# Socio-Economic Condition of the Communities Dependent on Loktak Lake, **Manipur: A Study on Five Lakeshore Villages**

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#### ABSTRACT

We investigated the socio-economic conditions of the community living in five villages (Nongmaikhong, Phoubakchao, Laphupat Tera, Karang and Ithing) located in and around Loktak lake, and their dependency on the lake for livelihoods. Questionnaires, interviews and direct observations were used in data collection. Questionnaire was administered to 150 randomly selected households. Majority of the respondents were Hindu (73.06%) with fishing (99%) as their main occupation. While 33.29% of the respondents were illiterate, 32.0% had studied up to class VIII. The total annual income of 35.80% households was below Rs.30,000. Most of the respondents lived in kuccha houses (59.13%), used low cost toilets (60.33%), used river water for drinking (48.6%) and firewood (99%) for cooking food. The local communities depended on the lake for fishing, collection of vegetables, and prawns etc. for their livelihood and income. Fish and vegetables were the major resources for which 99% and 82.53% respectively, of all the five village communities depended on the lake. Several threats from various other anthropogenic pressures on the lake are resulting in poor socio-economic condition of the local people. Therefore, to conserve the lake and its resources from further degradation effective conservation and management programmes need to be taken up between the government, local authorities and community around the lake.

Key Words: Community; Dependency; Livelihood; Fishing; Income Generation; Conservation

# **INTRODUCTION**

Loktak lake, the largest freshwater wetland in northeastern India lies in the southern part of the Imphal valley of Manipur (from  $93^{\circ} 46'$  to  $93^{\circ} 55'$  E and  $24^{\circ} 25'$ to  $24^{0}42$ 'N). The lake is oval in shape with a maximum length and width of 26 km and 13 km respectively (Figure 1). Its depth varies from 0.5 to 4.58 m with an average depth of 2.7 m. Loktak lake can be considered as a sub-basin of the Manipur River basin. It has a direct catchment area of 980 sq.km and indirect catchment area of 7157 sq.km. There are 55 rural and urban settlements around the lake with a total population of 100,000 (LDA and WISA 1999). Because of its ecological status and its biodiversity values, the lake was designated as a Wetland of International Importance under the Ramsar Convention on 23<sup>rd</sup> March, 1990. Keibul Lamjao, the only floating national park in the world and the home of the endangered Brow Antlered Deer, Sangai (Cervus eldi eldi) is situated in the south-west part of the lake (Trisal and Manihar 2004).

The characteristic feature of the Loktak lake is the presence of floating islands covered with vegetation, locally known as *phumdis*. These floating islands, occurring in all sizes and thickness are heterogeneous mass of soil, vegetation and organic matter at various stages of decomposition. They float on lake water with about one-fifth thickness above and four-fifth under the water surface. Generally their thickness varies. The maximum thickness is 2.4 m (Trisal and Manihar 2002). The phumdis cover an area of 206.51 sq. km. The lake water is used for drinking and domestic purposes, irrigation, generation of hydro-electricity power, biodiversity, recreation etc. Most of the communities were

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involved in fishing, fish marketing, fish farming, agriculture and ferrying, weaving products of the lake etc. (Singh and Moirangleima 2009).

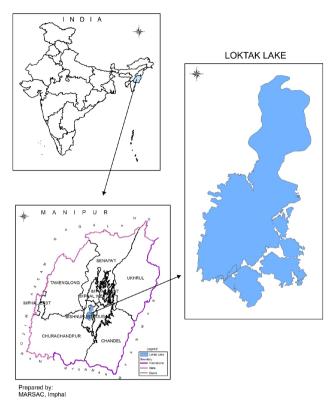


Figure 1. Map of the study area (Loktak lake, Manipur (from: Manipur Remote Sensing Application Centre, Imphal

The area experiences sub-tropical monsoonal climate with an annual rainfall of 982.2 mm to 1980.8 mm. The rainy season is mostly from April to September. The maximum rainfall is recorded in July. The mean daily minimum and maximum temperature recorded were 1 °C and 29 °C respectively (Singh et al. 1999). There are two types of soils in the areas around the lake: the Residual poor sandy soil and Transported alluvial soil (Singh 2010).

