

Water Pollution in India: Its Impact on the Human Health: Causes and Remedies

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Abstract: *Water contamination is a significant issue in India. In recent years, the issue at hand has grown significantly as a result of the processes of industrialization and urbanisation in India. The access to water is considered a fundamental human right. The Indian constitution does not explicitly recognise this particular right as a fundamental right. According to Article 21 of the Indian constitution, all individuals are granted the fundamental right to life. This article encompasses the fundamental entitlement to access potable water. The sustenance of human life is rendered impossible in the presence of water that has been contaminated. The attainment of pollution-free water is vital for the sustenance of a healthy lifestyle. Polluted water is identified as the underlying factor contributing to the development of several ailments. There exist multiple factors that contribute to water pollution. Polluted water originates from multiple sources, rather than being attributed to a singular point of origin. Article 47 of the legislation mandates that the state has the responsibility of enhancing the quality of life by elevating nutritional standards and promoting public health. The provision of clean water to the general people is a responsibility that falls under the purview of the state. Furthermore, in accordance with Article 51 (A) g, it is incumbent upon each individual as a citizen to assume the responsibility of safeguarding and enhancing the natural environment, encompassing woods, lakes, rivers, and wildlife, while also demonstrating empathy towards sentient beings.*

Keywords: Water contamination

I. INTRODUCTION

Contaminated water is the primary factor contributing to the onset of various diseases. The contamination of water not only has implications for the current generation, but also has long-lasting effects that extend to future generations. The Bhopal gas tragedy case can be cited as an illustrative example. The Bhopal Gas tragedy is often regarded as the most severe industrial catastrophe in global history. Research conducted by reputable scientific organisations has revealed that the contamination of groundwater has extended to a depth of 40 metres and has spread up to a distance of 3.5 kilometres from the abandoned facility. Over the course of the past 14 to 20 years, around 40,000 individuals have been exposed to the aforementioned contaminated water. It has been observed that the prevalence of malignancies, birth defects, and various ailments affecting the skin, lungs, brain, kidneys, and liver within this community is significantly higher compared to other regions in the country.¹ The utilisation of water has multiple purposes. The sustenance of the human species is contingent upon the presence of water. The sustenance of human life is dependent upon the presence of water. Access to clean and uncontaminated water is essential for maintaining a healthy lifestyle. In the event of water pollution in a given region, individuals and other organisms are compelled to consume the contaminated water due to the absence of viable alternatives and their inherent dependence on it for survival. Water pollution has emerged as a significant concern nationwide in recent times, mostly because to the unprocessed discharge of effluents, chemicals, and pesticides into water bodies.² Water pollution is caused by a multitude of factors. The mitigation or regulation of these causes can be achieved by increased public knowledge and the effective enforcement of legislative measures. The inclusion of the right to clean and sufficient water in Article 21 of the Constitution of India can be attributed to the active involvement of the court in promoting this cause. In the event of water contamination or pollution, individuals have recourse to legal remedies as outlined in the Constitution of India. These remedies can be pursued through the law of torts and through the filing of writs under Article 226 of the

Constitution in the High Court of the relevant state. Additionally, under Article 32, individuals have the option to file writs in the Supreme Court.

Water is a fundamental and indispensable resource for the sustenance and survival of the human species. As per the 2021 World Water Development Report published by UNESCO, there has been a significant surge in the global use of freshwater during the last century, experiencing a six-fold rise. Moreover, since the 1980s, this consumption has been steadily expanding at an annual rate of approximately 1%. The escalating levels of water usage have resulted in significant issues for water quality. The processes of industrialization, agricultural production, and urbanisation have led to the deterioration and contamination of the natural environment, resulting in negative impacts on vital water bodies such as rivers and oceans. These unfavourable effects have significant consequences for human health and the long-term viability of social development (Xu et al., 2022a). On a global scale, it is estimated that over 80% of industrial and municipal wastewater is released into the environment without undergoing any form of treatment. This unregulated discharge has been found to have detrimental impacts on both human health and ecosystems. The aforementioned proportion exhibits a greater magnitude in the least developed nations, wherever the presence of adequate sanitation and wastewater treatment infrastructure is notably deficient.

