

Loktak Multipurpose Project and its Environmental Implications in Manipur

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Abstract

Development was considered synonymous with the materialistic achievements of the people and development concerns were confined to merely increasing production of goods and providing for facilities of comfortable living. Consequently, indiscriminate emphasis was laid on the exploitation of natural resources for maximizing outputs and causing extensive damage to the environment. Loktak Multipurpose Project came to the state with many development schemes of power, irrigation and flood control to bring prosperity to the entire Northeast India from industrialization with low cost electricity and agricultural development particular in Manipur. Though there are many expected benefits the project suffers from a number of limitations. In the present paper, an attempt has been made to describe an integral view of causes and impacts of the Loktak Multipurpose Project to the environment and its adverse effect to the economic activities of the people of Manipur and it further attempts to keep suggestive findings for the future development process in a sustainable manner in the region.

KEYWORDS: Loktak, Athaphum, Phumdis, Jhum, Keibul Lamjao, Shangai

Introduction

The central lacustrine plain of Manipur with an area of 2,238 km² and surrounded by the mountain grids of all sides is drained by the Manipur River having slopes from north to south decreasing an elevation from 838 to 777 meters. The southern parts of this plain is occupied by a number of lakes and swamps. Though these swamps are small in size during the dry months and they swell up to enormous dimensions during the monsoon and merge into a vast expanse of water occupying over an area of 286 km². The Loktak Lake which is the largest among all these extends over less than 100 km² at its normal water level. This lake was traditionally used for agriculture and fisheries and considered as the lifeline of the people of Manipur due to its importance in their socio-economic and cultural life. It is the largest natural freshwater lake in the Northeastern region and plays an important role in providing ecological and economic security to the people of Manipur. A large population living in and around the lake depends upon its resources for their sustenance. Local people sustainably managed its rich biodiversity and derived benefits through its natural functioning.

There are a number of mountain streams in the state. Some of them flow through the central plain which is subject to devastating floods and crops damage every year. Drought conditions and lack of timely rain is also another cause of crops failure in the state. People thus, have been suffering from the twin problems of floods and drought. Agriculture forms the single largest source of livelihood and is the mainstay of the people in the state. The state is poor in mineral resources. Lack of power resources like coal and petroleum has greatly hindered industrial development in the state. Loktak Multipurpose Project was commissioned in 1983 for generation of water power, flood control and

irrigation by constructing a barrage across the Manipur River at Ithai. This has brought drastic changes in the hydrological regimes and converted a natural wetland with fluctuating water level into a reservoir with more or less constant water level. Such unsustainable developmental activities without understanding the nature of the wetland ecosystem has led to its degradation and loss of benefits accrued from the ecosystem. Here, an attempt has been made to examine research questions, viz., what are the major issues of the Loktak Multipurpose Project to the environment of Manipur? How does Loktak Multipurpose Project affect to the environment of Manipur? How does Loktak Multipurpose Project affect to the socio-economic activities of the people of Manipur?

Materials and Methods

The present study is based on both primary and secondary data sources, collected through published and unpublished government and non-government records, interviews and personal observations. For the conceptual and historical framework of environment and development attributes, the present study depended on secondary sources. The available literature including books, journals, government documents research articles and newspaper reports were scanned, analyzed and collated.

Components of Loktak Multipurpose Project

To have brought 'a new era of development', not only in Manipur but also the entire Northeast region, the Loktak Multipurpose Project, one of the most ambitious projects was initiated by the Ministry of Irrigation and Power, Government of India in 1971. With the formation of National Hydroelectric Power Corporation (NHPC), the project was transferred to the Corporation with effect from 1st January, 1977 and commissioned in 4th June, 1983. With a dam of 10.7m (35ft) height across the Manipur River, the Loktak Multipurpose Project has four components, viz. 1) Loktak Hydroelectric Project, 2) Lift Irrigation scheme, 3) Sugunu Hump flood control scheme and 4) K V transmission line scheme. The following are the main objectives of this project when the project is once completed.

- a) At the beginning, produced 2x35MW and then in future 3x35MW but first 35MW was produced by March 1975.
- b) Giving irrigation facilities to the 23,000 hectors of land for double to triple cropping.
- c) Flood control of land around the Loktak Lake and Imphal city.
- d) Preparing transmission line of 132KV for the states of Manipur, Nagaland and Assam.