A large population living in and around the lake depends upon its resources for sustenance. People of Manipur are culturally, socially and economically linked with the Lokak and hence the lake has been referred to as lifeline of Manipur (Trisal and Manihar 2002). The socio-economic values of the lake include hydropower generation, irrigation, fisheries, control of floods, supply of drinking water, production of aquatic organisms for food and of commercial importance, the many uses of *phumdi* (mass of floating vegetation) and water transport. Among natural values the most important is the conservation of wildlife including many rare fishes and migratory birds, besides the maintenance of high biodiversity. More than 100,000 people living in and around the lake depend on the lake for their livelihood to a great extent (Singh and Shyamananda 1994). Communities living in and around Loktak and associated wetlands are directly or indirectly dependent upon the lake resources for sustenance. The lake provides various resources including fisheries, vegetation and water. Lake degradation leading to decline in these resources has directly impacted the livelihoods of the local communities. Therefore, proper understanding of the relationship between lake resources and community livelihoods is critical to management of the lake. 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 (WISA 2005).

Fishery is an important economic resource of Manipur contributing to approximately 3% of the state's gross domestic product. Loktak Lake is the largest fishery resource of the state accounting for more than 50% of its fish producing area. At present the lake is under stress mainly due to anthropogenic pressures. Deforestation and shifting cultivation in the catchment area has promoted soil erosion resulting in increased lake siltation. The problem has further been aggravated due to prolific growth of floating weed mats locally called as phumdis. Besides nutrients from the catchment area and domestic sewage from Imphal city is carried by Nambul River, which finally discharges into the lake. Pesticides used in the agricultural fields are also washed off into the lake. In addition to above threats, encroachments through construction of fishponds, roads, settlements and construction of Ithai barrage have gradually led to degradation of the lake ecosystem (Trisal and Manihar 2004). This indicates that conservation of the lake which is the main source of livelihood for the people living in and around the lake is necessary by involving the concerned authorities along with the local communities. With this background household surveys were conducted to determine the socio-economic conditions of the community living in five villages in and around Loktak lake and their dependence on the lake for livelihoods.

#### **METHODS**

The five villages included three lakeshore villages -Nongmaikhong, Phoubakchao and Laphupat Tera, and two island villages - Karang and Ithing (Figure 2). These villages were selected for the present study based on their accessibility.

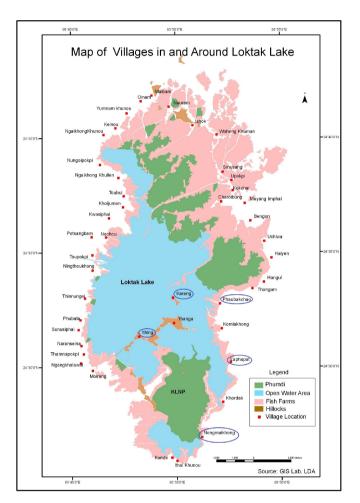


Figure 2. Location of villages in and around Loktak lake, Manipur (from: Loktak Development Authority, Imphal)

The present study is mainly based on primary data and information collected through household a questionnaire survey. The questionnaire was designed in English and asked in Manipuri, which is the local language of Manipur. Stratified random sampling of about 10% of the households (Sah and Heinin 2001, Shrivastava and Heinen 2007, Singh and Moirangleima 2009) resulted in the selection of 150 households (20 households from Nongmaikhong, 50 from Phoubakchao, 40 from Laphupat Tera, 25 from Karang and 15 from Ithing). The questionnaire sought to obtain information on the socioeconomic condition of the local people and their dependence on the lake for livelihoods. It was prepared referring (Sah and Heinin 2001, Baral 2005, Baral and Heinin 2007, Mishra et al. 2008). It was pretested and modified to meet the objectives of the study and adapted to suit the local conditions of the surveyed villages. The topography and demographic profile of the five villages are given in Table 1.

