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## The Poisoned Waters: A Critical Study of River Pollution in the Middle Bhogdoi Basin

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**ABSTRACT:** Human activities are neither limited nor localised. With the passage of time and growth of population the intervening actions of the human beings have assumed a severe dimension resulting into a tremendous degradation of the natural environment. River basins, supporting high population densities are suffering from severe environmental threat due to increasing of human activities. As such, from this point of concern, these are the worst affected regions. The Bhogdoi is a small but important tributary of the Brahmaputra and it is in no way an exception to this. The Middle part of the Bhogdoi Basin is witnessing high population density, especially with in the township of Mariani. It has been a victim of human interference since quite long and has all sorts of symptoms of severe degradation in its usual form. Thus, the condition of the river has been aggravating day by day. The increasing population of Mariani and its fast growing interference with the homeostatic mechanism of the river has been deteriorating the river quality. As a result, the Bhogdoi is suffering from a major jolt in its carrying capacity in the form of unwise and unaccountable use. In this paper, an attempt has been made to analyze the increasing human intervention in the Middle Bhogdoi basin and its ensuing consequences. At present, a sustainable approach to augment the environmental scenario of the basin is of utmost necessity, which is a part of consideration of this paper.

**KEYWORDS:** Pollution, River basin, Population, Environment.

### I. INTRODUCTION

Since antiquity, river basins have been areas of high population density. Nevertheless, with the growth of population and consequently rising densities, river basins across the world have been witnessing more and more human intervention. Most of the surface waters in India, including both rivers and lakes, are getting increasingly polluted due to onslaught of human activities of diverse nature [1]. Human activities like unaccountable use of the river water, discharging garbage, dumping of industrial waste, and fishing with the help of poisonous chemicals are gradually destroying the natural ecosystem of our rivers. Many rivers are today but a caricature of the complex and dynamic ecosystems, they once were, and biodiversity and ecosystem functioning are consequently profoundly compromised [2]. The river Bhogdoi is not an exception to this and has witnessed immense unwise use in the name of human activities.

The Middle part of the Bhogdoi Basin is witnessing high population density, especially within the township of Mariani. This area has been a victim of human interference since quite long and exhibits symptoms of severe degradation in its usual form. Regular dumping of Garbage, discharging sewage and toxic chemicals in the river front, has polluted it tremendously and it has been gradually losing its ground of usability. Taking this into consideration, an attempt has been made in this paper to analyse how human activities in the Middle Bhogdoi Basin have been leading to environmental deterioration and its ensuing consequences.

### II. RELATED WORKS

The poisoning of rivers has begun of late years to cause serious concern, in consequence of the extension of manufacturers, many of which are situated on the banks of streams, and use such streams as a drain of sewer [3]. The phenomenon has started to grab the attention of many scholars worldwide. For instance, Bratt L. Walker [4] studied the cadmium poisoning in the Jinzu River basin of Japan. Likewise, Marie-Anik Gagne [5] reviews the status of mercury

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poisoning in Grande River of Brazil. In India too, many rivers have been studied to reveal the status of their pollution and poisoning. Among all the rivers, Ganga is the worst affected from pollution [6]. No less is the plight of its tributary, Yamuna. S.K Agarwal [7] highlights the state of pollution and management in various Indian rivers, including Ganga, Yamuna, Betwa, and Chambal. However, the smaller rivers like Bhogdoi have not yet been provided much attention. This is more so in terms of the sections of these rivers that flows through small but densely populated townships like Mariani. Hence, the topic of river pollution in the Middle Bhogdoi basin is yet to create a recognisable literature.

### III. OBJECTIVES

To enrich the study with a systematic analysis and to highlight the problems, the following objectives have been formulated:

- a) To identify and analyse the physical background of the study area along with the anthropogenic characteristics to set a stable form of analysis,
- b) To investigate the causes responsible for pollution of river water in the region,
- c) To correlate the major factors of river pollution with the existing ecosystem of the river.
- d) To suggest viable measures for combating the problem of river pollution in the region.

### IV. METHODOLOGY

Data pertaining to the study are mostly primary in nature, gathered by means of empirical observation along the selected portion of the river Bhogdoi. Besides observation, personal interviews were also conducted by visiting the settlements located in the vicinity of the river. The selection of sample population for conducting the interview was done by means of simple random sampling. The data collected are analysed and synthesized to co-relate with the objective by proper explanations and interpretations. Along with this, secondary sources like relevant books and journals also have been consulted to support the analysis.