Leimatak River by diverting 58.8 cusecs of water from Loktak Lake of which 42 cusecs are used for power generation and 16.8 cusecs for irrigation. The project involved the construction of Ithai barrage downstream of the confluence of Manipur River and Khuga River, and diversion of water from the Loktak Lake (768m above MSL) through an open channel. The Ithai barrage (10.7m high, with 5m x 10m span water ways) creates an impoundment and backflow of water into the Loktak Lake through the Khordak cut. The lift irrigation component consists of seven pump sets for pumping of water from the open channel at Ningthoukhong. Another two pump houses are in Bishnupur for the second stage lifting. A 100 km long canal network distributes the water to the fields. Thus, by giving light to every household, bringing prosperity with the developments of agriculture,

industries, tourism, aquaculture and floods control, etc. are the major alternatives of Loktak Multipurpose Project.

Major Issues of Loktak Multipurpose Project

The Ithai barrage was constructed in the downstream of the Manipur river as a part of the Loktak Multipurpose project to maintain sufficient water level in the Loktak Lake by making it as a reservoir for maintenance of the project. In fact, the Manipur River is the only outlet of draining water from the central valley of Manipur, since all the rivers, streams and major water bodies in the valley are connected directly or indirectly through the Loktak Lake, and subsequently drained outside the state joining the Chindwin-Irrawady system of Myanmar. Hence, the Ithai barrage can be considered as the main gate which control quantity of water of Manipur Central valley, playing an important role in the environment of the valley as regards to the water supply, storage, flood, drought, agriculture, fishery, irrigation, power production, aquatic flora and fauna etc. of Manipur Central Valley in particular and Manipur state in general. It appears that the barrage which was constructed as a part of the Loktak Multipurpose Project has now become a major problem for the socio-economic life and the environment of Manipur.

The serious implications of construction of Ithai Barrage have led to:

- (a) changes in hydrological regimes thereby affecting ecological processes and Loktak Lake,
- (b) inundation of agricultural lands and displacement of people from flooded lands,
- (c) loss of fish population and diversity, and
- (d) decrease in the thickness of *phumdis* (floating masses) in the Keibul Lamjao National Park thereby threatening the survival of *Sangai* deer.

The above root-cause problems led the following issues:

Flooding

One of the major problems of the Ithai barrge on the environment of Manipur is the flooding of several thousand hectares of agricultural land around the Loktak Lake. The construction of Ithai barrage and decrease in absorption capacity of the lake due to siltation and *phumdis* (floating masses) has resulted in inundation of the peripheral agricultural and settlement areas. It is estimated that the inundation of cultivable and habitation land is about 50,000-80,000 hectare (WWF India 1994). Although the floods caused by this project do not claim human life, it affects many lives of domestic animals and cultivated crops. Lack of understanding, jealousy, limited means of livelihood are also causes of more deforestation in the hill areas of the state. Due to force of rainwater, fertile soils of the cleared hill areas are brought down and deposited to the streams, rivers and lakes of the valley and decrease their depth. When rainy season comes, few hours raining at the heads of steams, the level of the rivers have increased to the danger mark. Local dailies published that the year, August 2009 witness when everywhere worried about drought situation due to less rainfall, few hours raining of mid August caused heavy flood in the state and keep opening the Ithai dam. Some local dailies claim that the most dangerous flood of 2003 in the state was caused by Ithai barrage which was not opened in time.

A total area of 63.5 km² from different zones of the lake has been identified as highly flood prone (Trisal and Manihar 2004). The affected settlements in the four zones are:

Northern Zone: Nambol, Ishok, Waheng Khuman, Top Upokpi, Irom Meijrao, Samushang, Shantipur, Wangoi, Mayang Imphal, Yumnam Khunou and Keinou with a total population of 62,637.

Western Zone: Toubul, Khoijuman, Kwasiphai, Potsangbam, Nachou, Toupokpi, Upokpi, Ningthoukhong, Thinungei, Phubala, Sunusiphai and Thamnapokpi with a total population of 37,750.

Southern Zone: Moirang, Moirang Khunou, Keibul, Keirenphabi, Thangalawai, Kumbi, Wapokpi, Ithaikhunou, Nongmaikhong, Laphupat Tera and Khordak with a total population of 22,252.

