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The Impact of Industrial Pollution on Water Quality in India's Major River: An Analytical Study

Avnish Chauhan
Associate Professor, Department of Environmental Science, Graphic Era Hill University, Dehradun, Uttarakhand India 248002

Abstract

The ramifications of industrial contamination on water quality have become a paramount apprehension for the administration and interested parties. The government has implemented several measures to curb industrial pollution. Enforcing laws and regulations, erecting wastewater treatment plants. Advocating for cleaner production technologies. However, these interventions have been insufficient, and the issue of industrial pollution persists. The impact of industrial contamination on water quality in the major rivers of India is a critical matter. It demands immediate attention and intervention from all stakeholders. Need to ensure the availability of uncontaminated water for both the present and future generations.
Keywords: Indian River Pollution, Industrial Pollution River, River Food Chain.

Introduction

In India, rivers hold enormous significance as they provide indispensable nourishment to the populace. Unfortunately, human activities have significantly impacted the riverine ecosystem over the last few decades. The emergence of industries and their discharge of untreated or partially treated waste into the rivers have raised concerns regarding the safety of using river water for drinking and other essential uses. The pollution of river water due to industrial waste is a significant issue in most urban areas. The discharge of diverse industrial waste into the water system modifies the physical, chemical, and biological attributes of the riverine ecosystem. This alteration can result in bioaccumulation and biomagnification in aquatic organisms, which can eventually infiltrate the food chain. Exposure to such water bodies can lead to various health maladies and affect aquatic biodiversity, resulting in the deterioration of the riverine ecosystem.

India harbors an estimated 195 million hectares of cultivable territory within its territorial jurisdiction, of which almost 63% or roughly 125 million hectares depend on precipitation for irrigation. The remaining 37% or about 70 million hectares of agrarian land necessitate irrigation to sustain their crops. According to Rajaram and Das (2008) It is a customary approach for rural areas to procure irrigation water from the neighbouring rivers. Furthermore, India's fluvial system encompasses various animal reserves that provide a habitat for different at-risk species mentioned in the International Union for Conservation of Nature's Red List, and the survival of these creatures is reliant on India's waterways. Additionally, the water from these rivers maintains the subsistence of numerous professions such as fishermen, sand dredgers, and other associated vocations. Figure 1

shows the various toxins and presence of other harmful material in water that deteriorates the water quality because of industrial pollution:

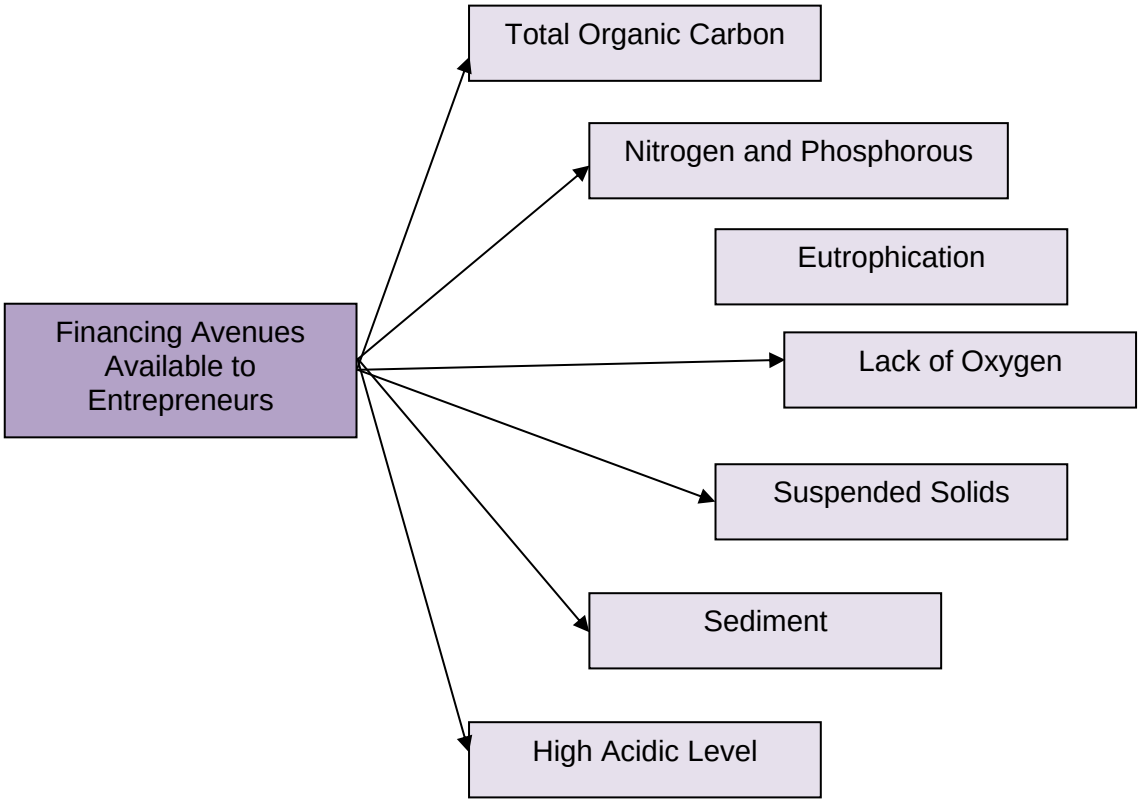

Figure 1 Characteristics of Polluted Water Due to Industrial Pollution

The preeminent environmental court in India, the National Green Tribunal. In the year 2017 that contaminated water was the cause behind the extensive illnesses plaguing Indian villages. Hamner et al., (2006) found that India takes pride in its possession of some of the world's most momentous rivers, namely the Ganges, Brahmaputra, and Yamuna. Origins of these are indispensable for the survival of millions of people. The rivers have been subjected to an onslaught of poisonous materials discharged by industrial sources. Tainting their water and leading to their diminishing quality. The harmful effects of these contaminants have been calamitous. Severe consequences on human health and the surroundings. There has been an upsurge in apprehension over the matter of industrial toxins endangering the quality of India's principal water channels, necessitating expeditious action.

Misra & Pandey, (2005) the unrestrained dumping of untreated waste and sewage has transformed the Ganges into one of the most polluted rivers in the world, culminating in severe water contamination that renders it unsuitable for human use and wreaks havoc on aquatic life in its vicinity. In addition, the Yamuna, a prominent river in India, has also fallen prey to the dangers of industrial pollution, leading to its significant pollution levels, with a multitude of pollutants being discharged from factories and other industrial facilities located in its surrounding areas.

Upadhyay, Dasgupta, Hasan, and Upadhyay (2011) water contamination is killing aquatic creatures and making the water unsuitable for humans. The gravity of the situation prompted Delhi administration to declare the Yamuna River "biologically deceased". This highlights the urgent need to address the issue. The Brahmaputra, one of the largest rivers globally, is facing severe

pollution. It flows through China, India, and Bangladesh and is a vital water source for millions of people. However, industrial effluents discharged into the river have significantly deteriorated water quality. This has made it dangerous for human use and has harmed the ecosystem. Industrial pollution's impact on the water quality of India's major rivers is a significant challenge that requires immediate intervention. The situation is now so severe that it poses a grave threat to public health and safety.

Literature Review

Rampant industrialization has led to a significant surge in water pollution. Industries indiscriminately discharge contaminants, including hazardous heavy metals and chemicals.
Misra, (2011) found that detrimental effects to human health and the environment. These pollutants stem from a myriad of sources. The discharge of untreated or inadequately treated wastewater, industrial effluents, and agricultural run-off. Wastewater alone, which contains a slew of harmful substances. Bacteria, viruses, and chemicals, poses a formidable source of water pollution, potentially harming both aquatic life and humans. Industrial effluents are not to be taken lightly either. They contain hazardous chemicals that could inflict harm upon both the environment and humans. Water pollution portends severe threats to ecosystems and human health. The proliferation of waterborne diseases, disruption of aquatic life, and environmental degradation. It is therefore imperative to regulate the quantity of pollutants that are discharged into waterways.

