

A Review on Environmental and Sustainability of Bharalu River

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ABSTRACT

Water is existence without contamination, however passing when it is dirtied. The objective of this study is to conduct a literature review of environmental and sustainability water quality. The strategy utilized study is a review of journal articles, internet, textbooks, bulletins and publicly available materials on the environmental effects of surface water contamination. Every single past author whose works were explored concurred that anthropogenic activity, poor waste management incredibly added to surface water contamination. From the review and based on the results of the previous studies, this study concludes that surface water of Bharalu River water is contaminated and as such should be treated before utilize both for household and modern purposes to keep away from the spread of scourges that can prompt deaths of people who are the most valuable everything being equal.

Keywords- Bharalu,Water quality, Physio-chemical, Micro-biological, Heavy metals, Flood mitigation

1. INTRODUCTION

Bharalu River is a small tributary of the Brahmaputra river on its southern bank flowing down from the foothills of Khasi Hills in Meghalaya.. The Bharalu carries a large portion of the city's municipal as well as other wastes and it also serves as the natural drainage for stormwater runoff. People generally consider the Bharalu water to be extremely filthy and populated and is regarded as one of the major sources of contamination affecting the overall quality of the Brahmaputra water. Bahini and Bharalu is a similar waterway. The underlying 13 kilometer stretch of the stream is known as Bahini, which gets named Bharalu after it passes the Assam State Botanical Zoo territory. The

stretch of Bharalu stream is 6.2 kilometers and it in the long run meets the Brahmaputra waterway at Bharalumukh. The deterioration of the Bharalu River starts from the Basistha hill south National Highway 37 and worsen as it flows through the densely populated residential and commercial areas of Guwahati and undergoing more intense deterioration till it joins Brahmaputra at Bharalumukh. The major localities of the city that contribute to the deterioration are Sixth Mile, G.S Road, ZooRoad, Bhangagarh, Athgaon and Bharalumukh. The waste water discharging from the Indian Oil Corporation Refinery at Noonmati drains directly into the Bharalu. The waste water from household, commercial establishment and small to medium industries within the city flows directly into the Bharalu River through the system of interconnected drains. The deterioration caused by domestic and commercial wastes poses a serious threat for the inhabitants of Guwahati and the downstream receptor.

1.1 Statement of the problem

Water is significant for every single living being and is devoured by all and as such it is fundamental that all ought to get unadulterated and clean drinking water. Fundamental access to safe water and acceptable sanitation is fundamentally the underlying advance to guarantee human prosperity, and as a basic human right (Pandey, S., 2006). In Assam, the Bharalu River, a tributary of the Brahmaputra River once outfitted with consumable water to a large number of people living on its banks. It was also a wellspring of variety of fish and other maritime broadly fluctuated vegetation for the people. The conduit is by and by so genuinely dirtied that analysts have advised that with the exception of if measures are begun a war-balance, an incredible disaster is drawing closer (Roy, S., 2011). The State Pollution Control Board has stamped Bharalu as one of the most contaminated stream extends in the nation falling under Priority 1 according to CPCB with a BOD level of 52.0 mg/l, henceforth making it thoroughly unfit for drinking and washing purposes. In addition, the contamination level at Bharalu is viewed as one of the significant wellsprings of tainting influencing the general nature of Brahmaputra's water. Likewise the debased water and waste conveyed by Bharalu waterway are additionally making hurt the biodiversity of the wetland protection, home to numerous oceanic species and many transitory winged animals.

1.2 Objective of the study

The objective of the study is to conduct a review of environmental and sustainability of the Bharalu River water.

2. METHOD

This study made use of a review of journal articles, conference papers. Internet materials and textbooks. The researchers assembled seventeen (17) materials for this study. This enabled researchers to make a synthesis of various researchers' perspectives on environmental impacts and sustainability of the Bharalu River water.

