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Water Resource Management In Manipur: An Emerging Problem In The River Basin Environment And Related Issues

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ABSTRACT: *Water resources in Manipur are from both the surface water & ground water. As per land use data, total water bodies of the state is about 1.65% of the total land coverage. Surface water in Manipur sources from wetlands, lakes, ponds & rivers has been an alarming position as they can't fulfil the requirement to the state in sustainable development.. Moreover, springs in the surrounding barrel hills and mountains has been tremendously declined with same as only remains for evidence due to deforestation and shifting cultivation in the catchment areas. These water sources are the key drivers of economic, social development and basic function in maintaining the integrity of the natural environment of the state. As a result, some areas are now in a perpetual state of demand is outstripping and at critical times of the year of low water availability. As the state enjoys summer monsoon, there having wide variation in water spread during pre-monsoons and post-monsoons, showing distinctive hydro feature except for Loktak Lake in which water level is kept constant to run the existing hydro-electric project. The valley districts of the state are prone of floods every years and damaged properties and lives. On the contrary, dry seasons are encountering with scarcity of water in both the valley and hilly areas. Ground water table of the state is reported at 2-4 meter bgl (below ground level), whereas, for the hill & foothill areas reported as 4-5 meter bgl. Owing to clayey nature of formation in the top aquifer, development of ground water resource is not considered promising on a large scale in irrigation of water supply either for domestic or agricultural purposes. However, it can be exploited for local water supplied through open wells dug-cum-bore wells and tube wells. Unfortunately, ground water in some districts has reported the presence of arsenic. Manipur lies in the catchment area of two-river systems, namely Ganga - Brahamaputra and Chindwin-Irrawaddy river systems and rivers are having deep narrow "V" shaped valley. However, the state enjoys sufficient rainwater during rainy seasons and there is ever increasing demand of water in the lean season from demographic, economic and climatic pressures. Wastewater treatment, water recycling and watershed management measures by rain water harvesting, management of water for sustainable to meet the requirement of regular supply can only solve the challenges of inadequate water supply in the state.*

KEYWORDS: *Rain Fed, Wetlands, Shifting Cultivation, Perpetual State, Aquifers, Sustainable*

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I. INTRODUCTION

Manipur, falls under high intensity of rainfall area of the North East India during monsoon season and eventually surplus water too. However, the state faces acute shortage of water particularly during dry / lean season i.e. January - May every year. All the river systems of the state remain dry except Barak River, Manipur River and her tributaries. Deforestation in the river catchment areas of the state because of forest fire for shifting cultivation and firewood also leads to drained rainwater quickly into the rivers after rainfall. Every year, the state is facing sever flood during rainy season (June-October) and drought like situation, particularly in the months of February - May, due to depletion of raw water at source and drying up of all the water bodies like Ponds, Lakes, Moats, etc. The problem is further aggravated due to the climate variability, as a result, the state is also facing erratic monsoon for the past few years resulting to shortage of water supply every year. Manipur has 15 major rivers having 166.77 sq. km. of total area i.e. about 0.75 % of the total geographical area of the state (ENVIS, 2015) and 90% of the total population used surface water whereas remaining 10% used underground water from hand pump, tube well, etc (aquifer water) as domestic purposes. The problem is further aggravated due to the climate variability, as a result, the state is also facing erratic monsoon for the past few years resulting to shortage of water supply every year.

II. SOURCES OF WATER

Manipur is divided into two sources of water-*surface water* and *underground water*. Surface water of the state is sources from rain fed; lakes, wetlands, rivers, ponds, marshes, moats, tape water etc. Moreover, the

private transporting tankers are supplementing the domestic water supply both in rural and urban areas whenever tape water supply is not functioning. Manipur has 15 major rivers / streams having 166.77 sq. km of total area, i.e. about 0.75 % of the total geographical area of the state out of which, the Barak and the Manipur river basins are the two major river basins in the state. The average annual yield of the two major basins is estimated to be 1.8487 million hectare meter (14.98 million acre feet).

Barak River Basin:

The Barak river rises from the southern slopes of the Mt. Javo of Nagaland and it flows towards the south west known as Sangulok by forming the inter-state boundary between Manipur and Nagaland. The Makru and Irang rivers are the two important tributaries of the Barak river. The river Tuvai joints the Barak river at Tipaimukh and the Jiri river joints at Jirimukh. The Barak river basin is the largest in terms of the area drained in the state i.e. 9041 sq. km and 68% yield join to the Ganga–Meghna–Brahmaputra (GMB) and finally falls into the Bay of Bengal.