### RESULTS

# General Particulars of the Respondents and Their Household

Among the 150 respondents from the selected households, 81.1% were males (Table 2). The highest male respondents (84%) were from the villages of Phoubakchao and Karang. The highest female respondents (25%) were from Nongmaikhong village. Majority of the community in the five villages was Hindu (73.06%), followed by Muslims (22%) and Christians (4.93%). In Nongmaikhong village, all respondents were Hindu. Schedule caste (47%) was the major group for all the villages; all respondents in Karang and Ithing villages belonged to Schedule caste. At the education level, the maximum illiteracy was 39.10% in Laphupat Tera village while the maximum literates (38.14%) were found in Phoubakchao village with Primary (nurseryclass VIII) education. Among the total respondents, 33.29% were illiterate, 32.68% were Primary educated, 23.14% Secondary (class IX-XII), 5.15% Undergraduates and 5.71% Graduate and above.

#### **Respondent's Income**

The income level was, in general quite low. For all the five villages, the highest proportion of respondents had their annual income below Rs 30k (35.80%), followed by 34.13% in the level of Rs 30-60k, 24.36% in the level of Rs 60-90k and 5.7% above Rs 90k (Table 2). Highest percentage of people in Ithing village (93.33%) had an annual income in the range Rs 60,001-90,000/-. This is due to good transport facilities available in this village for quick transportation of fishes for selling. The village is also nearest to a big market like Moirang where the communities sold fishes and vegetables collected from the Loktak lake.

Characteristics	Nongmaikhong	Phoubakchao	Laphupat Tera	Karang	Ithing
Distance from Loktak lake (m)	170	650	345	0	0
Latitude	24°26'53'' N	24° 32'44'' N	24°30'15'' N	24°32'55'' N	24°31'23'' N
Longitude	93°51'11'' E	93°52'11'' E	93°52' 49'' E	93°49'56'' E	93° 48'9''E
Location	South	East	East	Central	Central
Village area (acre)	412	770.61	2478.09	152.27	54.39
Total population	848	2531	2007	1673	1056
Number of household	143	433	343	223	141
Female/1000 male	1019	1029	979	1052	1190
Literacy (%)	46.46	29.86	49.67	32.03	40.15

Table 1. Topography and	demographic r	profile of the five	surveyed villages
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Source: Primary Census Abstract, Manipur (Census of India, 2001), Loktak Development Authority (LDA)

Table 2. General particulars of the respondents and their households

Particulars	Nongmaikhong	Phoubakchao	Laphupat Tera	Karang	Ithing	Mean
Gender of respondents (%):						
1) Male	75	84	82.5	84	80	81.1
2) Female	25	16	17.5	16	20	18.9
Religion (%):						
1) Hindu	100	40	40	92	93.33	73.06
2) Christian	0	0	10	8	6.66	4.93
3) Islam	0	60	50	0	0	22
Category (%):						
1) Schedule caste	35	0	0	100	100	47
2) OBC	65	70	55	0	0	38
3) General	0	30	45	0	0	15
Educational level (%):						
1) Illiterate	32	35.73	39.1	26.82	32.77	33.29
2) Primary (Nursery-VIII)	30.66	38.14	31.18	33.17	30.25	32.68
3) Secondary (Cl. IX-XII)	21.33	18.55	20.29	27.8	27.73	23.14
4) Under-graduate	6.66	3.43	3.96	5.85	5.88	5.15
5) Graduate and above	9.33	4.12	5.44	6.34	3.36	5.71
Total annual income (%):						
1) Below Rs.30,000/-	35	64	80	0	0	35.80
2) Rs. 30,001 to 60,000/-	55	36	5	68	6.66	34.13
3) Rs. 60,001-90,000/-	10	0	2.5	16	93.33	24.36
4) Above Rs. 90,000/-	0	0	12.5	16	0	5.7

The major portion of the income comes from fishing (48.53%) followed by agriculture (18.89%), handloom and handicraft (9.12%), livestock rearing (7.49%), business (5.53%), government employment (4.88%), private employment (4.56%) and migrant

worker (0.97%). The pattern of the respondent's income is shown in Table 3.

