1. Loktak Development Authority

Government of Manipur constituted Loktak Development Authority (LDA) in 1986 for overall improvement and management of Loktak Lake. The objective of the Authority is to check the deteriorating condition of Loktak Lake and to bring about improvement of the lake ecosystem along with development in the field of fisheries, agriculture, and tourism while conserving the catchment area involving concerned Departments of the State Government.

Loktak Development Authority (LDA) is now a body constituted by the Government of Manipur under the Act, 'The Manipur Loktak Lake (Protection) Act, 2006 (Manipur Act 3 of 2006) notified in the Manipur Gazette, Imphal, the 5th April, 2006, to provide for administration, control, protection, improvement, conservation and development of the natural environment of the Loktak Lake and for matters connected with as incidental thereto. The Chief Minister, Manipur, heads the Authority and Ministers of relevant Departments, MLAs of Assembly Constituencies falling under Loktak catchment, Chief Secretary, Manipur, and Secretaries/Commissioners of relevant Departments, VC (CAU), DCs of Imphal West and Bishnupur Districts, HoDs of relevant Line Departments and NHPC, are members. The Act now provides the basis for lake zonation, regulation of detrimental activities and coordinate developmental works.

The Authority, over the years, has grown to a professional lake management organisation through the experiences gained and a systematic process of capacity building at various levels to effectively respond to the challenges of managing Loktak Lake through integrated lake basin management practices. The organisational structure of LDA has become more multidisciplinary over the years. Establishment of Project Management Unit (PMU) in LDA has strengthened its project management and administration capacity.

The Authority is also equipped with advanced equipment and machinery for both land and water management works needed for lake conservation and management.

The Authority has set up a state of art Lake Monitoring Laboratory that monitors the health of Lake Ecosystem on the basis of a set of wide ranging parameters. A network of hydro-meteorological stations has also been set up to monitor the hydrological regime of the Manipur River Basin as a whole. Remote Sensing and GIS laboratory is also the hallmark of LDA as it has been spearheading monitoring of the wetland regime and the entire Manipur River Basin especially the forest regime of such a large spatial dimension.

2. Loktak and Associated wetlands

Manipur valley is blessed with a wealth of shallow lakes of enchanting beauty in the form of Loktak and its associated wetlands like Pumlen, Khoidum and Lamjao, Ikop and Kharung, Loushi, Waithou etc. These wetlands provide critical support to ecological and economic security of the region through provisioning of fisheries and other aquatic resources, serving as habitat of several rare and endangered biodiversity and supporting hydropower generation and irrigation.

These wetlands together covered an area of 340 sq. km as recorded in Survey of India (SoI) Topo Map,1970. Loktak Lake, the largest, comprises 60% of the wetland regime. The wetland system is drained by Manipur River and its major tributaries namely Iril, Thoubal, Sekami, Khuga etc.

The characteristic feature of Loktak and associated wetlands is the presence of natural floating islands, locally called *phumdi*, occupying almost half the lake area. Southern portion of Loktak Lake forms the Keibul Lamjao National Park (KLNP), which is the largest floating protected wildlife area in the world. It comprises of a continuous mass of floating *phumdi* occupying an area of about 27 sq km. The park is the natural habitat of the most endangered ungulate species, the brow antlered deer *(Cervus eldi eldi)* locally known as *Sangai.*

Manipur River Basin is very densely populated with 71% population of the state living within the area. 14% of the valley population is located in and around Loktak Lake alone. Overall 45 villages and 29 towns are located in and around these wetland systems. Communities living in and around Loktak and associated wetlands are directly or indirectly dependent upon the lake resources for sustenance. These wetlands play an important role in the management of the surface water resources in the basin. These floodplain wetlands absorb floodwater during monsoon and are used for agriculture during dry seasons. The wetlands support rich biodiversity, particularly fishery resources. Sustenance of the wetland communities is mainly derived through agriculture, fisheries and harvesting of lake vegetation for use as food, fuel, fodder and vegetables

Problems & Issues

Analysis of ecological and socio-economic features of wetlands integrating catchment and institutional arrangement reveals the following key issues which need to be addressed in the plan for conservation and management of Loktak and associated wetlands.