The Manipur River Basin:

The Manipur river is the longest and antecedent drainage pattern. The Manipur river with its tributaries like Iril, Thoubal, Khuga, and Chakpi rivers together formed the Manipur River system or Basin. It finally merged into the Chindwin river, a tributary of the Irrawaddy river in Myanmar. The Basin formed a total catchment area of 6332 km^2, covering 28.4 % of the total geographical area of the state. The Manipur River basin, on the other hand, is the most important as it passes through thickly populated areas and covering four valley districts-Imphal East, Imphal West, Thoubal and Bisnupur. It also covers most of the habitations of Senapati district, the western portion of Ukhrul and Chandel districts and the more populated one-third of the eastern Churachandpur district.

The Chindwin Drainage System:

It comprises the Imphal river and its tributaries, the lakes and marshes lying in the valley and the hill streams of Ukhrul and Chandel districts, which drain into the Chindwin river of Myanmar or into the Yu river, a tributary of Chindwin in Myanmar. The Imphal river, also known as Manipur river originates from the north of Kangpokpi and flows southward to the eastern side of the Loktak Lake. The principal tributaries of the river in the valley are the Iril, Thoubal, Nambul and Nambol.

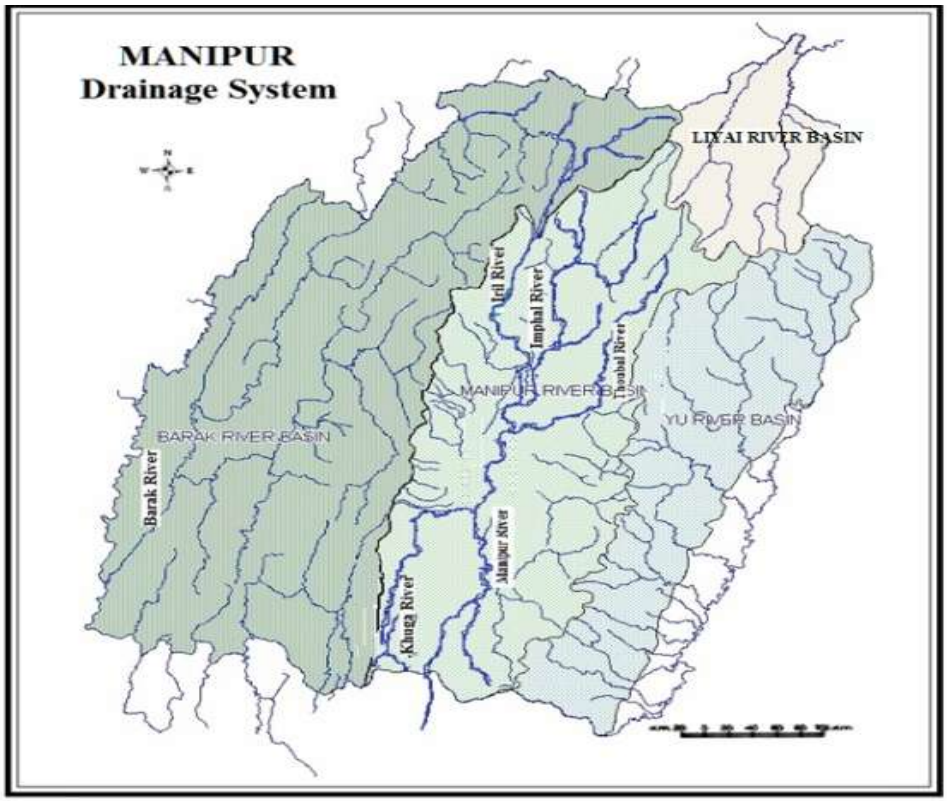

Fig-1: Drainage System of Manipur [catchment and average yield]

Table-I: River Basins and Catchment Areas in Manipur.