Occupation wise, 99% respondents are fishers, 27.8% are farmers, 53.36% weavers and artisans, 42.33% work as livestock farmers, 24.26% are engaged

4) Livestock rearing

6) Migrant worker

8) Private employee

7) Government employee

5) Business

Main source of income	% share
1) Fishing	48.53
2) Agriculture	18.89
3) Handloom and Handicraft	9.12

Table 3. Pattern of the respondent's income

in business, 12.7% as migrant worker, 11.33% and 11.83% as government and private employees. Fisherfolk were engaged in selling of fishes caught from Loktak lake. Farmers cultivate paddy. Weavers and artisans are engaged in handloom work like weaving of clothes and handicrafts like mat making, making of fishing traps, etc. Duck, hen, cow, goat, pig were reared by livestock farmers. Small grocery shops were owned by business people. Migrant workers were involved in work like pulling of rickshaw, working as labourer in construction of buildings, roads etc. (Table 4).

Table 4. Percent of rea	spondents with	different occup	ation in the	e studied villages

7.49

5.53

0.97

4.88

4.56

Occupation	Nongmaikhong	Phoubakchao	Laphupat Tera	Karang	Ithing	Mean
1) Fishing	95	100	100	100	100	99
2) Agriculture	15	54	70	0	0	27.8
3) Handloom and Handicraft	90	26	37.5	60	53.33	53.36
4) Livestock rearing	85	38	30	52	6.66	42.33
5) Business	45	34	5	24	13.33	24.26
6) Migrant worker	30	16	17.5	0	0	12.7
7) Government employee	20	4	10	16	6.66	11.33
8) Private employee	40	6	2.5	4	6.66	11.83

## Housing

Data in Table 5 show that all of the respondents lived in semi-pucca houses in Nongmaikhong village; 85% respondents in Laphupat Tera village lived in kutcha houses. On average for all the villages, 59.13% live in kutcha (mud-thatch) houses, 39.13% in semi-pucca and 1.73% in Pucca (brick-cement) houses. For the construction of kutcha houses, grasses like *Zizania latifolia* and *Imperata cylindrica* were used for thatching the roof, *Phragmites karka*, *Narenga prophyrocroma*, mud and bamboo were used for walls and for floor, mud was used. Pillars were made from tree species like *Eucalyptus citriodora* which is collected locally and planted by the local communities.

#### Sanitation and Water

The highest proportion of the respondents (90%) use low cost toilets in Nongmaikhong village. Overall, only 9.5%

of the respondents use modern sanitary latrines with septic tanks, 30.16% use open pit and 60.33% low cost toilets. The use of modern sanitary latrines with septic tanks was constrained by their cost that the communities cannot afford.

Six different sources are used for drinking water. These were Loktak lake (40%), Rain water (4.23%), Public water supply (0.8%), Hand pump (2%), Pond (26.4%) and River (48.6%). Loktak lake was not used for drinking water in the villages Nongmaikhong, Phoubakchao and Laphupat Tera as they could use the water from river Imphal flowing close by. All the respondents in the villages Karang and Ithing used Loktak lake for drinking water.