Eastern Zone: Uchiwa, Hayel, Hangul, Thongam, Phoubakchao and Komlakhong with a total population of 7,750.

Siltation

Jhum cultivation, extensive deforestation and unscientific land use practices in the catchment area are responsible for deposition of 5,95,164 tonnes of silt annually in the Lake. 6,57,436 metric tons of sediments are carried down by the streams from the surrounding hills of the state. Out of this 62,272 metric tons release when the dam is opening and the remaining 90.52 per cent is deposited into the lake (Meitei 2002). This is clearly defined that so much amount of deposition would not be happened into the lake if there was no Ithai barrage in the state. So, there is possibility of lost of the Loktak Lake, one day, by decreasing its depth by sedimentation due to Ithai barrage.

Loktak project is not the reason of mass deforestation in the hills of Manipur. But for this project by blocking Manipur river, all the water of streams of surrounding hills store at this lake throughout the year and causing inundation and deposited many sediments and decrease its depth. LDA/WISA, in 2002, published 5,95,164 tones of sediments deposited annually into the Loktak Lake. The Loktak Hydro Power Station inaugurated in 4 June 1983 is 32 years old now and 32 times of deposition has happened. The sedimentation process decreases the storage capacity of the lake and causes flood situation around the lake and sudden increase of level of water to the rivers during the rainy season. Water has to store to the lake to produce electricity. But, if the present situation of sedimentation happens, both the lake and the project will be lost one day.

Weed Infestation

The blocked of water current in the outlet of the Loktak Lake through Manipur River due to Ithai barrage also blocked the floating away and removal of the *phumdis* (floating masses) from the Loktak lake to Manipur river. This has increased the masses of *phumdis* inside the lake. As per the remote sensing imagery of 2002, the total area covered by the *phumdis* in Loktak lake is 134.6 km². The central zone has the largest area under *phumdis* (59.6 km²) followed by the northern zone (41.6 km²) and the southern zone (33.4 km²) respectively. Overall area of *phumdis* in the lake has increased from 116.4 km² to 134.6 km² during 1989-2002.

Table: *Phumdi* Proliferation in Loktak Lake

(All figures in sq.km.)

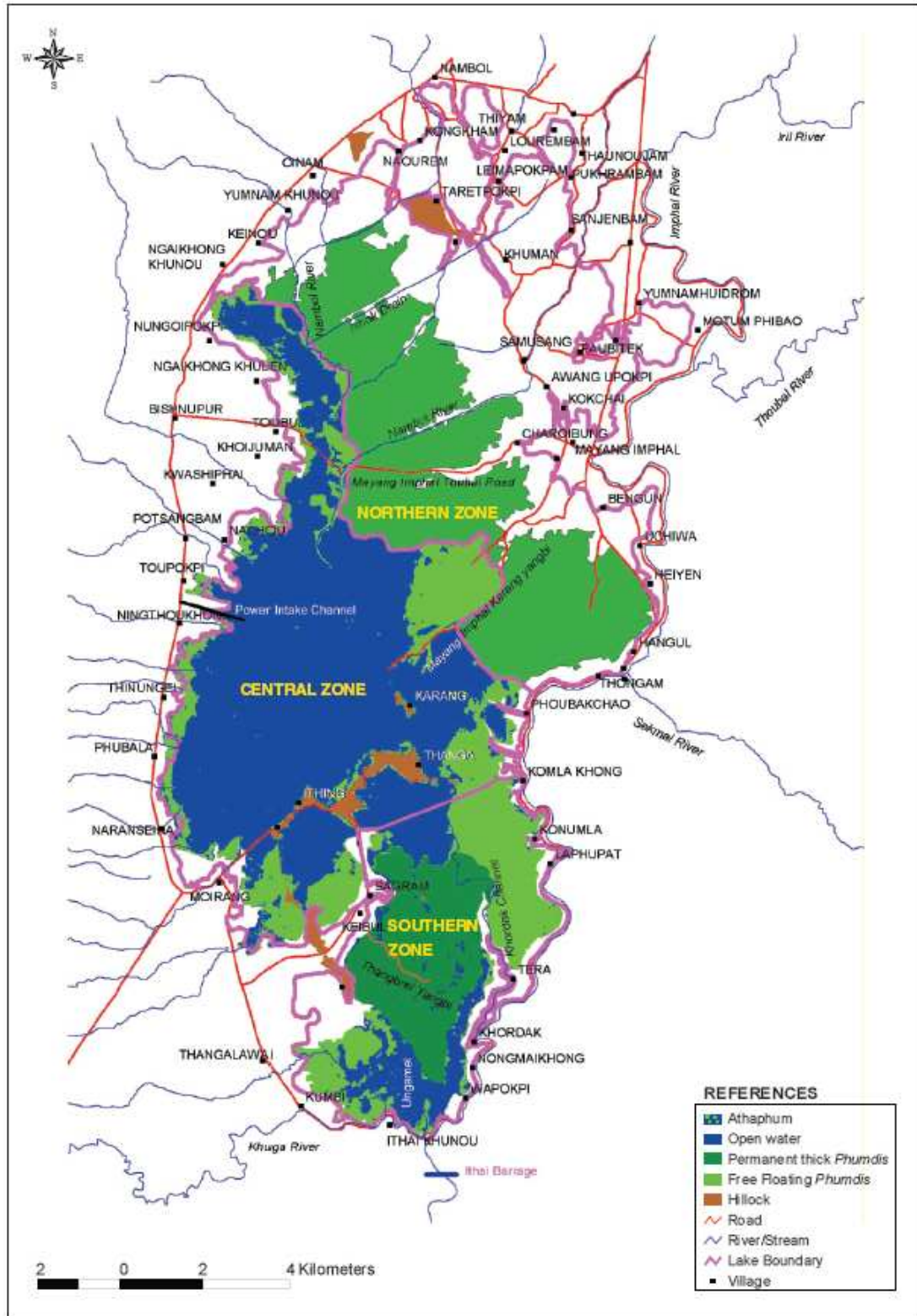
Zone	1989	2002	Net Change(+/-)
Northern	55.0	41.6	-13.4