3. LITERATURE REVIEW

Lal, Prem Chandra, (1992) studied the municipal and other inputs to the Bharalu and have accounted the general environmental situation pertaining to the river and also described inadequacies of the city's water supply, sewerage and drainage systems. The physico chemical test of Bharalu river water results indicated high turbidity, TSS and TDS antichloride. BOD and COD loads are very large along with low DO levels. This study concludes that River has very high oil

and grease content and phenol content is also considerable. The river is thoroughly polluted with faecal coliforms from its origin to its confluence with the Brahmaputra.

T.R.Girija, Chandan Mahanta, V.Chandramouli, (2007) analyzed the physical, chemical and biological parameters of water samples from different locations of the Bharalu River. Locations where the contaminants exceeded the permissible limits during different seasons were identified by examining spatial and temporal variations. BOD, DO and total phosphorus were found to be the sensitive parameters that adversely affected the water quality of Bharalu. Elevated levels of total phosphorus, BOD and depleted DO level in the downstream were used to develop an ANN(Artificial neural network) model by taking total phosphorus and BOD as inputs and dissolved oxygen as output, which indicated that an ANN based predictive tool can be utilized for monitoring water quality in the future. The researcher concluded that water quality degradation in the Bharalu River are due to catchments input, anthropogenic activities and poor waste management.

Saptadeepa Roy and Jogen Chandra Kalita, (2011) carried out the study to detect and identify the various heavy metals namely Pb, Cd, Ni and Hg having estrogenic properties in the Bharalu river. Water sample were collected and analyzed using Atomic Absorption Spectrophotometer with air acetylene flame except mercury where N₂O-C₂H₂ flame was used. The result showed the concentration of these heavy metals is beyond their permissible limits and was in the order Pb>Cr>Ni>Hg>Cd. This study revealed that the presence of elevated levels of Pb, Cd and Hg is a serious matter of concern and the potential for human exposure to heavy metals from eating fish caught in the water bodies as well as drinking water from these polluted areas.

Barman P, Sarma B and Sarma A.K, (2012) carried out the study on flood hazard mitigation of Guwahati city. The study showed that topography of the city is such that it is difficult to provide required gradient for many part of the drainage system and at the time of peak flow the water level of river Bharalu rises to such a level that the water of the drainage system forms a backwater profile and the flow velocity drops almost to zero which contributes towards sedimentation and aggravates the flood problem in the city. The study concluded that the problem can be mitigated through establishment of EMP (Ecological Management Practice). EMPs for urban residential areas are grass land, forest land, vegetated waterways, rain water harvesting, covering of rain impacted areas with pebbles, vegetation or wood chips and detention drain and retention pond.

Lakhimi Gogoi, (2013) studied the degradation natural resources in Guwahati city and its impact on the environment. The study is based on primary and secondary data which has been collected from the field and different sources. The study is carried out in three phases -pre fieldwork, field work, and post field work. The study observed that various human activities such as encroachment along the river banks, industrial discharges into the River contribute to the heavy level pollution in river. Present study revealed that due to rapid population growth and urbanization, illegal settlements, industries and excessive growth of invasive species the natural resources has been degrading gradually. As a result hills and wetlands are encroached.

Jiwan Singh and Ajay S.Kalamdhad, (2015) carried out the study on agitated pile composting of water hyacinth collected from different areas (Bharalu River, Agriculture site, Boragaon landfill site and Industrial site) and evaluated nutrients (Na, K, Ca, total nitrogen and phosphorus) in all agitated pile composting. Stability parameters such as CO₂ evolution rate and oxygen uptake rate, biochemical chemical oxygen demand and chemical oxygen demand. The result showed that nutrients content in compost of water hyacinth collected from Bharalu River site was highest and the stability parameters were significantly reduced as compared to other agitated piles. After the

study the researcher concluded that in the final compost of all trials, total coliform and fecal coliform were reduced significantly, which are pathogen indicators in the compost. The best compost quality was found in water hyacinth collected from Bharalu River site.

Tarali Devi and Pradip Sharma, (2015) carried out the study on morphometric analysis of Basistha and Bahini-Bharalu drainage basin. The study analyzes the morphometric characteristics for river basin evaluation and assessing the hazard vulnerability of the basins as well as Guwahati city. The study showed that the Basistha River basin is a moderately circular which carries a little flood probability while the Bahini- Bharalu river basin is nearly an elongated basin with less flood probability. The author concluded that the present state of flood and water logging problems in Guwahati are not only due to natural characteristics of the rivers but human induced factors are also predominant in the basins.

