objectives were defined to meet each of the individual needs:

- Minimize flooding by releasing water before and during monsoon to give sufficient flood storage
- Restoration of KLNHP habitat by lowering the lake levels during winters enabling grounding of *phumdis* and preventing sudden rise in water levels which flood the entire park
- Optimizing hydro-power production by maintaining water levels at 768.5 m for maximum duration possible
- Enhancing fish migration by simulating natural flows to the extent possible
- Reducing sedimentation through high energy releases based on the greatest hydrological gradient between the lake and the river
- Controlling *phumdi* proliferation by their flushing through the barrage gates
- Optimizing water allocation for agriculture by managing retention in the upstream reservoirs based on actual requirements, and high levels in the lake towards end of monsoon season

Combining these multiple objectives into a single lake level management regime provides a desired lake level as shown in fig 3. The plan is characterized by the following stages:

**January to April**-Lake level drops gradually due to evaporation and water use for agriculture. Other outflows are minimized

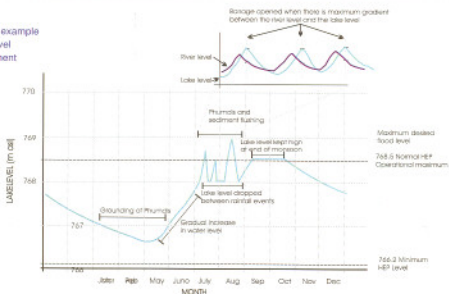
**May**-With the onset of monsoon the lake level is allowed to increase gradually to 768 m amsl so that the national park does not flood

**June to August**-Lake level is maintained at 768 m amsl but is allowed to increase for short periods to create optimum conditions for flushing

**September to December**-The lake is maintained at 768.5 m amsl to maximize storage for the coming lean season, and then gradually drops due to evaporation and abstraction for irrigation and domestic use.

Water management planning would involve developing three to four such lake level management options, their evaluation in terms of ecological and socioeconomic outcomes and finally implementing the best for design of a barrage operation rule.

Fig 3: An example of lake level management scenario



# Management Action Plan for Loktak and associated Wetlands Integrating Manipur River Basin

Wetlands within Manipur River Basin represented by the presence of several shallow lakes, locally called *pats*, occupy 6.8% (469 sq. km) of the basin and account for approximately 16% of its water availability. Loktak, Lamphel, Wathou, Ikop, Kharung, Lousi, Khoikum, Lamjaokhong and Pumlen are important wetlands of the basin. The people of Manipur depend on these wetlands for livelihoods. Loktak, the largest wetland, is characterized by presence of floating lands called *phumdis*. Its southern part supports globally endangered ungulate species, *Cervus eldi eldi* locally called Sangai. Water from the lake is used for hydro-power generation for a highly power deficit northeastern region. Based on its high biodiversity value and socio-economic importance, Loktak was designated as a Wetland of International Importance in 1990 under Ramsar Convention.

Sectoral development planning within Manipur River Basin with focus on hydro-power generation and agriculture development without realizing the multifunctionality of wetlands have led to their rapid degradation with concurrent impacts on livelihoods and loss of ecosystem services. The detailed inventory and assessment carried by Loktak Development Authority and Wetlands International - South Asia indicated the following :

- a) Degraded catchments of Loktak and associated lakes annually lead to erosion of 4.5 mt of topsoil, of which 0.65 million mt is deposited into the lake. The rate of soil loss has increased by 69% since 1966 due to enhanced area under shifting cultivation with reduced cycle.
- b) Water holding capacity of Loktak has decreased by 175 Mcum during last two decades. *Phumdis*, fish farms and islands have further reduced the effective water holding capacity to 448 Mcum.
- c) Construction of Ithai barrage has drastically affected fish migration thereby impacting fishing practices. Prolific growth of *athaphums* has led to choking of lake and deterioration in water quality. Natural recruitment of Indian major carps has also stopped due to absence of flow in lake water.
- d) *Phumdis* have profusely proliferated in the lake from 30% of lake area in 1983 to 74% in 2002 mainly due to construction of barrage. *Brachialaria mutica*, an exotic species has assumed nuisance proportions in the lake area thereby threatening the natural biodiversity.