### V. THE STUDY AREA AND ITS PHYSIOGRAPHIC FRAME

The River Bhogdoi originates in the Mokokchung district of Nagaland at an elevation exceeding 1200 m above mean sea level. The section of the river from the foot hill zone of Nagaland to the end point of Mariani town in Assam is being selected as the Middle Bhogdoi Basin. This length of this section is estimated to be about 13 km. This part of the river supports a very high population density having a varied type of economic activity ranging from agriculture to small industries.

Topographically, the river in this part flows along a zigzag course producing a number of well-exposed meander belts. The valley floor area is composed of silt and sand deposits and gets flooded mostly during the peak flow period. The growth of hydrophytes in the valley floor forms the support base for all kinds of water birds, insects and various species of mammals. A part from this, the shifting course of the river produces a large number of marshy patches that provides a congenial environment for the growth of various aquatic animals. Beyond the valley floor, there is an increase in elevation, where lies a built up zone that occupies most part of the gently sloping valley side sophisticated with an interaction between lowland and highland. Further beyond, is the highland zone consisting of eroded hills and dissected topography.

The following map (Fig. 1) shows the location of the Middle Bhogdoi Basin.

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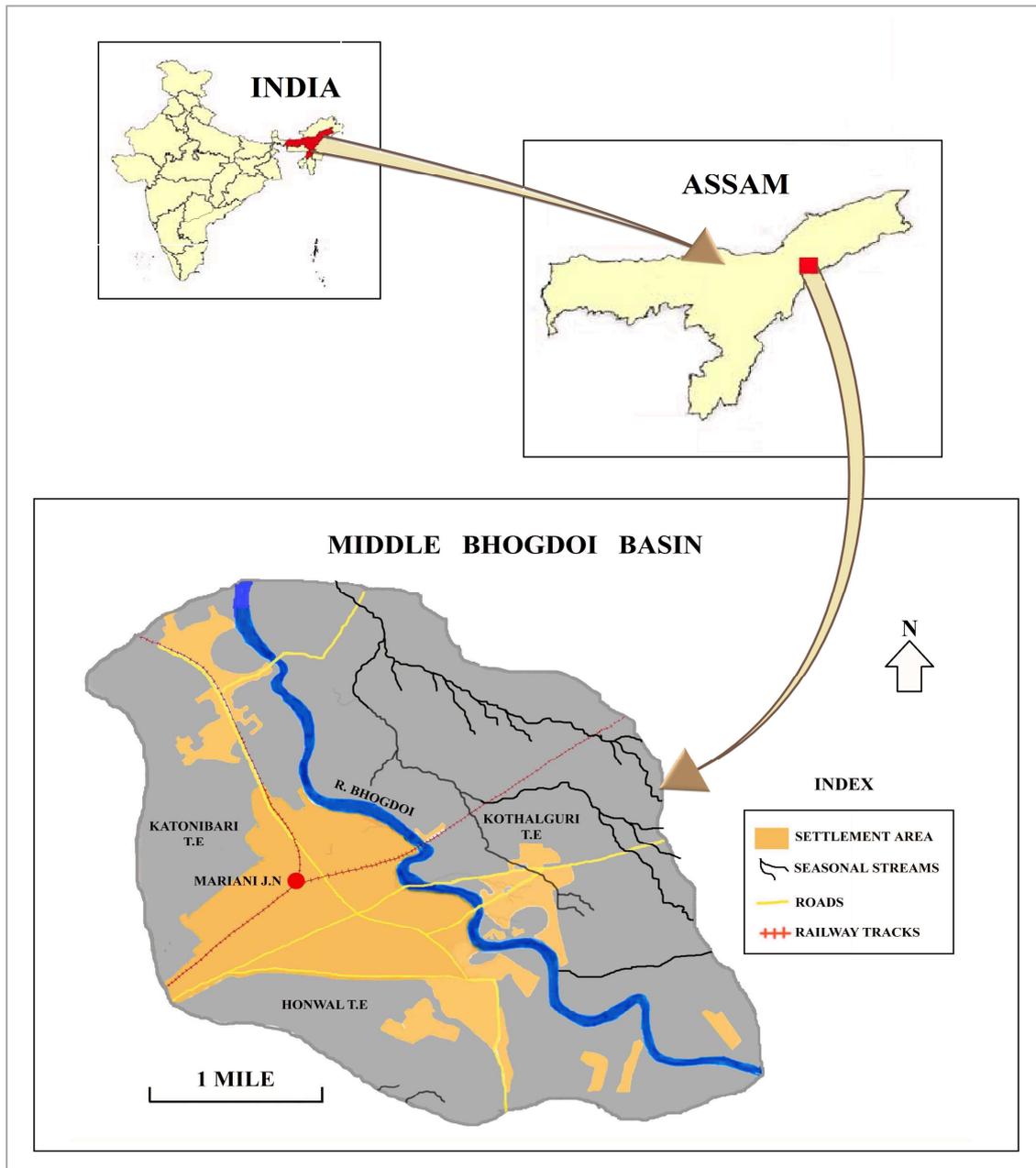