- *Enhanced soil erosion leading to wetland sedimentation due to shifting cultivation and loss of vegetal 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.*
- *Deterioration of water quality due to inflow of sewage from urbanized and peripheral areas.*
- *Decline in fish resources thereby 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 of livelihood diversification.*

3. Project Implementation: 2010-11

LDA is currently implementing the Short Term Action Plan (STAP) for Conservation and Management of Loktak Lake. The STAP includes priority activities and immediate management interventions necessary to restore the lake ecosystem and forms an integral part of the overarching river basin level management plan formulated by Wetlands International South Asia and approved by the Planning Commission, Govt. of India.

The STAP, organised into 6 major components, is implemented by LDA and various other relevant Line Departments as shown below.

Sl No.	Activity components	Implementing Agencies/Department
1.	Phumdi Management	Loktak Development Authority
2.	Water Management	Loktak Development Authority Public Health Engg. Department
3.	Catchment Conservation	Forest Department Horticulture & Soil Conservation
4.	Biodiversity Conservation	Forest Department(Wild Life Wing)
5.	Sustainable Resource Development and Livelihood Improvement	Fisheries Department Veterinary & AH Department Horticulture Department Agriculture Department Sericulture Department District Administration (IW & Bpr)
6.	Project Management & Administration	Loktak Development Authority

3.1 Achievement: 2010-11

3.1.1 State Plan

Major Head: 2402-Soil & Water Conservation (Plan)
Minor:102 Soil Conservation
Sub Major:28 Loktak Development Authority
Detailed - 00
Object: 31-Grant – in Aid
(i) Others (Salary & Wages)

Loktak Development Authority					
	Earmarked		Achievement		Remarks
	Physical	Financial	Physical	Financial	
		(Rs in lakhs)		*(Rs in lakhs)*	
(a) Institutional Mechanism		700.00		700.00	*A sum of Rs. 248.25 lakhs was kept in 8449 - Other Deposits*
(b) Flushing of phumdi from Pumlen Lake through Marimba Maril	42 Lcum	50.00	42 Lcum	50.00	
(c) Procurement of Water Master Classic III	1 unit	350.00	1 unit	350.00	
Total		**1100.00**		**1100.00**	

3.1.2 SPA (FY: 09-10)

Demand No: 30 (General Economic Services and Planning)
Major Head: 2402 – Soil & Water Conservation (Plan)
Sub Major – 00
Minor Head: 800 – Other Expenditure
Sub Head: 02 – Development of Loktak Lake
Detailed – 00
Object: 31 – Grant – in – Aid for the year 2009-10

Project: Conservation and Management of Loktak and Associated Wetlands Integrating Manipur River Basin (Short Term Action Plan)

Though the budget provision is for FY 2009-10, actual implementation has taken place in 2010-11 as funds were released at the end of the financial year.

Activities	**Earmarked**		**Achievement**		**Remarks**
	Physical	Financial	Physical	Financial	
		(Rs in lakhs)		*(Rs in lakhs)*	
1. Phumdi Management					
• Mechanical Removal	27.93 Lcum	1022.24	23.13 Lcum	1156.57	
• Removal from Drainage System	1.60 Lcum	32.82	-	-	
• Flushing of Phumdi	-	-	40.44 Lcum	459.49	

• Economic Utilisation					
-Transportation	22.64 Lsqm	2293.88	17.99 Lcum	1797.50	
- Organic Manure/ Compost	2 units	48.00	1 unit in progress	7.74	
- Up-gradation of Biotech. Lab		10.00			
• Mobilisation Advance				308.00	
• Payment for Cost escalation				329.39	
2. Water Management					
• Improvement of Drainage system	3.16 Lcum	182.77	2.87 Lcum	58.18	
• Desiltation at critical locations	2.50 Lcum	144.60	0.96 Lcum	54.97	
• Construction of Cross Regulators	4 units	38.58	4units	34.47	
• Water Allocation Plan		10.00			
• Total Sanitation Cover					
- BPL	2704	202.80	2704 units	247.87	*Implemented by PHED*
-APL	676	65.57	676 units		
3. Catchment Conservation					
a) Treatment of Degraded Forests					*Implemented by Forest Deptt.*
• Afforestation					
Preparatory operation	5000 ha	515.00	5000 ha	350.00	
Final plantation	3563 ha	123.98	3563 ha + 5000 ha	400.00	
Maintenance of 1 yr plantation	3024 ha		3024 ha + 3563 ha	146.08	*3563 ha Final Plantation and 3024 ha of Maintenance work funded through TFC*
Maintenance of 2 yr plantation			3024 ha	100.70	
• Aided Regeneration					
Aided regeneration operation	6000 ha	498.00	6000 ha	408.00	
Maintenance of 1 yr plantation	3947 ha	97.49	3947 ha	148.20	
Maintenance of 2 yr plantation	3220 ha	79.53	3220 ha	97.49	
• Small Scale Engg. Works		49.20		19.20	
					Rs.30 lakhs for small scale engg. Works from TFC
b) Management of Shifting cultivation					
• Agroforestry					
Preparatory operation	500 ha	28.60	500 ha	28.60	
Final plantation			500 ha	17.00	
• Promotion of settled agriculture	150 ha	69.00	150 ha	69.00	*Implemented by Horti. & SC Deptt.*
• Improved Mngmnt. of Homesteads	150 ha	15.00	150 ha	15.00	
• Alternate Sources of Energy	1000 units	5.00	500 ha		*TFC*
• Livelihood Improvement (Hills)		54.03	Livelihood activity programs in progress	54.03	
4. Biodiversity Conservation					
• Water birds conservation		34.50		34.50	*Implemented by Wild Life Wing, Forest Deptt.*
• Capacity building for Park management		26.70		27.19	

