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Chapter 17

River water pollution, sources, and human health effect in India

Contaminación del agua de los ríos, fuentes y efectos en la salud humana en la India

Sahdev

School of Studies in Environmental Science, Pt. Ravishankar Shukla University, Raipur, Chhattisgarh-492010

Email - sahdevsahurkb@gmail.com

ABSTRACT

Pollution of rivers in India is continuously affecting many areas and affecting the human and environment living in these areas. Due to changes in the standard of river water, the quality of river water is changing, now it is no longer potable. Pollution of river water is affecting the ecosystem of the river. People are facing health-related problems due to the consumption of contaminated water from the river. The factors polluting the river water are industrial, agricultural, oil, social, religious, Disposal of Untreated Sewage, Littering, urban, Human Activities, domestic, etc., due to which the river water is getting polluted continuously. Act and Cess Act of 1974, 1977 have been made for the water prevention and control of pollution in India. Through this review, the reason for the pollution of India's river and human health and cleanliness of the river has been told.

KEYWORDS: River water Pollution, sources, impact, Act, and human health effect.

RESUMEN

La contaminación de los ríos en la India afecta continuamente a muchas áreas y afecta a los seres humanos y al medio ambiente que viven en estas áreas. La calidad del agua del río está cambiando debido al cambio en el nivel del agua del río, ahora ya no es potable. La contaminación del agua del río está afectando el ecosistema del río. Las personas enfrentan problemas relacionados con la salud debido al consumo de agua contaminada del río. Los factores que contaminan el agua del río son industriales, agrícolas, petroleros, sociales, religiosos, disposición de aguas servidas sin tratar, basura, urbano, actividades humanas, doméstico, etc., por lo que el agua del río se contamina continuamente. La Ley de 1974, 1977 y la Ley Cess se han promulgado para la prevención del agua y el control de la contaminación en la India. A través de esta revisión, se ha explicado la causa de la contaminación de los ríos de la India, la salud humana y la limpieza de los ríos.

PALABRAS CLAVE: Contaminación de las aguas fluviales, fuentes, efectos, actos y efectos sobre la salud humana.

INTRODUCTION

Water is a precious and very important liquid for all forms of life on earth. It is a colorless, odorless, tasteless chemical molecule, but the added minerals, nutrients; organic and inorganic compounds occur either naturally or through human activities that give color, smell, and taste to water (Nagarsekar, et al., 2014). Water sources are an integral part of our ecosystem. Water sources are present in the form of rivers, glaciers, lakes, rainwater, groundwater, etc. They not only ensure sustenance for animals but also facilitate economic growth, agricultural development, power generation, and industrial development. The human population living on the banks of rivers depends hugely on it for livelihood through fishing and livestock production. But this dependence also plays a vital role in the deterioration of water quality of the water sources. Increasing population, industrialization, and urbanization are some of the prominent factors responsible for the degradation of water quality (Tyagi, et al., 2013). Accumulation of waste and toxicants in the stream while flowing from the upstream side to the downstream side (Al-Obaidy, et al., 2013, and Ravindra et al., 2003). River water pollution is one of the major global environmental concerns today. Diminished river water quality upsets the balance of the aquatic ecosystem and leads to fatal consequences both for humans and animals. It is not only an environmental concern but also a socio-economic issue that needs to be acted upon immediately (Dulo, 2008, and Milovanovic, M. 2007). Anthropogenic activities like direct sewage discharge, washing and bathing, waste disposal, and direct industrial discharge have deteriorated the river water quality globally. But unfortunately, it has been taking the jolt of pollution for decades and that has led to serious degradation in its water quality (Kamboj, N., & Kamboj, V. 2019). River Water pollution is one of the major concerns of many countries. In a country like India, where rivers are considered goddesses, numerous factors are responsible for the degrading quality of river water. All the factors affecting the quality of water should be handled with equal attention (Kamble, R., & Patil, D. 2012).