Fig. 1 Map showing the location of the Middle Bhogdoi Basin

## VI. ANTHROPOGENIC SETTINGS OF THE REGION

The Middle Bhogdoi basin has been witnessing tremendous growth of population along its valley sides in recent years. Within the town of Mariani, the valley side settlements of Joymoti Nagar, Kennedy Park, Udaipur and Gandhi Nagar etc, have grown as regions of high population density. Most of the people residing close to the river bank in the region

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are economically categorized as ‘Below Poverty Line’ (BPL). They are tremendously dependent on the river for their various needs.

The following figures’ (Fig.2, Fig.3, and Fig.4) present a comparative picture on the pattern of population density, literacy and monthly income in five main settlement zones of the region in the vicinity of the river:

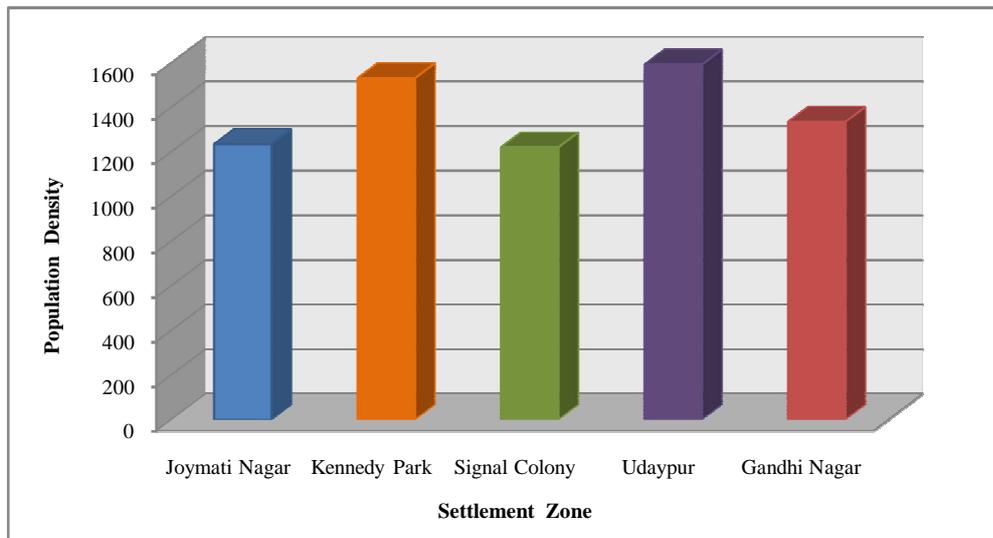


Fig. 2 Population Density in the vicinity of the river Bhogdoi  
(Source: Sample Survey)

Fig. 2 reveals the state of high population density in the settlement zones situated near the Bhogdoi River in Mariani. From the figure it is clear that the settlement of ‘Udaypur’ is the most densely populated, followed by ‘Kennedy Park’. The third most densely populated settlement of the region is Gandhi Nagar, followed by Joymati Nagar and Signal Colony respectively.