Central	29.0	59.6	+30.6
Southern	32.4	33.4	+1.0
Total	116.4	134.6	18.2

Source: Source: Trisal, C. L and Th. Manihar. 2004. *The Atlas of Loktak*, Loktak Development Authority (LDA), Imphal.

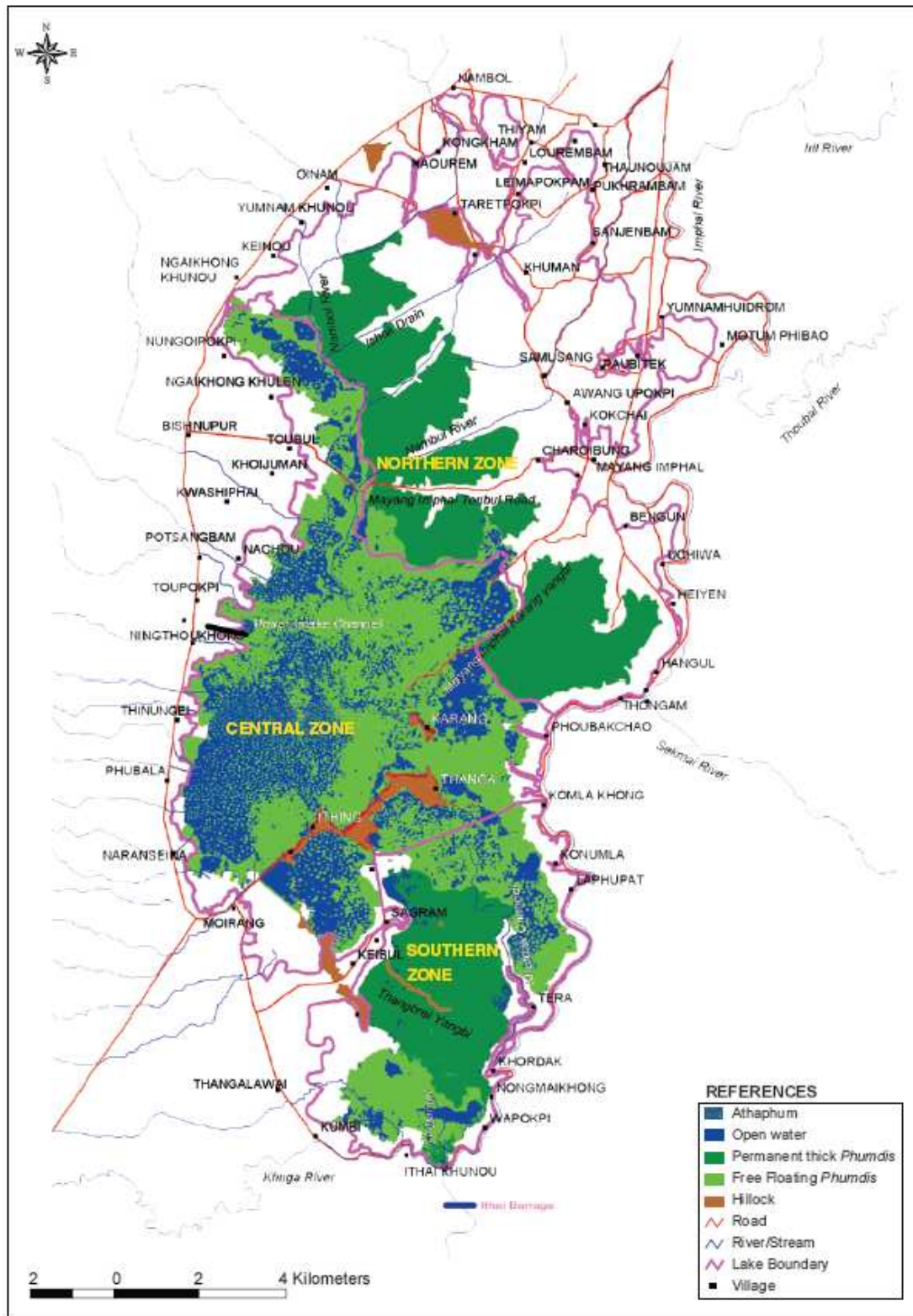
Rapid proliferation of *phumdis* and aquatic weeds have led to reduced water holding capacity, deterioration of water quality, interference in navigation, and overall reduction in aesthetic values of the lake.