5. Sustainable Resource Development & Livelihood Improvement					
• Operationalisation of Fish hatcheries	2	26.14	2	26.14	*Implemented by Fisheries Deptt.*
• Alternative Livelihoods for fishers		339.50			*To be implemented by 5 Line Depts*
6. Project Mgmt.& Administration					
• Monitoring & Evaluation		93.75		32.30	
• Capacity Building		93.75			
• Contingency		62.50		32.60	
	Total	**6500.00**		**6463.10**	

3.1.3 SPA (FY: 10-11)

Demand No: 30 (General Economic Services and Planning)
Major Head: 2402 – Soil & Water Conservation (Plan)
Sub Major – 00
Minor Head: 800 – Other Expenditure
Sub Head: 02 – Development of Loktak Lake
Detailed – 00
Object: 31 – Grant – in – Aid for the year 2010-11

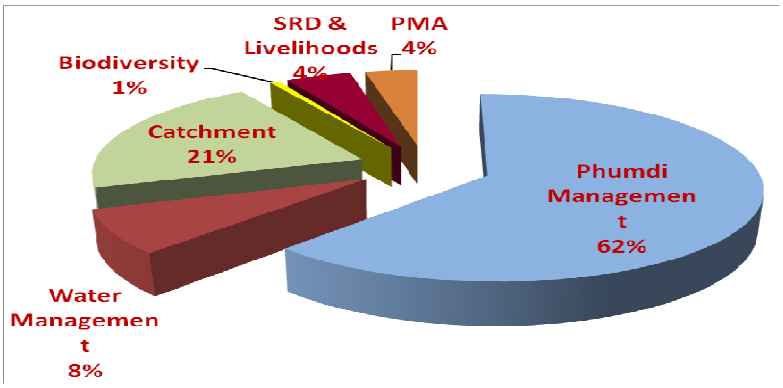
Project: Conservation and Management of Loktak and Associated Wetlands Integrating Manipur River Basin (Short Term Action Plan)

Activities	**Earmarked**		**Achievement**		**Remarks**
	Physical	Financial	Physical	Financial	
		(`in lakhs)		*(`in lakhs)*	
1. Phumdi Management					
• Mechanical Removal	28.70 Lcum	1050.42	11.03 Lcum	430.11	
• Removal from Drainage System	1.67 Lcum	34.25	0.17 Lcum	3.11	
• Manual Flushing	32.20 Lsqm	415.38			
• Phumdi Restoration	6 Lsqm	284.58			
• Economic Utilisation					
-Transportation	22.96 Lsqm	2326.31	2.01 Lcum	204.31	
- Organic Manure/ Compost		15.00			
- Up-gradation of Biotech. Lab		10.00			
• Price Escalation				202.05	
• Plant & Machinery Advance				2240.00	
2. Water Management					
• Improvement of Drainage system	3.25 Lcum	187.98			
• Construction of cross regulators			2units	8.76	
• Desiltation at critical locations	2.00 Lcum	115.68			
• Water Allocation Plan		10.00			