# Fuelwood

There is no forest near the villages from where firewood can be collected. Therefore, tall grasses such as *Phragmites karka* and *Saccharum munja* collected from

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Housing and Sanitation	Nongmaikhong	Phoubakchao	Laphupat Tera	Karang	Ithing	Mean
Type of house:						
1) Kuccha	0	80	85	64	66.66	59.13
2) Pucca	0	2	0	0	6.66	1.73
3) Semi-pucca	100	18	15	36	26.66	39.13
Mode of sanitation:						
1) Septic	10	2	7.5	8	20	9.5
2) Open pit	0	20	37.5	20	73.33	30.16
3) Low cost toilets	90	78	55	72	6.66	60.33
Source of drinking water:						
1) Loktak lake	0	0	0	100	100	40
2) Rain water	0	0	2.5	12	6.66	4.23
3) Public water supply	0	4	0	0	0	0.8
4) Hand pump	0	10	0	0	0	2
5) Pond	75	52	5	0	0	26.4
6) River	100	48	95	0	0	48.6
Fuel used for cooking:						
1) Firewood	100	100	95	100	100	99
2) Coal	0	6	0	8	13.33	5.46
3) Kerosene	15	0	0	16	6.66	7.53
4) LPG (Gas)	45	30	15	76	40	41.2
5) Electricity	5	0	0	0	0	1

Table 5 Housing and	ather facilities	(aquitation	drimling water	fuel for eaching	) in the studied villages
Table 5. Housing and	other facilities	(samtation.	urinking water.	I luer for cooking	) in the studied villages

Table 6. Education, health facilities and health problems

Education and Health	Nongmaikhong	Phoubakchao	Laphupat Tera	Karang	Ithing	Mean
Educational facilities						
1) Balwadi/Anganwadi	100	100	100	100	100	100
2) School	100	100	100	100	100	100
3) College	0	0	0	0	0	0
Medical treatment facilities						
1) Allopathy	0	0	0	100	0	20
2) Homeopathy	0	0	0	0	0	0
3) Traditional medicine	65	52	55	84	33.33	57.86
4) Not available	35	48	45	0	66.66	38.93
Health problems of family members						
1) Diarrhoea	90	38	55	36	33.33	50.46
2) Jaundice	30	14	32.5	20	20	23.3
3) Stomach infections	15	32	7.5	20	20	18.9
4) Skin infections	40	8	7.5	28	20	20.7

the lake are used for fuel while some *Eucalyptus* citriodora, Grevillea robusta, Melia azedirach, Litsaea monopetala, Castanopsis hystrix and Delonix regia were collected from the plantations. Since these firewood

sources could not meet the household needs, 99% of the respondents purchased the wood from the market. Other fuels used for cooking in the villages were coal (5.46%), kerosene (7.53%), LPG (41.2%) and electricity (1%).

Land and Assets Owned	Nongmaikhong	Phoubakchao	Laphupat Tera	Karang	Ithing	Mean
Sole ownership:						
1) Land	100	100	100	100	100	100
2) Fish farm	75	56	95	40	60	65.2
3) Agricultural land	20	60	65	0	0	29
Household assets:						
1) TV	80	30	50	76	100	67.2
2) Radio	85	52	85	96	33.33	70.26
3) Two wheeler	30	32	17.5	16	6.66	20.43
4) Four wheeler	5	6	7.5	8	13.33	7.96
5) Tractor	0	4	5	0	0	1.8
6) Boat	65	82	100	100	80	85.4
7) Refrigerator	5	0	10	0	0	3
8) Generator	0	4	27.5	20	0	10.3
9) Mobile phone	90	84	95	96	93.33	91.66
Livestock reared:						
1) Cow	0	30	15	0	0	9
2) Buffalo	0	0	15	0	0	3
3) Goat	0	26	15	0	0	8.2
4) Swan	0	12	10	0	0	4.4
5) Duck	60	52	60	76	40	57.6
6) Pig	40	28	25	24	13.33	26.06
7) Bullock	0	4	0	0	0	0.8
8) Hen	90	62	62.5	64	46.66	65.03

Table 7. Ownership of land, household assets and livestock reared

# **Education and Health Facilities**

Balwadi/Anganwadi and school are educational facilities available in the villages. There is no college and hence for higher education, the students have to go to towns like Mayang Imphal, Kumbi, Moirang, Kakching, Wabagai and Imphal which lie 5 to 55 km away. Some students go outside the state for higher studies.