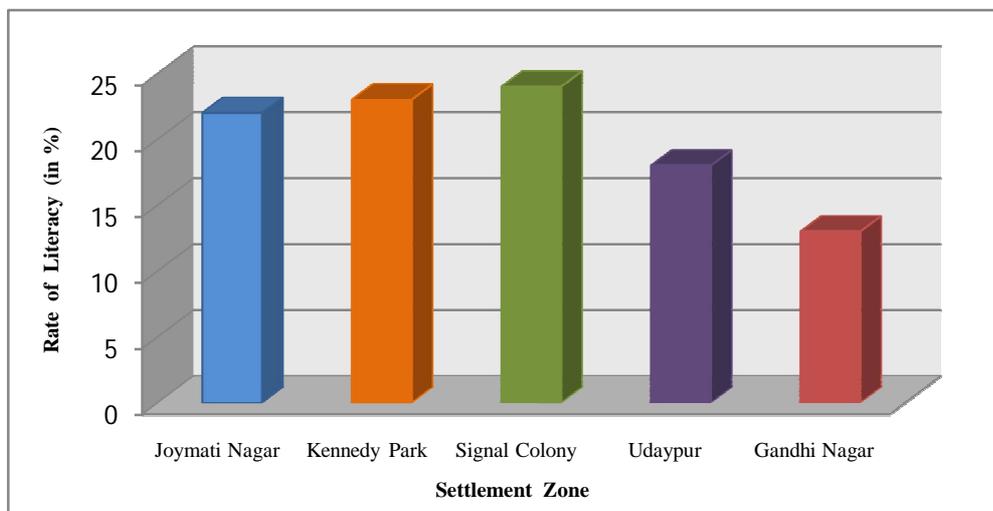


Fig.3 Rate of Literacy in the settlement zones near river Bhogdoi (%)  
(Source: Sample Survey)

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Fig. 3 throws light on the rate of literacy in the settlement zones situated near the Bhogdoi River in Mariani. The overall status of literacy in the region is gloomy. Among the five selected settlements, the highest rate of literacy is observed in the Signal Colony area, followed by Kennedy Park, and Joymati Nagar respectively. The settlements of Udaypur and Gandhi Nagar have very low rates of literacy. In fact, Gandhi Nagar has the lowest rate of literacy in the region.

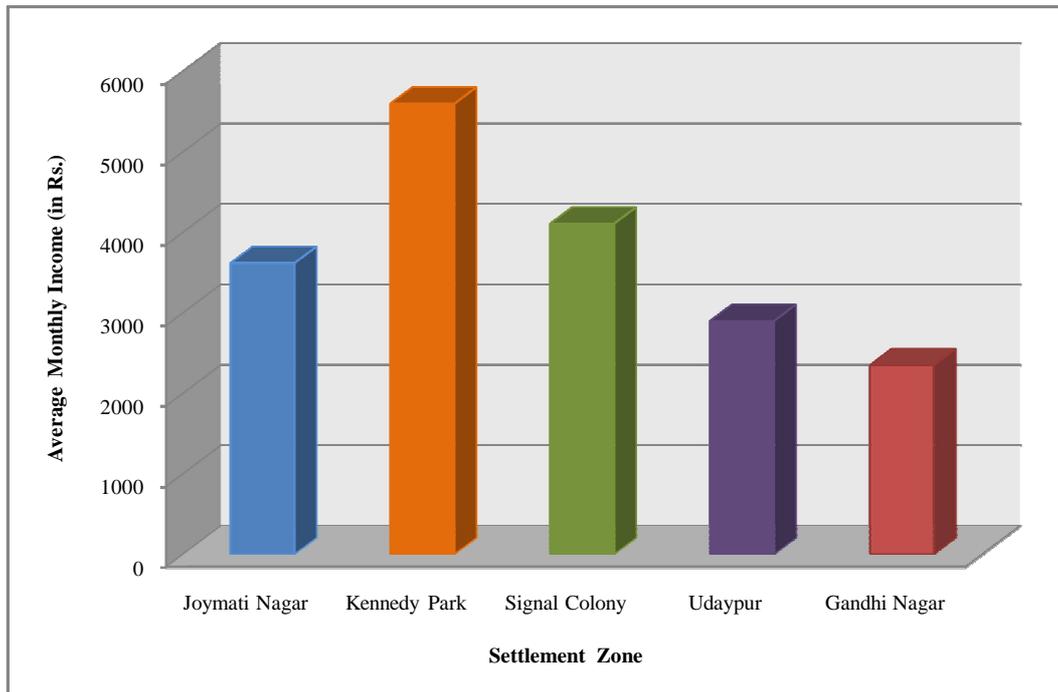


Fig. 4 Average monthly income in the settlement zones near river Bhogdoi (in Rs.)  
(Source: Sample Survey)

Fig. 4 reveals the status of average monthly income in the settlement zones near the Bhogdoi River in Mariani. Average monthly income is seen to be highest in Kennedy Park, followed by Signal colony, and Joymati Nagar respectively. Udaypur and Gandhi Nagar are seen to occupy the second last and the last slots respectively in terms of average monthly income.

Due to low rates of literacy in the region, people are not conscious of the environment and their obligations towards it. Besides, the BPL population of the region also suffers from the lack of basic amenities like drinking water facility, sanitary system, garbage disposal facility, cremation ground. Thus, these people end up depending on the river for their various needs like bathing, washing, disposing of human excreta, disposing of garbage, discharging sewage, fishing, collection of drinking water, transportations and cremation along its banks.