Karishma Hussain et al., (2015) studied the sediments of the Bharalu River to obtain PAH levels in the river and their possible sources. The PAHs or polycyclic aromatic hydrocarbons were determined in river bank sediments during two distinct seasons namely pre and post monsoon. The results indicated maximum concentrations of PAHs during post monsoon season. The study revealed that diagnostic ratios indicated both petrogenic and pyrogenic origin of the PAHs. The pyrogenic contributions were mainly attributed to emissions from diesel, gasoline and wood combustion which are mainly from anthropogenic sources.

Navanita Das et al., (2016) carried out the study on self purification phenomenon of Bharalu River. Various laboratories test were conducted on the water samples obtained from various sources starting from Zoo Road till Bhoothnath via G.S. Road and Bharalumukh. Along the length of the running water of the Bahini-Bharalu River, the DO content was found to be very low at first, and then showed a definite increase at site 4. Similarly the BOD and COD values were very high in the sites taken into the city, but then slowly decrease towards site 3 and site 4 (i.e. towards its merging point with the Brahmaputra). Thus, the results obtained concluded that from the three different tests i.e. BOD, COD, DO are in good agreement with the self purification phenomenon.

Shally Sultana Choudhury et al., (2016) examined the physicochemical and microbiological properties of Bahini River to ascertain their suitability for consumption and presence of microorganisms that could cause water-borne diseases. The water sample was collected from four different sites of the river based on their use by the local people, taken 10 replications for each site. The analysis showed that the water quality parameters were within the permissible limits, except for TSS, total alkalinity, total acidity and BOD. After the study she concluded that the Bahini River needs a serious effort in limiting the numbers of microorganisms released into the body. The high microbial load in the river renders it to be unfit for human consumption though they can be used for other purposes.

Anwasha Borthakur and Pradeep Singh, (2016) published the article on India's lost rivers and rivulets. This article states that the Bharalu and Bahini were once considered healthy and sound ecosystems but now they are reduced to mere 'nallahs' or 'sewers' due to rapid, unplanned and haphazard developmental activities and urbanization processes. Encroachment is a common problem on the river banks which results in reduction in the width of the rivers and rivulets. As a consequence, the water flows to the banks of the rivers in no time even during a short rainfall episode. During the monsoon, the city is subjected to artificial flooding episodes almost every year. According to a report by the Guwahati Development Department (affiliated to the Government of Assam), the topography of Guwahati city is 'bowl-shaped' with some areas lying at the lowest

points of the bowl which leads to involuntary stagnation of water over a short period of time during the heavy rainfall in monsoon. Further, the floodwater from the nearby hills and city's own rainwater together aggravates the stagnant water crisis in the city.

A.C. Das et al., (2017) carried out the study on Bahini River, Brahmaputra River, Bharalu River and some major drains carrying urban wastes. The study revealed extremely polluted water quality of Bharalu river indicated by very low level of DO, high load of BOD, COD, Phosphate and ammoniacal nitrogen making the river unsuitable for aquatic life. The four major drains of the city also had low DO, high BOD, COD, Chloride, sulphate and ammoniacal nitrogen. The researcher concluded that however, the water quality of Bahini River and Brahmaputra River did not reveal gross deterioration.

N.Sharma, (2017) carried out the study on water related disaster in urban areas. The study revealed that the Bharalu basin is the most flood prone having several pockets of low lying areas and back flow nature from Brahmaputra during rainy season. After the study the author concluded that If the system does not work properly, it leads to environmental hazards. Government needs to strictly enforce use of only biodegradable materials for packaging of essential commodities for the citizens.