River Basin	Catchment Area(in km²)	% of Average yield	Yield in MLD	% of the total area
Barak River Basin				
Barak	6,865	43 %	230 MLD#	
Tuvai River	1,860	17 %	95 MLD	
Jiri River	316	7.3 %	39 MLD	
Total	***9,042***		*364 MLD*	*40.5*
Manipur River Basin				
Manipur River (up to Ithai Barrage)	5,109	21 %	116 MLD	
Manipur River (beyond Ithai Barrage)	1,223	10 %	55 MLD	
Total	**6,332**		171 MLD	28.4
Chindwin River Basin				
Chindwin River Basin (Liyai River and Yu River)	6,953			31.1
Total Geographical Area of Manipur	22, 327	98.3%		100.00

Source: Extracted data from http://www.manipur.nic.in/planning/

#MLD= million litres per day

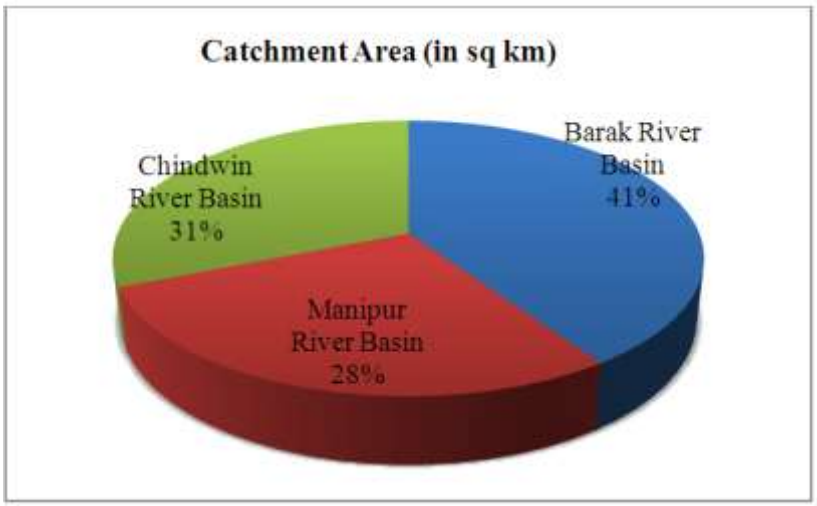

Fig-2

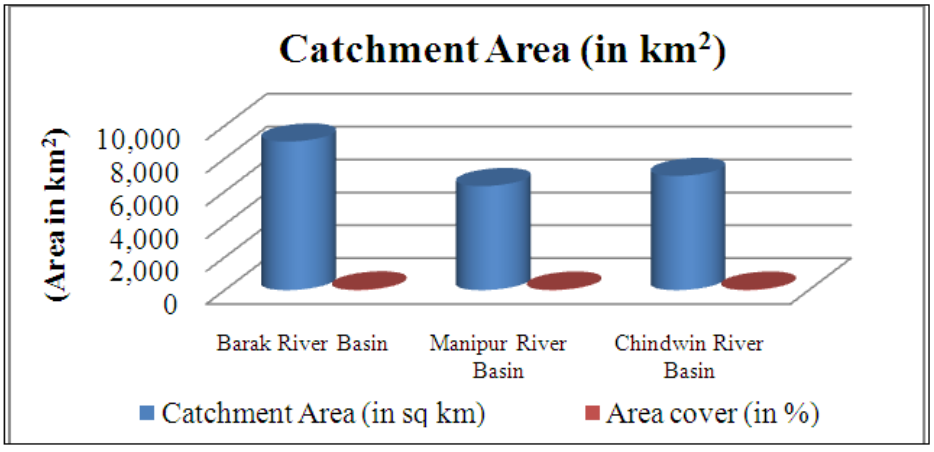

Fig.3

Underground Water Resources:

Groundwater in the state is mostly exploited through open wells. As per reported by the Central Ground Water Board (CGWB), ground water in the deeper aquifers occurs under sub-artesian and artesian conditions. Granular zones are encountered at a depth of about 150 m in Imphal valley and at about 220 m in Jiribam valley (ENVIS Report, 2015).