Kjellstrom et al., (2006) need to adopt effective measures to prevent and mitigate water pollution. The contamination of the environment by industries has become a momentous issue that carries the potential of inflicting severe and widespread harm on aquatic creatures. The phenomenon known as eutrophication arises as a result of contamination, which is considered detrimental. This event is characterized by an excess of nutrients that originate from industries, including sewage, wastewater discharge, and agricultural runoff, among others. The nutrients trigger an upsurge in the proliferation of aquatic vegetation, especially algae. The overgrowth culminates in the emergence of massive algal blooms. Which spread throughout the water's surface. The algae cover impedes the penetration of sunlight, it causes a reduction in oxygen levels in the water. The decomposition of the surplus algae intensifies the oxygen depletion. This poses a lethal threat to the survival of fish and other aquatic organisms that require a specific level of oxygen to survive.

According to Sinha, Michalak, and Balaji (2017), found that eutrophication inflicts significant harm on aquatic life, leaving a lasting impact. This phenomenon, characterized by the proliferation of algae and reduction of oxygen levels. This release harmful toxins that endanger humans and wildlife. Fish, birds, and mammals that rely on these bodies of water for survival are affected.

According to Ansari, Singh, Lanza, and Rast (2010) eutrophication can also result in devastating economic consequences. Such as reduced recreational and commercial activities, diminished property values. It increases costs for water management and treatment. Thus, mitigating industrial pollution is an imperative undertaking to maintain the well-being of aquatic ecosystems and protect the health of both humans and animals.

The contamination of Indian waterways due to chemical substances, effluents, and sewage is significantly impacting the surrounding ecosystem's flora and fauna. According to Gall and Thompson (2015) the ramifications of this pollution are resulting in numerous species of aquatic life becoming extinct or relocating to more secure areas. Regrettably, this has a direct influence on the conservation initiatives of both the Central and state governments, which are directed at safeguarding the varied wildlife found in national parks and wildlife sanctuaries.

(Vaseem & Banerjee, 2016) found that the pollution of rivers has a bearing on the ecological equilibrium and biodiversity of the surrounding zones. The toxic substances discharged into the water because of human activities represent a menace to both flora and fauna. This pollution has a harmful impact on humans and domestic animals. Bathing in the contaminated waters of rivers can give rise to a plethora of skin diseases, allergies, and related ailments. This cause moderate to severe health conditions, It increase even to be life-threatening if ignored. Consuming water that has been contaminated can lead to a wide range of severe medical conditions. Cancer, osteoporosis, vision loss, impotence, sterility, and tuberculosis.

The rise in water pollution levels has put immense strain on the state-sponsored healthcare systems in India. It has caused a significant increase in the demand for medical care. Rising pollution also harms domestic animals. Increases osteoporosis and other health issues. Urgent action is needed to reduce water pollution levels. The government and relevant authorities must take necessary measures to ensure clean water is available to all. Citizens must also reduce their pollution footprint and support local initiatives to combat water pollution.

According to Lakra, Sarkar, Gopalakrishnan, and Kathirvelpandian (2010), several freshwater fish species in India are currently facing threats to their survival. india's freshwater piscine varieties, such as the coveted Hilsa, Rohu, Katla, and prawns, were previously in high demand in foreign lands, particularly the Middle East. Regrettably, the veracity of the matter is that waterway impurity has led to the contamination of these prized fish with malady-inducing microorganisms and detrimental chemicals. This has resulted in a significant decline in the export revenue derived from these fish, causing a substantial economic loss for India.