### VII. POLLUTION AND POISONING OF THE RIVER

Many varieties of local fishes, mammals, hydrophytes and unicellular protozoa are present in the river in Middle Bhogdoi Basin. The common varieties of fishes found in the river are Swam barb (*Puthi*), Magur, Kuria labio (*Kurhi*), Fresh water shark (*Barali*), Stripped dwarf cat fish (*Singora*), and Indian carplet (*Moa*) etc. Mammals like snakes, snails, tortoise, and frogs are also found here. The silt and sand deposits of the river support the growth of hydrophytes like hydrilla, water hyacinth, and algae, which serve as food for many water birds, insects, and mammals. However, the

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ongoing human activities in the region have not only polluted the river but also have poisoned it to a considerable extent.

The following table (Table 2) portrays a picture of the activities through which pollutants are discharged into the river in Middle Bhogdoi Basin:

**Table 1: Human Activities and Pollutants Discharge**

Activities	Total no. of spots	Type of Pollutants Discharged
Fishing	15	Poisonous chemicals and pesticides
Sewage discharge	13	Liquid and solid toxic waste
Waste discharge from Tea Estates	07	Poisonous pesticides
Disposal of Human Excreta	31	Solid waste
Washing/Laundry	08	Toxic detergents
Bathing	16	Toxic detergent
Garbage dumping	16	Solid toxic waste

(Source: Sample Survey)

Fishermen's of the region instead of using accessories for fishing, use poisonous chemicals and pesticides, like Malathion, Parathion, DDT, Thaiadin, Aldrin, Endrin, and Lindane. The poisonous nature of the substances used not only makes the fishes senseless but also destroys their reproduction system. Along with fishes other aquatic animals also suffers due to the use of these poisonous substances. As a result, the river has started losing its biodiversity rapidly. Concentrations of chemicals slowly increase as they accumulate through the food chain [8]. The higher we go on the food chain, the more concentrated they become [8]. Thus, the people consuming these contaminated fishes are under severe threat from health problems. Large scale contamination of the river water is also being caused by the discharge of sewage from tea estates located in its vicinity like Hunwal Tea Estate, New Sonwal Tea Estate, Nagajanka Tea Estate, Kothalguri Tea Estate, Katonibari Tea Estate, and Dessoie Tea Estate. Such sewage contains a large amount of chemical fertilizer and varieties of pesticides that are extremely harmful. These Tea Estates are well linked with the Bhogdoi by a number of discharge outlets. A part from this, during the rains, the remains of the chemical fertilisers and pesticides sprayed in the Tea gardens are brought down to the river along with the surface runoff. Although a river can assimilate a certain amount of organic waste, it can't cope with huge volumes of sewage, and it can't destroy every pathogen present in human waste [9].

The use of detergents for washing clothes and soaps for bathing in the river leads to the release of highly toxic chemicals of non-degradable variety into the water. It pollutes the water and threatens the aquatic organisms. Besides, dumping garbage, disposing of human excreta, and cremating dead bodies along the river bank are gradually contaminating the soil and water of the region. This is increasing the threat of water borne diseases like cholera, typhoid, jaundice, and diarrhea for the people using this water for drinking purpose. Thus, 'unwise and anti-thesis of environmental ethics of human beings can be said as a culprit in poisoning the river water' [10].

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## VIII. SUGGESTION AND CONCLUSION

The study reveals that the environment around the basin is no longer in a healthy state. The Middle Bogdoi Basin is suffering from tremendous river pollution and poisoning due to unwise, inconsiderate, and unethical human activities. Hence, it is highly important to take necessary steps to check the river environment from further degradation and to make the river valley region a healthy livable space in the coming days. Practices like, fishing with poisonous chemicals and pesticides, dumping garbage, discharging sewage etc. need to be checked at the earliest. The formation of a monitored cell by the government can help in this regard. Effective cooperation from NGO's working for the improvement of the natural environment can serve a great deal in tackling the problem.

People of the region must be educated towards the necessity of keeping the surroundings clean. It is necessary to spread environmental awareness in the region. Any plan to control pollution can succeed only if the people feel initiated and involved in its working and are able to participate in its implementation [11].

It is evident that the people of the region don't have the enough facilities in terms of proper garbage disposal, sanitation, and cremation area etc. As a result, people of the region end up looking towards the river for all these needs. Considering the low economic levels in the region, special efforts must be made to ensure all these facilities to the population residing below poverty line (BPL). This will reduce the load on the river significantly.

The sewage channels from the Tea Estates draining into the river must be blocked immediately. Many countries now have strict laws controlling the dumping of wastes in rivers [12]. Such stringent laws must be imposed in India as well, to check the problem and to ensure a pollution free environment.

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