• Total Sanitation Cover				224.99	*Transferred to PHED Dpt.*
- BPL	2365	177.38	2365 in progress		
-APL	1015	98.46	1015 in progress		
3. Catchment Conservation				946.37	*Transferred to Forest Dpt.* * *Expenditure borne from 2009-10 budget and reported in the achievement of 2009-10.*
• Afforestation					
Preparatory operation	2000 ha	206.00	2000 ha		
Final plantation	5000 ha	-*			
Maintenance of 1 yr plantation	3563 ha	146.08			
Maintenance of 2 yr plantation	3024 ha	100.70	3024 ha*		
• Aided Regeneration					
Aided regeneration operation	4700 ha	390.10	4700 ha		
Maintenance of 1 yr plantation	6000 ha	148.20	6000 ha		
Maintenance of 2 yr plantation	3947 ha	97.49	3947 ha		
• Small Scale Engg. Works		80.80			
• Agroforestry					
Preparatory operation	4500 ha	257.40	4500 ha		
Final plantation	500 ha	-*			
• Promotion of settled agriculture	250 ha	115.00	250 ha	140.00	*Transferred to Horticulture Dpt.*
• Improved Mgmnt. of Homesteads	250 ha	25.00	250 ha		
• Alternate Sources of Energy	1000 units	5.00	1000 units		
• Livelihood Improvement (Hills)		122.38	-		
4. Biodiversity Conservation				50.50	*Transferred to Wild life Dpt.*
• Water birds conservation		37.50	Study on water birds in progress.		
• Capacity building for Park management		13.00	1 Training Program conducted & 1 vehicle purchased.		
5. Sustainable Resource Development & Livelihood Improvement				5.00	*Transferred to Fisheries Dpt.*
• Lake Restocking		5.00	Lake Restocking done		
• Alternative Livelihoods for fishers		384.50			
6. Project Mgmt.& Administration		260.72			
• Monitoring & Evaluation/Capacity building				18.84	
• Contingency				12.14	
	Total	**7000.00**		**4485.67**	

4. An Update on Implementation of Short Term Action Plan

The Short Term Action Plan is at the end of second year of implementation. The Steering Committee of LDA provides the policy direction and maintains an overview of implementation of various activities and coordination between various Line Departments and Agencies. The Steering Committee chaired by the Chief Secretary, Government of Manipur, Mr. D.S.Poonia has introduced several important measures for enhancing effectiveness of project implementation, key being streamlining of project fund flows, convergence of funds and schemes with Line Departments, establishment of a Project Management Unit within LDA, and implementation of the monitoring system recommended under the Monitoring and Evaluation Framework. The Committee has also approved setting up of a Technical Advisory Committee to provide technical support to conservation and management of Loktak Lake. Additionally, a Committee on Convergence has been constituted under the Principal Secretary (Forests and Environment) to enhance convergence amongst various schemes being implemented by line departments working under the project. An Interdepartmental Coordination Committee on Nambul River has also been constituted.



STAP is implemented by LDA in collaboration with Forest Department, Horticulture and Soil Conservation, Public Health Engineering and Fisheries Department. The Planning Department facilitates the fund flows, convergence of fund/schemes and reporting activities for STAP. Component wise allocation of funds is illustrated in the pie chart.

The following are the highlights of project implementation:

4.1 Phumdi Management

- **Mechanical Removal:**

Management of *phumdi* has been one of the focus areas during implementation of STAP for lake restoration. Mechanical removal of *phumdi* was initiated in January 2010 by LDA. The work has been taken up in strategic locations along the shoreline of the Lake. A total of 34.16 Lcum of *phumdi* has been removed by this method during the reporting year.

- **Manual Flushing:**


A cost effective and eco-friendly method of managing *phumdi* is by manual flushing through Khordak and Ungamel channels down the Manipur River. LDA has successfully flushed 4.04 sq km of *phumdi* from Loktak. Flushing of *phumdi* is done in consultation with NHPC which regulates the gates of Ithai barrage. This activity also provides employment opportunities for the local communities while contributing to lake improvement.

- **Phumdi Restoration:**

Under *phumdi* restoration, stray thick *phumdi* are being restored to the contiguous thick masses located in the northern zone such as *Maibam Phumlak* so that they get integrated into a single system to perform vital ecosystem services.

- **Transportation:**

The removed *phumdi* are transported to disposal sites and composting yards initiated at Ningthoukhong and Moirangkhunou. During the year 18.16 Lcum of the phumdis was transported to the designated disposal sites. Steps have been initiated in managing the composting yards by private agencies and local farmers' associations emphasising on value addition and promotion of uses in Loktak catchment. The Biotechnology Laboratory of LDA has been upgraded to support culture of microorganisms for composting purposes.