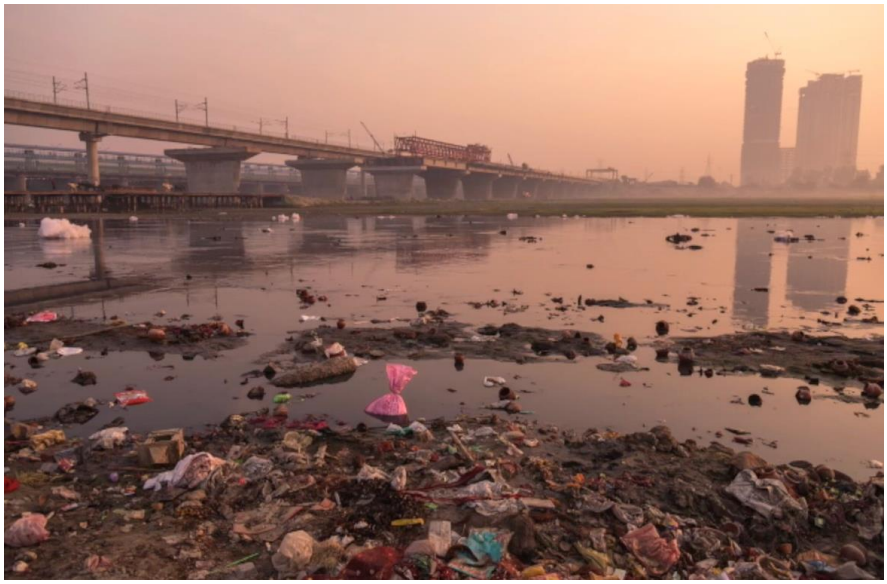

Figure: 1 the degradation of the Mithi River has become an icon of water pollution.

Source: https://www.wearewater.org/en/mithi-river-the-pollution-of-poverty_340931

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RIVER WATER POLLUTION

River Water pollution occurs when pollutants are discharged directly or indirectly into rivers without adequate treatment of harmful compounds. River Water pollution affects humans, plants, and organisms living in these rivers. Water pollutants are damaging not only the individual species and populations but also the natural biological communities. Moving water dilutes and decomposes pollutants more rapidly than standing water (Government of India, 2021).

The main reasons for river water pollution are due to three main sources of pollution, namely industry, agriculture, and riverside residences. Industries and cities have traditionally been located along rivers because rivers provide transportation and have traditionally been a convenient place for waste disposal. Agricultural activities were mostly concentrated near rivers because river floodplains are exceptionally fertile due to the numerous nutrients deposited in the soil when the river overflows (Government of India, 2021).

SOURCE OF POLLUTANTS IN RIVER

(A) Point source pollution refers to the pollution entering the waterway through a discrete conveyance like pipes, channels, etc., from a source such as industry.

(B) Non-point source pollution Non-point source pollution refers to the pollution that does not enter the waterway through a discrete source but is accumulative. The pollutants are collected in small amounts from over a large area (Government of India, 2021). These pollutants are:

1. Disposal of Untreated Sewage: India produces 20,000 million liters of sewage per day (MLD), of which 30% is treated in sewage treatment plants (STP) and the rest of the sewage is discharged untreated into natural waters. A survey of sewage treatment plants in India was conducted by the Central Pollution Control Board (CPCB). According to this survey, most wastewater treatment plants are not operating at design efficiency. About 30,000 MLD of pollutants enter Indian rivers, 10,000 million liters from industrial plants alone (Kamble, R., & Patil, D. 2012).

2. Littering: The volume of waste in India is 0.2 to 0.6 kg of waste per capita per day. Waste is often dumped in the river or on the side of the road, which is then carried down the drain to the river. Many rivers in India are nothing more than bodies of water, little more than flowing dumps, with up to 57% of waste ending up in the rivers. The garbage falls along the banks, giving off the foul-smelling stench of a cesspool (Kamble, R., & Patil, D. 2012). The second part of the seventh report on the state of the environment of India - Excreta Matters (71 cities: a survey) by the Center for Science and Environment (CSE) says that Indian cities wallow in their waste and that rivers become landfill become. In this report, CSE describes 71 cities on their ability to manage wastewater and maps the status of groundwater and its resources. There are other similar towns and villages that haven't even been explored, what we see now is just the tip of the iceberg (Kamble, R., & Patil, D. 2012).

3. Disposing of Ritual Materials: India is a country with 82% of Hindu population by religion. Many people perform various rituals, including throwing the ritual material into the river as it is considered a sacred body of water. In some places, even dead bodies are dumped into the river. In this attempt to cleanse the sins, forgetting that the river is polluted. One of the critical issues is the dumping of thousands of plaster sculptures

(POPs) at various festivals. POP tones are deposited in the river bed and the inorganic paints of the sculptures add toxic pollutants to the river (Kamble, R., & Patil, D. 2012).