- e) Construction of Ithai barge has led to degradation of KLNK by interfering with vertical movement of *phumdis* and their nutrient uptake leading to reduction in their thickness. The habitat area of Sangai (*phumdis* with more than 1 m thickness) has decreased to 8 sq km. The composition and growth of plant species providing food and shelter to Sangai has also changed. Formation of acidic zones within the park area has led to stunted growth of shelter plants and affected breeding grounds of economically important fish species.
- f) Livelihoods of communities have been threatened by waterlogging of peripheral agricultural lands (63.5 sq km) and decline in capture fisheries due to reduction in migration and natural restocking. Water quality deterioration has enhanced health hazards to the communities.
- g) Benefits derived on account of use of water from Loktak Lake for hydro-power generation account for 63% of the overall economic contribution, and dictate the present water allocation pattern at a heavy cost due to loss of ecosystem services. Adjusting for the environmental costs, the actual price of power produced from Loktak Lake is 5 times more than the present user charge.

Realizing the importance of wetlands, Planning Commission involved Wetlands International - South Asia for formulation of management plan. Integrated Water Resources Management (IWRM) approach was adopted to develop strategies and actions for integrated conservation and management of wetlands at river basin level. The key management issues identified were:

- Enhanced soil erosion leading to wetland sedimentation due to shifting cultivation and loss of vegetative cover in the catchment area
- Reduction in water holding capacity of wetlands as a consequence of siltation, encroachments, and prolific growth of aquatic vegetation
- Flooding in peripheral areas leading to inundation of agricultural areas and damage to life and property.
- Decline in fish resources affecting the livelihoods of the fisher communities.

- Degradation of *phumdis* in KLNP affecting the biodiversity of the national park particularly flagship species, *Cervus eldi eldi*
- Poverty due to resource degradation and limited opportunities for livelihood diversification
- Absence of policy, regulations and coordination with line departments for effective conservation and management

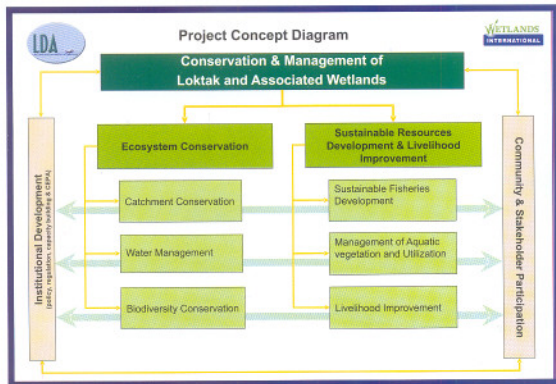
### Management Action Plan

#### Goal

The goal of the Management Action Plan is conservation and sustainable utilization of wetlands at river basin level for ecological security and livelihood improvement particularly of local communities.

#### Objectives

- Control of soil erosion from degraded watersheds through enhancing vegetative cover in degraded watersheds and improvisation of shifting cultivation
- Improving water regime of Loktak and associated wetlands through enhancing water holding capacity, flood mitigation, water quality improvement and allocation of water for human and ecological purposes
- Biodiversity conservation through habitat improvement of Keibul Lamjao National Park, waterbird conservation and ecotourism development
- Livelihood improvement and socioeconomic development of communities through sustainable fisheries development, economic utilization of *phumdis*, alternate income generation based on value added wetland produce and improvement of quality of life
- Institutional development for effective coordination and management



## Implementation Strategy

Implementation will be carried by Loktak Development Authority in coordination with line departments and other agencies through establishment of high level empowered committees / steering committee.

Participatory processes involving user organizations, NGOs, CBOs and government departments and agencies are critical to successful implementation of the management plan.

## Monitoring and Evaluation

Result oriented framework for project achievements at activity, output, outcome and impacts level would form the basis of monitoring and evaluation. LDA would establish a multi-disciplinary monitoring and evaluation team for assessing changes in hydrological regimes, biodiversity and livelihoods using hierarchical inventORIZATION and assessment techniques supported by remote sensing and GIS. Independent evaluation of the outcomes by external agencies and community groups would form basis for midterm correction and review and adaptation of the plan.

### Expected Results

#### Ecological

- Reduction in soil loss from degraded watersheds by 49% of existing rate
- Improvization of hydrological regimes through enhancement in water holding capacity of Loktak, Pumlun and Ikop and enhanced water flushing and circulation
- Reduction in flooding by 70% in the flood prone areas around Loktak Lake
- Improvement of water quality by control of leaching of nutrients and direct discharge of pollutants into wetlands
- Allocation of water for human and ecological purposes through formulation and operationalization of stakeholder endorsed water management plan
- Habitat improvement of Keibul Lamjao National Park and conservation of waterbirds
- Enhanced awareness on values and functions of Loktak and associated wetlands through ecotourism development