- **Removal of *Phumd*i from the Drainage System**:

Most of drainage systems in the wetland complex have been choked with *phumdi* thereby reducing their discharge capacity drastically. This has resulted to floods upstream as well as the processes of lake circulation have been impaired. Several drains have been rejuvenated by removing phumdi that have been blocking the waterways.

- **Economic Utilisation of Phumdi**

During the reporting year, two composting yards have been established in the surrounding villages of Loktak Lake at Mayang Imphal and Komlakhong. Consultation with private partners is underway to pave way for large scale production of *phumdi* compost through Public Private Partnership efforts.

4.2 Water Management

Improvement of Drainage System

LDA has undertaken concerted efforts in improving the Lake drainage by undertaking desiltation activities in 14 inflowing streams of the Lake. During the reporting year, 2.87 Lcum silt has been removed from the drainage systems improving the flow regime.

Desiltation of critical areas

Desiltation activities have been undertaken along the critical stretch near the mouth of the western streams to improve the water holding capacity and water exchange of Loktak Lake. Currently 0.96 Lcum silt has been removed from the mouth areas. The dredged material is used for constructing embankment in low lying areas along the southern and western periphery to mitigate flood.

Construction of Cross Regulators

Regulators have also been constructed in 4 sites (Nausekpi Khong, Hiyangkhong, Naoremkhong and Keibul- Takmu Khong) to mitigate flood and water logging in agricultural areas of the northern and southern zone of Loktak Lake.

Water Allocation Plan

The stakeholder endorsed Water Allocation Plan has been developed by Wetland International- South Asia in collaboration with Centre for Ecology and Hydrology, UK. The initial assessments and evaluation of scenarios indicated trade-offs between hydropower generation and maintenance of lake ecological character. Base on the evaluation WI-SA has recommended a barrage operation rule to the Steering Committee which will be jointly determined by LDA and NHPC in consultation with all stakeholder Departments and local community, and facilitated by WISA. Being a Ramsar site, maintenance of ecological character finds a significant place in WAP. Monitoring of ecosystem components, processes and services will be conducted according to the Monitoring and Evaluation Framework developed by WI-SA, based on which the barrage operation rule will be reviewed by the Steering Committee.

Total Sanitation Campaign



The programme is being implemented in convergence with the flagship national programme of Total Sanitation Campaign under the Department of Drinking Water Supply of the Ministry of Rural Development. A total of 3380 community toilets have been constructed in identified villages through micro-planning with the community groups. The Public Health Engineering Department which is implementing the programme is also organising awareness campaigns on safe sanitation through its Community Capacity Development Unit (CCDU).

4.3 Catchment Conservation

- *Treatment Degraded of Forests*




The Forest Department has undertaken the Catchment Conservation programme by treatment of barren and degraded areas through Afforestation programme in 8563 ha and promoting agro-forestry over 500 ha in 3 watersheds (Loktak, Thoubal and Heirok). Activities are being implemented in a participatory manner through JFMCs and FDAs as per guidelines of Govt. of India.

Further another area of 6000 ha of degraded forest lands have also been regenerated in these watersheds through activities under aided natural regeneration programme.

Small scale engineering works like counter trenching (in 50 ha), construction of Gabion check dams (in 300ha), bamboo spurs (1500 Rm), vegetative check dams (1500 Rm) and water harvesting structures(50 units) have also been taken up for control of soil erosion, landslides and arrest flow of silt from critical micro-watersheds.

- *Management of Shifting Cultivation*

An area of 400 ha under shifting cultivation has been converted to Settled Agriculture and an equal area of homesteads have been improved by the Horticulture and Soil Conservation Department by promoting

cultivation of species which would provide long term economic benefits to the community.

To reduce the pressure on forest 1000 units of energy efficient *chullas* have been installed in these 3 watersheds. Diversified livelihood options like weaving, bamboo and cane craft, integrated livestock, mushroom culture, apiculture, ginger dehydration and oleoresins, spices processing and preservation and processing of fruit and bamboo have been initiated by Forest Department under the ongoing STAP for conservation and management of Loktak Lake.

4.4 Biodiversity Conservation

- **Water Bird Conservation**




The water bird migration studies have been initiated in collaboration with BNHS, Wildlife Wing of Forest Department, and local organisations. Assessments have been conducted for species distribution, composition, feeding and foraging habits in relation to the Lake environment. The bird census programme is under progress by laying transect lines, point counts at strategic locations and "mist netting" methods. Capacity building programme on "Monitoring of Water Birds and Wildlife Management" and "Media sensitisation" have been organised for KNLP managers. KLNP management infrastructure has been enhanced by providing them with vehicles, motor bikes, dugout canoes, computers and WTI outfits.