II. SOURCES OF WATER POLLUTION

Water contamination primarily occurs as a result of industrialization, agricultural practises, natural phenomena, and inadequate infrastructure for water supply and sewage treatment. Firstly, it is important to note that the primary contributor to water pollution is the industrial sector. This sector encompasses many industries such as distillery, tannery, pulp and paper, textile, food, iron and steel, nuclear, and others. Industrial production can result in the discharge of a diverse range of harmful compounds, including both organic and inorganic molecules, as well as toxic solvents and volatile organic chemicals. If these waste materials are discharged into aquatic ecosystems without sufficient treatment, they will result in the contamination of water bodies (Chowdhary et al., 2020). The release of arsenic, cadmium, and chromium in wastewater is a matter of concern, with the industrial sector being a notable source of these dangerous pollutants (Chen et al., 2019). The phenomenon of urbanisation has led to a notable rise in the volume of wastewater generated by industrial operations. According to Wu et al. (2020), Moreover, the issue of water contamination resulting from industrialization is significantly influenced by the presence of foreign direct investment. According to Jorgenson (2009), there exists a positive correlation between foreign direct investment and industrial water pollution in less developed countries. Furthermore, there exists a strong correlation between water pollution and agricultural activities. Water contamination is mostly caused by the presence of pesticides, nitrogen fertilisers, and organic farm wastes originating from agricultural activities (RCEP, 1979). According to Parris (2011), the water is susceptible to contamination by many substances such as nitrates, phosphate, pesticides, soil sediments, salts, and pathogens as a result of agricultural activities. In addition, it has been argued by Moss (2008) that agriculture has caused significant degradation to freshwater systems, compromising their original condition of purity. The utilisation of untreated or partially treated wastewater for irrigation purposes is prevalent in water-deficient parts of developing nations, such as China and India. However, the existence of contaminants in sewage gives rise to potential hazards for both the environment and human health. Using China as a case study, it is evident that the disparity in both the quantity and quality of surface water resources has necessitated the utilisation of wastewater irrigation in certain regions of developing nations to fulfil the water requirements of agricultural production. Consequently, this practise has led to significant contamination of agricultural land and food, posing risks to food safety and human health. This issue has been highlighted by Lu et al. (2015). The utilisation of pesticides has been found to have detrimental effects on human health when consumed through drinking water. In a study conducted by Lai (2017), an examination of the Health Life Expectancy Longitudinal Survey data revealed a positive correlation between pesticide usage and the medical disability index among individuals aged 65 and above. Specifically, the findings indicated that a 10% rise in pesticide use corresponded to a 1% increase in the medical disability index. The Musi River in India presents a notable disparity in morbidity rates between villages that rely on wastewater irrigation and those that utilise regular water sources. Furthermore, water contamination exhibits a correlation with natural causes. Using the Child Loess Plateau as a case study, it is shown that the concentration of trace elements in water quality exceeds the global average. These trace elements are mostly derived from natural weathering processes and anthropogenic activities. According to a

study conducted by Xiao et al. (2019), there is a correlation between degraded river water quality and elevated levels of sodium and salinity, which pose potential dangers. Hexavalent chromium pollution is the prevailing form of water contamination observed in the central region of the loess Plateau. This particular type of pollution arises from a combination of natural environmental factors and human activity. The primary contributors to surface water contamination are loess and mudstone, as well as groundwater with elevated levels of hexavalent chromium (He et al., 2020). Water supply and sewage treatment facilities have a crucial role in influencing the quality of drinking water, particularly in developing nations. Concurrent with the rapid economic growth, industrialization, and urbanisation in China, there has been a lack of adequate investment in fundamental water supply and treatment infrastructure. Consequently, this has resulted in the contamination of water sources, a rise in the prevalence of infectious and parasitic diseases, and an increased vulnerability to industrial chemicals, heavy metals, and algal toxins (Wu et al., 1999). The econometric model provides a forecast of the potential effects of water purification technology on both water quality and subsequently human health. When the percentage of household water subjected to water filtration technology is decreased from 100% to 90%, there is a significant reduction of up to 96% in the anticipated health benefits. According to Brown and Clasen (2012), when the level of risk associated with the quality of pretreatment water is elevated, the magnitude of the fall becomes more pronounced.