Narayani Gogoi and Rashmi, (2017) carried out a case study of Bharalu river emphasizing on its polluted nature. The study includes both primary and secondary data collection. Primary data has been mainly collected through the process of simple random sampling where a total number of 150 questionnaires were being filled up through interaction with the local residents along the banks of the river and also in various wards throughout Guwahati and Secondary data for the case study of Bharalu river has been mainly collected from the River and Conservation Cell; Pollution Control Board, Assam (PCBA) and mainly includes Water Quality Data of the river water. After the study the author concluded main cause of pollution in the catchment area is anthropogenic causes and one of the major reasons behind this is lack of awareness among the common mass and lack of government concern and policy.

Angshuman M Saharia and Arup Kumar Sarma, (2018) studied the understanding of different hydrologic responses to climate change between urban and rural basins. The comprehensive semi-distributed hydrologic model, SWAT (Soil and Water Assessment Tool), is used to evaluate how the streamflow and water balance components vary under future climate change on Bharalu (urban basin) and Basistha (rural basin) River basins near the Brahmaputra River in India based on precipitation, temperature and geospatial data. The study evaluated possible variations in streamflow and water balance components under future climatic change on Bharalu River Basin and Basistha River Basin. After the study The author concluded that a decrease in stream flow, water yield, surface runoff, actual evapotranspiration in contrast to the rural Basistha Basin, for the 2050s and 2090s decades.

Tanaya Sarmah and Sutapa Das, (2018) carried out the study on for urban flood mitigation, by designing an integrated drainage network for the Bharalu basin which includes the low-lying urbanized areas bordered by the Guwahati-Shillong Road, the Radha Gobindo Baruah Road and the Rajgarh Road. They collected various data regarding Data regarding land use, flood level, rainfall, urban pattern and vulnerability towards urban flood were collected from available literature, field survey to find highest water level for 11.4 km road stretch, expert opinion survey from 18 experts and feedback from 77 community elders who have been residing in the city since the 1980s. The study concluded that design a drainage network for the entire Guwahati city, thereby reducing urban flood hazard to a significant extent.

Manish Kumar et al., (2019) carried out the study on analyzing the concurrence of PPCPs, enteric viruses, antibiotic resistant bacteria, metal, and faecal contamination in water of Bharalu River. The study revealed that antibiotic resistance is neither correlated with the prevalence of PPCPs nor E.coli but As, Co and Mn appear to be inducing antibiotic resistance in E.coli. The study concluded that the concurrence of pollutants and multi-drug resistant E. coli, owing to the complete absence of wastewater treatment, puts the city in a highly vulnerable state. Pollution is being regulated only by the dilution capability of the Brahmaputra River, which needs to be further researched for seasonal variation.

4. RESULT AND DISCUSSIONS

Water is an essential segment of the earth which its quality must kept up and liberated from contamination. The Bharalu River which was once considered as the life saver of the city has now profoundly debased. Water nature of Bharalu stream showed by low degree of DO, high heap of BOD, COD, Phosphate and ammoniacal nitrogen making the waterway inadmissible for sea-going life (Das. A.C. et al., 2017). Quick urbanization and industrialization just as infringement have exhausted the nature of the stream. The stream is found to have high convergence of different overwhelming metals which are harmful in nature. The nearness of metals (Pb, Cd, Hg, Ni, Cr) is a genuine matter of concern and the potential for human ecposure to overwhelming metals from earing fish trapped in the water bodies just as drinking water from the olluted stream (Roy.S.,2011). The physio-chemical test on water tests acquired from different area of the waterway uncovered that except for some different parameters surpass as far as possible creation it unfit for human utilization. The stream is likewise found to contain high measure of phosphorus that advances the unreasonable development of weeds and in this manner present low break up oxygen. The arrival of crude untreated sewage has likewise prompted high microbial substance in the waterway. With the crumbled condition of river water, the waterway dregs are likewise seen as exceptionally contaminated. The polycyclic aromatic hydrocarbon substances are found exceptionally amassed in stream silt prompting potential hazard.

5. CONCLUSION

This paper talked about the natural impacts and maintainability of the Bharalu River Through a survey of works of past authors. Past authors viewed water contamination as a danger to the endurance of the earth and humankind. Improving the waste framework requires capital implantation as well as repeating uses, for activity and upkeep. Citizen awareness is another significant issue, especially in regard of dumping of waste in the waterway straightforwardly or in the channel.

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