In terms of health facilities, only village Karang has allopathic medical facility. Most of the respondents from Karang village also reported high use of traditional medicine which is practiced in all the villages. In the Ithing village, there is no health facility and the villagers have to go to nearby towns or depend mainly on traditional medicine (57.86%). Common diseases in the villages are diarrhoea (50.5%), jaundice (23.3%), stomach infections (18.9%) and skin infections (20.7%) which are apparently due to poor water quality and lack of proper sanitation (Table 6).

#### Land Ownership and Household Assets

Ownership, household assets and livestock reared is presented in Table-7. Land for settlement was found to owned by all respondents i.e. 100% in all villages, followed by land for fish farm (65.2%) and agriculture (29%). Land was used for growing vegetables and fruits, livestock rearing, fish farming, agriculture and own settlement. Fish farm ownership was highest i.e. 95% in Laphupat Tera village. The size of sole ownership total landholding ranges from 0.5-5 acres. Fishes like Ctenopharyngodon idella, Chirhinus mrigala, Channa striata, Labeo gonius, etc. were cultured in the fish farm. Ownership of agricultural land was found in highest percentage i.e. 65% in Laphupat Tera village. Paddy was found to be the main crop of cultivation in the agricultural land. In Karang and Ithing villages there is no agricultural practices found due to shortage of land for cultivation. Hence, the main occupation of the communities in these two villages was found as fishing.

With respect to ownership of household assets, TV set and boat were owned by high percentages. TV set was found to owned in highest percentage in Ithing village (100%) while boat (100% each) both in Laphupat Tera and Karang villages. For all the villages it was found out that 67.2% of the respondents reported owning TV sets, 70.26% Radio, 20.43% 2-wheeler, 7.96% 4-wheeler, 1.8% Tractor, 85.4% Boat, 3% Refrigerator, 10.3% Generator and 91.66% Mobile phone.

Eight kinds of livestock are reared in the villages for livelihood and income generation. Ducks and hen are the most common; hen forms 90% of the livestock in Nongmaikhong village. Dairy animals are reared rarely because of the lack of grazing grounds and fodder availability. Only 9% of the respondents reared cow, 3% buffalo, 8.2% goat. In the villages of Nongmaikhong, Karang and Ithing, swan is not reared as the consumption of swan's egg or meat is against their religion i.e. Hinduism.

# Human Activities in and Around the Lake

Taking all the five villages together the respondents were found to depend on the Loktak lake for 14 different types of activities (Table 8). Fishing (99%) was the most common activity followed by boating (94.2%), collection of vegetables (82.53%), fuelwood (71.53%), water (64.3%), prawns (47.7%), eels (44.8%), thatching materials (42.6%), snails (24.7%), and materials for handicraft (20.6%). Collection of oyster and medicinal plants was also important. Fodder like Zizania latifolia and Setaria pallidefusca for feeding the livestock, fuelwood like Phragmites karka and Saccharum munja and handicraft materials like Scirpus lacustris and Cyperus brevifolius mainly for making mats, were collected from the lake.

#### DISCUSSION

The present study shows that the communities living in and around the lake Loktak are highly dependent on it for livelihood and income generation. However, various anthropogenic pressures are causing pollution and ecological degradation of the lake. Fishing in the lake was the main occupation of the respondents and major part of their annual income came from fishing alone. Species of fishes like Labeo rohita, Cyprinus carpio, Ctenopharyngodon idella and Chirhinus mrigala, etc., prawn Macrobrachium davanum, snails like Lymnaea stagnalis and Pila globossa, eel Monopterus albus, vegetables like Zizania latifolia, Nelumbo nucifera, *Eurvale ferox, Alpinia allughas, Hedvchium coronarium,* etc. were collected from the lake and sold in the local market. Other resources collected by the households were oyster Unio marginalis, fodder (Zizania latifolia and Setaria pallidefusca), fuel and thatch grasses, medicinal plants (Lagenaria vulgaris, Crassocephalum crepidioides and Melothria purpusilla and handicraft materials (Scirpus lacustris and Cyperus brevifolius).