The reduction in export revenue not only affects the anglers who depend on these exports for their subsistence but also the entire economy. The pollution of Indian rivers has dire ecological consequences in addition to the economic impact. The piscine populace is dwindling, and many species are at risk of perishing. This doesn't only affect the local ecosystem but also triggers a domino effect in the food chain and upsets the balance of nature. Multiple stakeholders, including the administration, corporations, and communities, need to come together to address this intricate issue of water pollution reduction and river restoration.

Industries are implored to embrace sustainable practices that diminish their deleterious impact on the environment. These practices are of paramount importance, as industries are a significant contributor to environmental degradation. Prioritizing sustainability would secure a better future for all. These sustainable practices may entail curtailing waste, emissions, and water usage, as well as leveraging renewable energy sources. The adoption of such measures would serve to ameliorate industries' carbon footprint and foster a more salubrious environment.

Governments can engender change by regulating and incentivizing sustainable practices within industries. Levying penalties against non-compliant entities and offering tax incentives to those who prioritize sustainability would motivate the necessary behavioral changes. Consumers, too, wield a mighty influence in promoting sustainable practices within industries. By advocating for companies that espouse sustainable operations, they create market pressure for other companies to follow suit. Industries, themselves, must take responsibility for their actions and act sustainably. In doing so, they would mitigate their expenses and improve their efficiency, while concurrently safeguarding the environment.

Misra & Pandey, (2005) found that effective management of waste is paramount for the preservation of the environment and the promotion of public health. It is imperative that solid waste undergoes appropriate handling before its disposal. The use of plastic bags ought to be strictly forbidden. Industrialists must bear the responsibility of treating water before releasing it into rivers. Community awareness programs must be intensified to promote and advocate for environmental protection. It is important to note that solid wastes produced by households, businesses, and industries pose a significant threat of pollution. Causes harm to both humans and wildlife.

Briggs (2005) it is vital to properly handle these wastes before disposal to minimize their impact on the environment. The proper management and handling of waste includes the process of segregation, composting, recycling, and incineration. By implementing these techniques, drastically reduce the amount of waste that ends up in landfills, ultimately leading to a reduction in greenhouse gas emissions.

The predicament of plastic bags necessitates immediate attention due to their non-biodegradable nature and their decomposition process taking centuries to complete. These bags pose a considerable threat to marine fauna as numerous creatures erroneously consume them, potentially leading to fatal consequences. Thus, the governing authorities must enact regulations that forbid the use of plastic bags and advocate for substitutes such as reusable bags. Additionally, the corporate sector should take accountability for their actions and treat their wastewater adequately before discharging it into rivers to prevent water contamination and safeguard aquatic life. In conjunction with this, public knowledge campaigns can play an integral role in promoting the significance of appropriate garbage disposal, the harmful repercussions of plastic bags, and the necessity of wastewater treatment before release into rivers. These initiatives can further encourage the population to engage in recycling, composting, and other sustainable practices. A paramount aspect of preserving the integrity of water bodies and safeguarding both humans and aquatic life is the proper maintenance of drains before the release of pollutants into rivers, mitigating the discharge of hazardous substances and chemicals.

Conclusion

India is a country with many rivers, which are its main lifelines. Several cities are situated on the banks of these rivers. Rivers play a crucial role in maintaining biodiversity by facilitating the food chain, starting from algae, small animals, insects, small fish, and large fish. However, pollution in rivers is increasing day by day due to the discharge of effluents and various human activities. Heavy

metals such as Pb, Cd, and Zn enter the fish bodies, leading to poor water quality and affecting the entire biodiversity of aquatic ecosystems.

Many fish species have died because of heavy metal pollution in the rivers. Due to the discharge of heavy metals, contamination and eutrophication occur, resulting in the extinction of several river species and loss of biodiversity. Planting trees on the banks of the rivers is an effective solution to reduce river pollution, and plastic should be banned as it affects the food chain. If we do not take necessary steps to check river pollution, it will seriously affect human population in the future. Rising pollution in India affects everyone and spares no area of life in the country. Urgent measures should be taken to enforce stringent environment safety rules and check the pollution of rivers. Otherwise, the situation is likely to worsen further.

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