III. RIGHT TO ACCESS TO CLEAN WATER

Access to clean water is an essential requirement for human survival. It is considered a fundamental component for the sustenance of the human species. Water plays a multipurpose role in various aspects of daily life. Water is utilised for several purposes such as consumption, personal hygiene, sanitation, and agricultural irrigation, among others. The primary sources of accessible water include lakes, rivers, oceans, ponds, and groundwater. The government also supplies water to the populace. The fundamental human right of an individual is the entitlement to get clean water. On July 28, 2010, the United Nations General Assembly adopted a resolution recognising the right to water and sanitation. During the presentation of the Resolution, Mr. Pablo Solon, the Bolivian Representative to the United Nations, emphasised that access to drinking water and sanitation should not be regarded solely as elements or subordinate components of other rights, such as the right to an adequate quality of life. The recognition of the right to access drinking water and sanitation as distinct and independent rights is vital. In India, the government assumes the role of trustee for all natural resources that are intended for public utilisation and enjoyment, including water. The Constitution of India mandates that water accessibility should be provided to all individuals, regardless of their caste or religion.

IV. CAUSE AND EFFECTS OF WATER POLLUTION

Water pollution refers to the process through which the quality of water is altered, rendering it unsuitable for human consumption due to various detrimental alterations inflicted upon its natural state. The definition of water pollution might vary across different academic perspectives. Typically, the term denotes the accumulation of one or more compounds in water to a degree that gives rise to adverse effects on organisms, including both animals and humans. Water pollutants encompass a diverse array of chemicals, microorganisms, and alterations in physical chemistry or sensory properties. A significant proportion of chemical compounds has hazardous properties. Waterborne infections can be caused by pathogens. Modifications to the physical chemistry of water encompass several factors such as acidity, electrical conductivity, temperature, and eutrophication. Water contamination has been identified as a significant contributor to the occurrence of human infectious diseases, which are regarded as highly consequential. In metropolitan regions of India, an estimated annual volume of 50,000 million litres of wastewater, encompassing both industrial and home sources, is produced. When considering the inclusion of data from rural areas, the overall numerical value will exhibit a significant increase. 16 Based on a research published by the United Nations on March 22, 2010, in observance of World Water Day, it was revealed that a significant proportion, specifically 80 percent, of urban garbage in India is disposed into the nation's rivers. Furthermore, the escalating issue is exacerbated by unregulated urban expansion throughout the country, compounded by inadequate governmental supervision. There is an increasing prevalence of water bodies in India that are unsuitable for human utilisation. Specifically, the River Ganga, which holds significant religious importance for the Hindu majority comprising 82 percent of the country's

population, is undergoing a gradual deterioration as a result of unregulated pollution.¹⁷ Water contamination poses a significant challenge in the context of India. Approximately 10% of the wastewater produced undergoes treatment, while the remaining portion is released untreated into various water bodies. As a consequence of this phenomenon, many pollutants are introduced into groundwater, rivers, and other aquatic ecosystems.¹⁸ The presence of contaminated water has significant implications for the human body. The causes of water contamination can be categorised into two distinct components. There are two types of speech acts: direct and indirect.