#### Sustainable resource development and livelihoods

- Increase in annual capture fisheries production from 1500 to 9645 MT and culture fisheries production from 12,000 MT to 34,000 MT through development of capture and culture fisheries
- Improvement of post harvesting of fisheries and marketing infrastructure
- Economic utilization of *phumdis* removed from Loktak and associated wetlands for annual production of 120,000 MT of *phumdis* compost; 20,000 MT of biofertilizers and 12,000 MT of fuel briquettes
- Reduction of population living BPL by 50% through provision of additional / alternative means of livelihood to 15,000 hill and 8,000 lakeshore households
- Enhanced participation of women in decision making through one third membership in executive bodies of village level organizations
- Reduced morbidity within lake communities by enhancing sanitation facilities
- Strengthening of microcredit infrastructure for additional incomes

#### Institutional Development

- Establishment of multi stakeholder working groups for conservation and sustainable resources development and conflict resolutions
- Establishment of an integrated policy framework supported by implementation of Loktak Conservation Act
- Enhanced awareness of decision makers and stakeholders on values, functions and attributes of Loktak and associated wetlands
- Enhanced technical and managerial capacity of LDA, government agencies and communities to implement wetland conservation and management initiatives
- Establishment of monitoring mechanisms for implementation of Action Plan

# Management Plan Implementation:

## Achievements 2007 - 08

### Institutional development

#### Policy and regulatory reforms for lake management

The Government of Manipur has notified the Manipur Loktak Lake (Protection) Act, 2006 paving way for reorganization of LDA and bringing legislative basis for lake management. Chief Minister of Government of Manipur is the chairman of the reconstituted authority. Members have been drawn from state government departments of forests, revenue, irrigation and flood control, fisheries, tourism, power, planning, ecology and environment; National Hydroelectric Power Corporation; elected representatives from the constituencies falling within Loktak catchments; and Central Agricultural University.

A steering committee has also been constituted under the chairmanship of Chief Secretary comprising heads of the departments of forests and environment, irrigation and flood control, planning; and representative of the ministry of environment and forests to ensure coordination amongst the concerned government departments, formulation of policy matters and timely release of funds.

The Loktak Act defines the boundaries of the lake delineating a core and a buffer zone within it. The core zone includes the central zone of the lake, wherein the act prohibits discharge of any sewage or domestic waste, *athaphum* fishing, building huts and use of fish feed or pesticides. Within the buffer zone, the Act prohibits setting up and expansion of industries particularly of fish processing, discharge of untreated wastes and sewage, dumping leading to land filling, reclamation and channelization of water courses, construction and altering of the hills. The state government has also notified Manipur Loktak Lake (Protection) Rules, 2008 to support implementation of the Act.

Notification of the Act and reorganization of LDA are expected to improve functioning of the authority and increase its overall conservation and management effectiveness.

#### Communication, Education and Public Awareness

Continuing with its efforts to enhance mass awareness on Loktak and its associated wetlands, LDA organized special events on Loktak Day and Pumlen Day in partnership with Manipur Pollution Control Board and



Cycle Rally on Pumlen Day

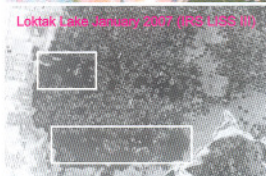
NGOs. Cultural functions based on theme of wetland conservation were organized by the community groups. Cycle rallies and public meetings were organized, wherein issues confronting the wetland were discussed. Overall, more than 4,000 people participated in these events and expressed solidarity with the state government in conservation and management of these resources.

#### Monitoring and Evaluation

Monitoring and evaluation of the impacts of management plan implementation for wetlands and its



Loktak Lake January 2007 (IRS LISS III)



Boxes indicate locations of Athaphum removal



catchment areas is being done through interpretation of remote sensing imageries through GIS at periodic intervals. For this matter, imageries for 2007 and 2008 have been procured from National Remote Sensing Agency. The authority is also working with WISA to develop a results based monitoring and evaluation protocol for long term planning and management.

## Water Management

### Removal of *phumdis* from Loktak & Pumlen

Removal of *phumdis* has been the focus of implementation of water management component. LDA has adopted a three pronged intervention strategy, ie. a) removal of *athaphums* from the central sector of Loktak; b) flushing of *phumdis* using traditional approaches, and c) clearing of *phumdi* choked channels.

#### *Athaphum* Removal

Keeping in purview the socioeconomic issues related to proliferation of *athaphums*, LDA has adopted a consultative approach to programme implementation. The communities were informed of the impacts of *athaphum* fishing through a series of consultation meetings, generating a consensus on their removal.