Arsenic in the ground water:

Tube well is the common source of water in the valley districts with the yields ranging from 0.6 to 4 cu.m/hr. Based on the monitoring of water level in key/dug wells network stations in the area, an annual recharge of 44 M.cu.m (*million cubic meter of volume*) has been estimated. Considering the clayey nature of formation in the top aquifer, development of this resource is not considered promising on a large scale. The stricken problems of ground water Arsenic contaminated in Manipur Valley are mainly located within the Newer Alluvium soils underlined of aquifer in the valley where, the plain of Manipur is a lacustrine formation due to siltation of rocks from the surrounding hills and mountains brough down by fluvial agents. Moreover, the highest concentration of arsenic (535µg/L) (*microgram/L)* has been reported from Manipur valley districts particularly in Kakching area of Thoubal district and Ngangkha Lawai Mamang Leikai of Bishnupur district. The contamination of arsenic in the ground water is fifty fold higher than the WHO limit and tenfold higher than the Indian permissible limit (50µg/L) of as in drinking water. In Manipur, the high rainfall and abundant surface water resources can be exploited to avoid repeating the mass arsenic poisoning that has occurred on the GMB plains (Dipankar *et al*, 2008).

III. HUMAN IMPACT ON THE RIVER BASIN ENVIRONMENT IN MANIPUR

The ever-increasing human population and their unlimited needs, the human impact on natural environment is one of the most drastic issues. Human impact on forest is greater than on any of the other components of the environment. People living in the hill areas of Manipur are largely depending on land and forests for their livelihood through agriculture, food gathering and hunting. "Jhum cultivation"(Gupta, 2000:605) or "shifting cultivation or slash and burn" (Seavoy, 1973-522) or Swidden cultivation" (Eden, 1993:146) or simply jhumming or "jooming"(Peal, 1874:476) has practiced as a way of life within the tribal communities and hill people from time immemorial. The rapid increase of tribal population in the hill districts of Manipur (3.41% in 2011Census) has put tremendous pressure on land. Shifting/jhum is cycle cultivation for 20-25 years in the long back but due to anthropogenic demands of more food has cleared greater chunks of forests, today most of the shifting cycle has reduced to 5-10 years and sometime 3-5 years and this adversely affecting eco-restoration, ecological process of forests and geomorphologic (Jugindro, 2016). According to ecologists and environmentalists, jhum or shifting cultivation is economically unviable and ecologically unsustainable (Shah, 2005). Forests performed different functions of regulate water supply, slow the flow of rainwater, controlling soil erosion, feeding springs, streams gradually, keep balance our ecosystem and so on. Forest in the River Basins of Manipur has been regularly affected because of deforestation for shifting cultivation or slash and burn agriculture. Manipur receives heavy monsoon rainfall, the average annual rainfall readings were 1116 mm in 1972 and 2646 mm in 1983 and 2887.6 mm in 1995. However, overall average total rainfall during the last 6 decades (1961-2010) was 1435 mm. Most of the districts of Manipur experienced a decrease in precipitation in the last few years. In 2014, the annual average rainfall of Manipur was recorded as 750.21 mm. Even though, the state recirved higher rainfall in Manipur, she is still suffer of water scarcity due to improper water management. As the forest catchment areas are destroyed, water is drained quickly after rainfall. Rain water is drained and disappeared just after rainfall, as there is no forests and rainwater harvesting facilities for checked the run-off water.. Moreover, the lost of water due to evaporation in Manipur for 2014 was recorded at 196.03 mm. The highest evaporation rate was recorded at Imphal West with 325.5 mm and the lowest in Chandel with 16.2 mm.

IV. CONCLUSION

In the last two decades, the State has been witnessing various environmental degradations due to some ascertain anthropogenic causes in the catchment areas and river courses including mass deforestation for Jhuming in the River Basins as well as some portion of the valley. The impacts of Jhuming are not felt by the mass for lack of awareness; it is evident that Jhuming/deforestation is leading to a number of ecological catastrophes like frequent occurrence of landslide, mudflow, land degradation in the hills of Manipur and causing major health hazards to the people of the state. The entire basin environment of the state gets disturbed due to injudiciously cutting of valuable trees in the upstream. As a result, there is occurrence of scarcity of water for agriculture, drinking and other domestic purposes in the river basin. However, the state is receiving sufficient monsoon rain; we are still suffering of water scarcity due to improper water management. Today, rivers of Manipur are very critical situation for fulfil the water requirement and maintaining the ecological balance in the basin and other associated adjoining areas. Therefore, it is expected that the present study will explore some areas where all the user communities in the river basin are adopted a regulatory sustainable policy for water management with sharing and introduced a model, which ensure conservation and optimum utilization of water resources for sustainable development in the river basins in the state.

ACKNOWLEDGEMENT

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