The presence of unsafe water poses significant consequences for the well-being of individuals. The 2021 World Water Development Report by UNESCO reveals that an estimated 829,000 individuals succumb annually to diarrhoea resulting from the consumption of contaminated drinking water, inadequate sanitation facilities, and poor hand hygiene practises. This distressing figure includes about 300,000 children below the age of five, constituting 5.3 percent of all fatalities within this specific age cohort. According to a study conducted in Palestine, there is evidence to show that individuals who consume municipal water without any treatment are at a higher risk of experiencing ailments, such as diarrhoea, in comparison to those who utilise desalinated water or employ household filtration methods (Yassin et al., 2006). According to a comparative study conducted by Payment et al. (1997), tap water was found to be a significant contributor to gastrointestinal sickness. Insufficient provision of water and sanitation services is also associated with an elevated prevalence of diseases such as cholera, trachoma, schistosomiasis, and helminthiasis. The available evidence from research conducted in developing nations indicates a distinct correlation between cholera and water that has been contaminated. Furthermore, it has been seen that the implementation of home water treatment and storage methods can effectively mitigate the incidence of cholera (Gundry et al., 2004). Furthermore, the presence of inadequate sanitation, contaminated drinking water, and substandard environmental hygiene might contribute to the occurrence of gastrointestinal illnesses, hence impeding the absorption of essential nutrients and resulting in malnutrition. The impacts are particularly notable in the case of children.

Direct Cause:

This category encompasses pollutants that enter the water resource directly, resulting in its contamination. Industrial effluents are identified as the primary contributors to water pollution, affecting both surface water and groundwater inside industrial regions. In that location, industrial waste is released straight into the waterways. Various pollutants, such as heavy metals, resin pellets, organic toxins, oils, nutrients, and sediments, are discharged into wastewater by industries. Thermal effects can also be observed in discharges, particularly those originating from power stations, resulting in a decrease in the oxygen levels.²⁰ The primary contributor to water pollution is municipal sewage. Sewage, sometimes referred to as wastewater, typically encompasses a combination of laundry waste, dishwashing waste, urine, and faecal matter. The management of garbage disposal poses a significant challenge inside the country, resulting in adverse consequences for the health and integrity of rivers and lakes. The contamination of sewage water has been found to be associated with the occurrence of diarrhoea and related health conditions.²¹ In the region of Punjab, over 70% of water pollution is attributed to sewage, resulting in contamination of both drainage systems and river water, as well as posing a threat to the groundwater in urban areas. The contamination of the Ghaggar River is resulting in adverse effects on the groundwater, leading to the manifestation of skin illnesses and other health conditions among the local population utilising it. The aquatic ecosystem in the region of the Ghaggar river has been experiencing significant mortality of fish and other organisms as a result of severe water pollution, resulting in a pervasive odour. Upon doing water testing, it was determined that the observed bio-chemical oxygen demand (BOD) level of the sample was significantly higher, ranging from 25 to 30 mg per litre, in contrast to the typical BOD level of 3 mg per litre.

Indirect cause:

The transport of pollutants from one location to water resources might be referred to as indirect causation. The process of precipitation, whether in the form of rainfall or snowmelt, entails the collection of pollutants as it traverses over terrestrial surfaces or infiltrates into the soil, subsequently leading to their deposition in water bodies.²⁵ The utilisation of fertilisers and other chemical substances by farmers for the purpose of enhancing crop growth is a prevalent

practise. Nevertheless, the introduction of these chemicals and nutrients into the soil has the potential to infiltrate the subterranean water sources.