Table 8. Respondents (%) carrying out various activities in and around Loktak lake

Activities	Nongmaikhong	Phoubakchao	Laphupat Tera	Karang	Ithing	Mean
Fishing	95	100	100	100	100	99.0
Collection of vegetable items	90	100	100	96	26.66	82.53
Collection of water	75	48	2.5	96	100	64.3
Snail collection	55	36	32.5	0	0	24.7
Collection of prawns	5	36	60	64	73.33	47.66
Collection of thatching materials	30	58	82.5	36	6.66	42.63
Collection of handicraft materials	30	18	35	20	0	20.6
Collection of fodder	0	46	15	0	0	12.2
Collection of fuelwood	85	88	90	88	6.66	71.53
Collection of medicinal plants	0	14	30	8	0	10.4
Collection of oysters	10	0	7.5	8	0	5.1
Collection of eels	0	42	50	52	80	44.8
Boating	75	96	100	100	100	94.2
Bathing	0	14	5	24	33.33	15.26

Old (>70 years age) respondents reported that various resources in the lake were abundant in the past and the communities were able to earn good income and easily meet their daily needs but now the resources are degrading and the income from selling these resources has greatly declined affecting their livelihoods. Fishes like Osteobrama belangeri, Wallago attu, Channa gachua, Bangana dero, vegetables like Polygonum barbatum, Trapa natans, fooder like Setaria pallidefusca, fuelwoods like Narenga prophyrocroma, Saccharum procerum, Quercus lamellosa, thatch grass like Imperata cylindrica, insects like Belostoma indicum and Cybister confusus (also used as food) have declined or are lost from some of the villages. The people are moving to other occupations like casual labour and livestock rearing.

It is well known that wetlands are one of the most productive and resource rich areas which provide basic needs of households and contribute to food security, income and welfare (Dugan 1990, IWRB 1992, Singh and Moirangleima 2009, McElwee 2010). In Nepal, the Ghodaghodi Lake supports more than 400 households who are extensively dependent on its plant and animal resources (Gurung 2003). Maithya et al. (2011) reported that Kadibo wetlands were important for their biodiversity and was of great socioeconomic value to the local community. Over-exploitation of the wetland resources results in their poor ecological performance.

Initiatives for the conservation of the lake have been taken up by the local communities, local NGOs and the state government. The Government of Manipur constituted a Loktak Development Authority (LDA) in 1986 for the overall improvement and management of the Lake. Removal of *phumdi*, desiltation of channels, afforestation, etc. are being taken up by this organisation. But these initiatives seem to be far from benefiting the lake and its resources. There is a need for developing and implementing a comprehensive management plan drawn up by all the stakeholders.

There is an urgent need to work on the development of the villages and provide good facilities to the villages to improve their socio-economic conditions.