AREA OF PHUMDHI IN LOKTAK LAKE – 1989



Source: The Atlas of Loktak Lake, 2004

AREA OF PHUMDHI IN LOKTAK LAKE – 2002



Source: The Atlas of Loktak Lake, 2004

Decrease in Water Holding Capacity and Power Generation

The decrease in water holding capacity due to siltation, construction of fish farms and proliferation of *phumdis* has reduced power generation capacity of the lake. The lake water holding capacity has reduced by 175 Mcum over a period of more than two decades (ERM, 2003). Based on the hydrographic survey carried out in 2000, the overall capacity of the lake is estimated to be 519 Mcum. Of which the volume displaced by *phumdis*, islands and the fish farms is 34 Mcum, 9 Mcum, and 28 Mcum respectively and the effective capacity of the lake after accounting for these displacements is 448 Mcum (Trisal and Manihar 2004).

Loss of Biodiversity

The populations of migratory and resident waterfowl have declined during last few decades due to poaching and changes in ecological character of the lake. Thirty five animal species (5 mammals, 3 birds, 9 reptiles, 3 amphibians, 12 fishes, 2 molluscs and 1 annelid) which were reported occurring abundantly in the past have declined and are now disappearing gradually (Trisal and Manihar 2004). The maintenance of constant water level of Loktak Lake due to Ithai barrage has led to a serious effect on the ecology and existence of the seriously endangered rare species of brow antlered deer, locally called *Shangai* of the floating Wild Life National Park of Keibul Lamjao, the only floating national park in the world. The natural habitation of *Shangai* is hazardous condition due to thinning of *phumdis*. Naturally, there was enough fodder for *Shangai* before Ithai barrage when the *phumdis* float during the rainy season with increase of water level and down to the earth at the time of dry seasons getting attached to the ground level and thus collected the nutrients from the soil so as to enrich offshoot of grasses which serve as the food and shelter of the *Shangai* and maintained the thickness of the phumdies. But, now less supply of fodder and shelter, *Shangai* are seriously endangered in their life. Further, the *phumdis* of National Park become thinner in the peripheral areas of the park and small factions got detached from the main body of the *phumdis* thereby decreasing the area of *phumdis* for existence of the deer.