V. REMEDIES IN CASE OF WATER POLLUTION

When faced with water pollution, the most effective course of action is to seek legal recourse through the judicial system. Polluting a pond, well, or any water resource is a significant inconvenience. Nuisance can manifest in either a private or public context. In the event that an individual's property or associated rights are impeded by the unreasonable pollution of water caused by another party, it is possible to initiate a legal action for private nuisance. The individual who commits a public nuisance may face punitive measures in the form of a criminal sentence, a monetary penalty, or a combination of both.²⁹ According to Section 268 of the Indian Penal Code, 1860, an individual can be held accountable for committing a public nuisance if they engage in any action or fail to act in a manner that is against the law, resulting in harm, peril, or irritation to the general public. The legal recourse for addressing public disturbance is outlined in Sections 133 to 144 of the Criminal Procedure Code. Section 133 confers authority upon the magistrate to issue a directive for the elimination of a public nuisance within a specified timeframe. Public interest litigation (PIL) can be utilised as a means to seek solutions for controlling water contamination through legal channels. The term "public interest litigation" refers to a legal proceeding initiated in a court with the purpose of enforcing matters of public interest.³⁰ A Public Interest Litigation (PIL) or social interest litigation may be initiated in either a High Court or the Supreme Court, in accordance with Article 226 and 32 of the respective courts. In the Supreme Court, the filing of a public interest litigation is limited to cases where there is an issue pertaining to the enforcement of a fundamental right. However, in the High Courts, such litigation can be initiated regardless of whether a fundamental right is at stake. Any anyone with a sense of civic duty has the ability to initiate legal proceedings in order to uphold the constitutional and legal entitlements of individuals or groups who, due to their disadvantaged social or economic circumstances, are unable to seek legal redress through traditional means such as the court system. Article 32 of the Constitution of India serves as a robust safeguard, offering protection to the fundamental rights enshrined in Part IV of the constitution. The aforementioned tool serves as a means of safeguarding the fundamental entitlement to obtain uncontaminated water resources. While the constitution of India does not directly recognise the right to water as a basic right, the judicial interpretation has established that this right is encompassed within Article 21 of the constitution of India. In the case of *Attakoya Thangal v. Union of India*, 1990 KLT 580, the Kerala High Court recognised the right to clean water as an inherent component of the right to life as enshrined in Article 21. The case of *S. K. Garg versus State of U.P.*, AIR 1999 All 41, expanded the scope of Article 21 to encompass the "Right to Water". The court opined that the entitlement to access water is encompassed under the right to life as protected by Article 21 of the Constitution. However, a significant portion of the population residing in Allahabad is now being denied this fundamental right. The absence of water in Allahabad has resulted in significant suffering and hardship for its residents, especially during the current hot season where temperatures can reach as high as 46 or 47 degrees Celsius.

VI. CONCLUSION

The current investigation reveals that the constitutional framework of India, as well as other legislative Acts, do not explicitly ensure the right to obtain clean water. The state bears the responsibility of ensuring the provision of clean water and the prevention and management of water pollution. The current investigation unveils that water pollution constitutes a significant concern in the context of India. The authority of the Supreme Court, as outlined in Article 32, encompasses more than just the ability to issue injunctions to prevent the violation of basic rights. It also includes the power to grant remedies for violations that have already occurred.³⁹ This report elucidates the insufficiency of waste water treatment plants in India. There are ongoing efforts being done. In order to preserve the biodiversity of aquatic organisms in the Ganga river and to implement efficient wastewater treatment measures, the World Wildlife Fund (WWF) has undertaken two pilot projects within the city.⁴⁰ The research emphasises the necessity of implementing sewage treatment facilities in all urban areas. Ideally, the authorization for urban settlement should be granted exclusively subsequent to the establishment of the sewage plant. India faces a significant dearth of safe drinking water and sanitation facilities. The groundwater level is seeing a decline. There is a pressing need for the implementation of a comprehensive and efficient water policy. The initial policy was implemented by the National Water Resources

Council in the year 1987. The revision and updating of this occurred in April 2002. Efforts should have been undertaken by governmental bodies, non-governmental organisations (NGOs), and individuals with higher levels of education to raise awareness among the populace on the issue of water pollution and its consequential impacts. The non-governmental organisation Green Earth orchestrated a series of competitions, including a Programme, poster making, slogan writing, and an environment quiz, with the aim of fostering awareness regarding the environment, health, and sanitation. These events were held in Brahm Sarovar in Kurukshetra.⁴² These types of operations should be prioritised and executed with a sense of urgency and efficiency. This report emphasises the need for the establishment of individual environmental courts in each state, with the aim of alleviating the workload of the judiciary and effectively implementing the recommendations outlined in the 186th Report of India's Law Commission.

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