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### REFERENCES

- Baral, N. 2005. Resource Use and Conservation Attitudes of Local People in the Western Terai Landscape, Nepal. M.Sc. Thesis, Department of Environmental Science, Florida International University, Miami, Florida. 115 pages.
- Baral, N. and Heinen, J.T. 2007. Resource use, conservation attitudes, management intervention and park-people relations in the Western Terai landscape of Nepal. Environmental Conservation 34: 1-9.
- Dugan, P.J. 1990. Wetland Conservation: A Review of Current Issues and Required Action. Pages 45-53, In: Nishat, A; Hussain, Z; Roy, M.K. and Karim, A. (Editors) Freshwater Wetlands in Bangladesh: Issues and Approaches for Management. IUCN-The World Conservation Union, Gland, Switzerland.
- Gurung, S.B. 2003. Education through learning by doing. Pages 57-64, In: Bhandari, B.; Abe, Osamu; Takahashi, Masahiro and Akihiro, Nakahata (Editors) Doing Education at Wetland Sites: Examples and Modalities from Asia. International Institute for Global Environmental Strategies (IGES), Ramsar Center Japan and Mahidol University, Japan.
- IWRB (International Waterfowl and Wetlands Research). 1992. Action programme for the conservation of wetlands in South and West Asia. Pages 112-119, In: Nishat, A.; Hussain, Z.; Roy, M.K. and Karim, A. (Editors) Freshwater Wetlands in Bangladesh: Issues and Approaches for Management. IUCN-The World Conservation Union, Gland, Switzerland.
- LDA (Loktak Development Authority) and WISA (Wetlands International-South Asia). 1999. Loktak Newsletter. Loktak Development Authority, Imphal and Wetland International-South Asia, New Delhi. Vol-1. 8 Pages.
- Maithya, J.K.; Wariara, Kariuki; Njoroge, J.B. and Adimo, A.O. 2011. Socioeconomic activities in Kadibo division of Nyando wetlands and their implication for wetland conservation. African Journal of Horticultural Science 4:31-47.
- McElwee, P.D. 2010. Resource use among rural agricultural households near protected areas in Vietnam: The social costs of conservation and implications for enforcement. Environmental Management 45: 113-131.
- Mishra, P.C.; Tripathy, P.K.; Behera, N. and Mishra, B.K. 2008. Socio-economic and socio-ecological survey of dependency of people on forest in Sambalpur Forest Divison, Orissa. Journal of Human Ecology 23(2): 135-146.
- Sah, J.P. and Heinin, J.T. 2001. Wetland resource use and conservation attitudes among indigenous and migrant peoples in Ghodaghodi Lake area, Nepal. Environmental Conservation 28(4): 345-356.
- Shrivastava, R.J. and Heinen, J. 2007. A microsite analysis of resource use around Kaziranga National Park, India (Implications for conservation and development planning). The Journal of Environment and Development 16: 207-226.

- Singh, Abha L. and Moirangleima, Kh. 2009. Shrinking Water area in the wetlands of the central valley of Manipur. The Open Renewable Energy Journal 2: 1-5.
- Singh, H. Tombi and Singh, R.K. Shyamananda. 1994. Loktak lake, Manipur. Worldwide Fund for Nature, India, New Delhi. 69 pages.
- Singh, R.K. 1999. What are wetlands? Pages 1-7, In: Singh, R.K. and Sharma, H.P. (Editors) Wetlands of Manipur (Vol-1). Manipur Association for Science & Society (MASS), Imphal.
- Singh, R.N.; Singh, N.S.; Garg, J.K. and Murthy, T.V.R. 1999. Loktak Notified Wetland Ecosystem and its Catchment. Pages 43-52, In: Singh, R.K. and Sharma, H.P. (Editors) Wetlands of Manipur (Vol-1). Manipur Association for Science & Society (MASS), Imphal.
- Singh, Th. Nabakumar. 2010. Loktak and its Environment in Manipur. Rajesh Publications, New Delhi. 194 pages.
- Trisal, C.L. and Manihar, Th. 2002. Management of Phumdis in the Loktak Lake. Pages 1-6, In: Trisal, C.L. and Manihar, Th. (Editors) Proceedings of the workshop on Management of Phumdis in Loktak Lake, January 22-24, 2002, Wetlands International-South Asia, New Delhi and Loktak Development Authority, Imphal.
- Trisal, C.L. and Manihar, Th. 2004. The Atlas of Loktak lake. Wetlands International-South Asia, New Delhi and Loktak Development Authority, Imphal. 93 pages.
- WISA (Wetlands International-South Asia). 2005. Conservation & Management of Loktak & Associated Wetlands Integrating Manipur River Basin. Wetlands International - South Asia, New Delhi. Vol-1. 94 Pages.

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