Decrease in Indigenous Fish Production

Over exploitation, indiscriminate methods of fishing, extensive growth of *phumdis* and weeds are responsible for decrease in fisheries production. Construction of Ithai Barrage across Manipur River has interfered with the migration of fishes from Chindwin-Irrawady River system of Myanmar and consequently brought changes in the species composition. Before construction of Ithai barrage, minor carps like *Labeo angara*, *Labeo bata*, *Labeo dero* and *Osteobrama belangiri* used to migrate from Chindwin Irrawady River system, Myanmar to the upstream of Manipur River for breeding and spawning purposes. Before the construction of Ithai Barrage, as many as 12 fish species used to migrate from the Chindwin-Irawadi river system of Myanmar to the upstream of Manipur River for breeding purposes (Fishery Department, Manipur, 1981). Fingerlings of *Labeo bata* and *Osteobrama belangiri*, locally known as *ngaton* and *pengba* respectively returned downstream with the onset of monsoon. Construction of Ithai barrage blocked the migratory route of the riverine fish species. Currently occurrence of these species is restricted to rainy season when either flood or short opening of Ithai barrage allows them to enter the lake. In such condition, market witnesses that there has been no such production of indigenous fishes once caught a plenty of numbers. In the past, these

natural fishes constituted about 60 per cent of the fish product in the state since the culture fishery was not common in Manipur till 1960 (Singh 1993).

Pollution

Loktak Lake has faced the problems of pollution. During the last 32 years, due to increase of population so many pollutants drain to the lake from different sides. Inflow of organo-chlorine pesticides and chemical fertilizers used in the agricultural practices around the lake, municipal wastes brought by *Nambul* and *Nambol* rivers from Imphal city and Nambol town are major factors responsible for deterioration of the water quality of the lake. A large population of 0.28million people living within *Nambul* catchment generates on daily basis 72.23 million tones of solid waste and 31,207 cum of sewage and Nambol also contributes 4.9 million tones of solid waste and 2,121 cum of sewage annually (Trisal and Manihar 2004). All these wastes are directly or indirectly find their way to Loktak Lake. Besides, soil nutrients from the denuded catchment area and domestic sewage from settlements in and around the lake can be mentioned. Building floating huts by making *Athaphum* (specially designed floating masses for aquaculture purposes) as a means of livelihood by the fishermen again increases the pollution to the lake. The decomposed layers of the *Athaphums* also help the pollution level of the lake. Before Ithai barrage, when dry season comes, normally, there was outflow of lake water to the Manipur River through *Khordak* channel and recharge again when rainy season comes. In such condition, the level of pollution was less. But now this cycle has stopped due to Ithai barrage.

Socio-Economic effects

Agriculture being the main occupation of the people of Manipur, presently about 52.19 per cent of the total workers, contributes a major share to the economy of the state. Most of the agriculture practices in the valley areas of Imphal East and West, Bishnupur and Thoubal districts which is only 10 per cent of the state and these areas are the granaries of the people of Manipur because of the maximum quantity of the food-grains are produced from these areas. The Loktak Lake, the water storage of Loktak Multi Purpose Project is in this southern part of the valley. This lake was less than 100 km² before Ithai barrage. It was 12 km long and 8 km broad with 96 km area during 1970's. After Ithai barrage, the area of Loktak Lake has increased 286 km² to maintain the water level at 768.5 m above MSL to generate electricity. There are many places far from Loktak Lake which were good for cultivation before Ithai barrage, are now converted into wetlands and swamps and deposited weeds due to the high water level of Loktak Lake throughout the year. Above all, Government has already taken off many good agricultural lands for making High and Low canals of Loktak Lift Irrigation (LLI) scheme to give irrigation to 23,000 hectares of lands. But with failing of this scheme these valuable lands have been lost since last 32 years. It is estimated that about 83,450 hectares of agricultural lands of both sides of the lake have been seriously affected by the Ithai Barrage. Out of this total area, about 20,000 hectares were used for double cropping purposes and about 34,75,920 quintals of paddy were produced from these agricultural areas and then in the off season the peasants could earn an additional income of about Rs.30 to 40 crores annually from the production of different varieties like potatoes, chillies, etc.(Joykumar 1993). By using these agricultural areas the peasants could strengthen the economic position of the state. But the construction of Ithai barrage has brought a reverse picture in her economic

position. Presently, Manipur needs 1-1.5 lakh tons of extra rice to meet her requirements (Sharma 2009). This may not be happen if there is no Loktak Project in the state.