Consultation meeting with *athaphum* fishers

Area specific *athaphum* committees were constituted involving the village elders, *athaphum* fishers, youth clubs, *Meira Paibis* and representatives of the panchayats. Baseline information on ownership and location of *athaphums* was developed by the Authority in consultation with the committees and field surveys. The *phum* enclosures were then cut by the LDA officials and the owners, with the cut pieces dragged onto the shore and removed using excavators, to be used for composting and other purposes.

To compensate against the loss of livelihoods and as an incentive for adopting sustainable fisheries, each of the owners has been provided with financial assistance



Chief Minister handing over compensation

to purchase boats and nets. The owners also enter into a commitment with the LDA not to enter into this illegal activity again. Till March 2008, 3544 *athaphums* were removed from the central sector of the lake leading to an increase in the open water area by 3.25 sq km as compared to year 1999.

#### *Clearing phumdi choked channels of northern sector*

Choking of the feeder channels within the northern sector of the lake is one of the primary reasons of reduced flushing and circulation inducing waterlogging and damages to agriculture and settlements within the area. During the current year, 4 channels (Kokngangpung Khong, Phigei Loukon khong, Hayen khong, Langban Hiramkhong ) were cleared using mechanical dredgers, creating better flow conditions and reducing waterlogging in nearby villages.



Clearing channels

#### *Flushing phumdis using traditional techniques*

Traditionally, communities managed *phumdis* by cutting them into small pieces and flushing through the Khordak and Ungamel channels down the Manipur River. Drawing on the experiences of communities, LDA has successfully flushed 1.89 million cubic meter of *phumdis* this year from Loktak and Pumlen. Flushing of *phumdis* is done in consultation with NHPC which regulates the gates of Ithai barrage. The activity is carried out during monsoon in phases, wherein benefiting from higher lake levels as compared to river channel, the cut *phumdis* are flushed out to the river



*Phumdis floating past Ithai*

using local implements as bamboo poles, ropes, pulleys (*palongs*), *phumlen thangol* and *thangjau* to guide the flow of *phumdis*. It has also created employment opportunities for the local communities as well as contributed to lake improvement.

#### *Augmenting infrastructure for phumdi removal*

LDA has procured 17 additional excavators and 15 tipper trucks to augment its infrastructure for removal of *phumdis*. With a total 27 excavators and 30 tippers, the Authority has now a capacity to remove 33,000 sqm of *phumdis* in a day.



*Phumdi removal with excavators*

#### **Water allocation**

Wetlands International- South Asia in collaboration with Center for Ecology and Hydrology, a premier wetland management institute of the government of UK has initiated formulation of a stakeholder endorsed barrage operations policy to address habitat improvement of Keibul Lamjao National Park and ensure sustained generation of hydropower alongwith provisioning water for fisheries, irrigation and domestic use. Adopting a scenario based approach, the assessment would generate series of options for water allocation to minimize tradeoffs while maximizing overall environmental and socioeconomic benefits.

#### **Catchment Management**

The state government department of forests has initiated implementation of the catchment conservation programmes under the management action plan. During the current year, implementation has been focused on Loktak subwatershed, which has been identified as one of the highest silt yielding catchments



*A nursery in Loktak subwatershed*

of the basin. During 2007-08, the department has undertaken preparatory works for afforestation in 3,024 ha and aided regeneration in 3,220 ha of the subwatershed.

#### **Sustainable resource development and livelihood improvement**

##### **Economic utilization of *phumdis***

Four *phumdi* composting yards have been established and operationalized in four peripheral villages. LDA is also exploring options for producing organic manure in partnership with external agencies. The Central Agricultural University (CAU) and Krishi Vigyan Kendra (KVK) have been procuring *phumdi* compost for trial fields.

##### **Enhancing availability of fish fingerlings**

LDA in collaboration with the state department of fisheries has established 6 hatcheries to enhance the availability of fish fingerlings for the fish farmers in the peripheral villages of Loktak. Of the hatcheries constructed, 2 are located within the northern shore villages (Ishok, Waheng Khuman), 2 on the eastern periphery (Mayang Imphal, Wangoi), 1 on the western periphery (Ngalkhong Khullen) and 1 in the south (Keirenphabi). These hatcheries have a production capacity of 15 lakh fingerlings per run and would be managed by village committees. Operation would be done based on a Memorandum of Understanding under which the communities would release 50% of the total produce to restock the lake and sell the balance to the fish farmers, using the proceeds to make the unit financially viable.

## Mission :



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



To sustain and  
restore wetlands,  
their resources and  
biodiversity for future  
generations

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