- **Capacity Building for Keibul Lamjao National Park Management**



Park management capacity has been built up to meet the challenges of conservation based on scientific management. Under STAP, Trainings on Wildlife Conservation and Water Birds Studies have been taken up. Infrastructure development in terms of vehicles, canoes, WTI outfits for inspection, and computers, soft ware for planning and management.

4.5 Sustainable Resource Development & Livelihood Improvement

4.5.1 Fisheries Development

Fishery Department, under STAP, has undertaken efforts to enhance the fishery resources around Loktak Lake by upgrading and bringing into operation 12 non-functional hatcheries. The hatcheries are operated by Hatchery Management Committees formed by local community. The initial support in terms of seed money is provided through STAP subjected to a condition of stocking 50% of the fingerlings produced into Loktak Lake free of cost.

The Fishery Department has restocked the Lake with 27 lakh fingerlings to enhance the Lake fishery resources. Fingerlings of Indian major carps and Common carps are mostly used for restocking. This is being undertaken through a convergence programme with the Department of Fisheries.

4.5.2 Livelihood Improvement

The STAP envisages development of alternative livelihood options for fishers to reduce pressure on lake ecosystem as well as for improvement of overall quality of life. Diversification and providing basic social infrastructure can complement the fisheries activities with a view to attain food security and economic empowerment. Phum hut fishers have been identified as the beneficiaries for the first phase through intensive processes of field surveys and verifications. Livelihood schemes are being worked out in consultation with Line Departments who will be implementing these schemes.

4.6. Project Management and Administration

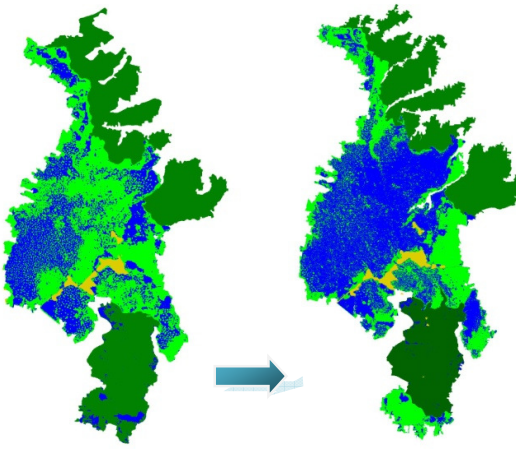
4.6.1 Monitoring and Evaluation

The Management Plan is monitored based on the Project Monitoring Framework developed by WI-SA following the Ramsar guidelines. The Steering Committee has met for 18 times since the project inception and reviewed the activities and provided policy decisions on the Management Plan. Interdepartmental workshop has been conducted in October 2010 in which the Management action plan was reviewed in relation to the 3-tier Monitoring and Evaluation Framework.

Third party Independent Monitors, Development Alternatives, New Delhi, & Karunya University, Coimbatore, have conducted the Mid-Term Evaluation during November- December, 2010.

Lake Ecosystem Monitoring

The lake ecosystem is monitored by studying 17 indicators for water quality on monthly basis in Lake Monitoring Laboratory at Ningthoukhong and 6 indicators for hydro-meteorology on daily basis. GIS based monitoring is also conducted by procuring NRSA imagery on land use and land cover, vegetation and *phumdi*. The establishment of Wetland Inventory, Assessment and Monitoring (WIAM) has been initiated with technical support of WI-SA.



The thematic maps show reduction in phumdi in Loktak lake.

4.6.2 Capacity Building

As part of the capacity building programme aimed at establishing an effective management system, training on Community Participation & Facilitation was held in Gurgaon during 8-11 Feb.2011. The training was conducted by Association for Stimulating Knowhow (ASK), Gurgaon, in collaboration with WISA, New Delhi. Altogether 18 officials from Forest, Wild Life, Fisheries, PHED, Horti & SC, Sericulture, and LDA attended the training course.

4.6.3 Communication Education Participation and Awareness

LDA is making constant efforts in raising awareness of community by organising campaigns on ecosystem services of Loktak Lake. Events like Loktak Day, October 2010 and World Wetlands Day, February 2011 were celebrated involving school students, local youth clubs and community in catchment areas. Cultural shows and painting competition involving school children have been organised in which Ramsar masks were distributed to the participants to raise awareness on conservation of the Lake ecosystem services.