Many grazing ground on the peripheral areas of the lake which was used for cattle and buffalo rearing in the past have become inundated due to ithai barrage. This has also affected the economy of the villages in and around Loktak Lake. Loktak lake used to be the source of food plants of the people like *Heikak* (Water chestnut/*Trapa natans* var. *bispinosa* linn.), *Tharo*(Lily/*Nymphaea pubescens* wild), *Thambal*(Lotus/*N.Nucifera* var. *rubra* Roxb), *Thambou*(Drumstick), *Thanging*(*Euryale ferox* salisb), *Ikaithabi*, *Ishing Kundo*(*Ludwigia claveliana* Gamez La la Manza), mosses, etc, which served as main vegetable for the local population. Most of these plant species have retarded because of the changes in water level of the lake, pollution and other factors of the Lake Environment and ecology. Before Ithai Barrage, fisherman had used to collect firewood and reeds like *Tou*(*Phrangmits karka*), *Khoimom*(*Saccharum munja*), *Singut*(*Narenga porphyrochoma*) and *Singnang* (*Eryanthus proceous*), etc, from the lake for cooking and smoking of fishes. But these fuel woods or plants have disappeared due to high water level of the lake.

After construction of Ithai Barrge most part of the peripheral areas of the Loktak Lake, previously use as agricultural land has converted into fishing ponds. But this process involves huge amount of investment. So many of the poor farmers could not afford the cost and their lands are lying unused under the water. Apart from the failure in agriculture, cattle rearing were also not possible since there is no grazing ground. Hence, people have lost their employment both in agriculture and animal rearing and have to change their occupation from agriculture to indigenous fishing activities. But the indigenous technique of *phum* fishing in Loktak Lake also become difficult due to the constant rise of water level and many other associated problems. Thus, Ithai barrage has completely shattered the traditional economy system and caused unemployment of the state particularly the peasants of the surrounding areas of the Loktak Lake.

Suggestive findings/conclusion

In the early stage, Loktak Project kept too much propaganda that this project would bring so many utilities to the people of Manipur and the Northeast India. No one thought about the merits and demerits of this project and people did not discuss about this. Only the benefits were highlighted like, giving light to every household, bringing prosperity with the developments of agriculture, floods control, industries, tourism, aquaculture etc. and people dreamed about this. But it is clear that the Loktak Multi Purpose Project and its key barrage at Ithai have brought a great impact to the environment of Manipur and the socio-economic activities of the people as well. So there is a dilemma that while generation of power is necessary for industrialization and improvement of quality of life, the suffering and miseries of the affected people are real. To find out a workable solution to the problems of the Loktak Multipurpose Project, the following suggestions can be recommended.

1. Programmes of afforestation and protection of forest cover to the catchment areas of the major tributaries of the Manipur River will certainly regulate the flow of monsoon water and timely checking of excessive soil erosion, so that silt and debris deposits along the river bed and lake can be checked.

2. Coordination among various river valley projects authorities i.e., Imphal Barrage, Thoubal Multipurpose Project, Iril Pilot project, Khuga Dam, Sekmai barrage etc. is needed so as to regulate the flow of water and rating of water into the Loktak Lake as well as provision of irrigation facilities in the state.
3. It is necessary to construct a number of dams in the tributaries of Manipur River in their catchment area. The water derived from these dams will be very profitably utilized for multiple cropping in the fertile central plain. Incidentally more irrigation water is needed during rainless period when water is also to be diverted to the power house. In days to come expanding agriculture will demand increasing volume of water during lean months.
4. Dredging or deepening of the lake to increase its water holding capacity is highly recommended. Siltation and deposition of coarse sands by many streams which directly discharge in the lake has decreased the depth of the lake.
5. To open Ithai barrage regularly to push down the weed/floating masses, and the LDA's efforts to remove weed by mechanical means should have strengthened.
6. Land encroachment in and around the lake by constructing fishery ponds and other activities should be prohibited.
7. Awareness should have given to the owners of *Athaphum* to minimize the environmental impacts caused by such weed within the lake.
8. Coordination and understanding among the project authority, NHPC, LDA, State Government and the local people is needed to bring a sustainable development in the region.

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