4. Human Activities: The river being the most important source of water is used by humans in every possible way. People bathe, washcloths and utensils, and chattels are cleaned in the river. Open defecation is practiced widely in rural and some urban regions, during the rainy season it causes pollution, as it is washed into the river. According to UNICEF, about 626 million people or nearly 51% of the population in India still defecate in the open (Kamble, R., & Patil, D. 2012).

5. Oil Seepage and Agricultural Pollutants: Spillage of oil through vessels and leakage through pipelines is one of the components responsible for river water pollution. Excess fertilizers are washed into the nearby water body and join the river course. It has been estimated (Qasim and Sen Gupta, 1983) that in 1984, 5 million tones of fertilizers, 55 000 tonnes of pesticides, and 125000 tonnes of synthetic detergents were used in India. Roughly about 25% of all these can be expected to ultimately end up in the rivers every year(Kamble, R., & Patil, D. 2012).

6. Industries: The unimpeded flow of sewage and industrial effluents into rivers has compromised their purity. All of this industrial waste is toxic to the life forms that consume this water (Drishtiias, 2021).

7. Urbanization: Rapid urbanization in India during the recent decades has given rise to numerous environmental problems such as water supply, wastewater generation, and its collection, treatment, and disposal.

Many towns and cities which came upon the banks of rivers have not given proper thought to the problem of wastewater, sewerage, etc. (Drishtiias, 2021).

8. Domestic waste: Swashing of fertilizer bags & pesticide, soap, detergent, washing cattle, cow dung, container (Panigrahi, A. K., & Pattnaik, S. 2019).

IMPACT OF RIVER POLLUTION

Marine life is affected by water pollution which increases day by day, disrupting the ecosystem of the river. This pollution affects aquatic life as dams are now being built on various rivers which act as water reservoirs which is dangerous as all animals have a hard time keeping up. Not only aquatic life but also people are affected as people end up drinking that polluted water, using it for daily chores, and making themselves vulnerable to various diseases, for example, water-borne diseases such as typhus, jaundice, cholera, etc. ., even threatening (blog. ipleaders, 2021). People are also exposed to chemically treated water for their daily activities such as cleaning, washing, etc., increasing the chances of spreading infectious diseases. A fragile ecosystem can be ruined by such pollution. If the water continues to be polluted, the ecosystem may collapse and some species are already extinct or on the verge of extinction and need to be taken care of. Chemicals released into water bodies settle to the bottom, forming a thick layer on the river bed. The bacteria present in the water feed on it, leading to a decrease in oxygen which harms the aquatic life present in the rivers. It also has a detrimental effect on the food chain of the animals present in the ecosystem. When the aquatic life tends to ingest the polluted water, the marine life may have toxins and pollutants in its body. When humans

tend to feed on fish, shellfish, or other forms of aquatic life, they also end up consuming toxins and pollutants (blog. ipleaders, 2021).

WATER QUALITY PARAMETERS

Table 1. Indian standards for drinking water specifications

S No.	Parameter Desirable	limit
1.	Turbidity	1–5
2.	pH	6.5–8.5
3.	Total Hardness	200–600
4.	Calcium	75–200
5.	Magnesium	30–100
6.	Chlorides	250–1,000
7.	Sulfates	150–400
8.	Nitrate	45 (no relaxation)
9.	Fluoride	0.6–1.2
10.	Chromium	(Cr+6) 0.05
11.	Alkalinity	200–600
12.	BOD	30–100
13.	TDS	500–2000
14.	Oil and grease	0.5 (no relaxation)

(Haldar, D., Halder, S., Das, P., & Halder, G. 2016).

SOME MAJOR RIVERS IN POLLUTED IN INDIA

Yamuna river, Brahmaputra river, Son river, Brahmani river, Mahanadi River, Ganga River, Cauvery river, Gomti river, Chambal River, Bandi River, Periyar River, Mithi River, Kali River, Narmada River, Damodar river, Mathabhannga river, Mula River, Musi River, and Kulti River (Panigrahi, A. K., & Pattnaik, S. 2019).

WATER (PREVENTION AND CONTROL OF POLLUTION) ACT, 1974

This Act was India's first attempt to comprehensively address environmental issues. This law aims to prevent, control and reduce water pollution and to maintain or restore watercourses which are important sources of water. In addition, this law empowers established bodies, such as the Central Council and the State Council established by the central and state governments respectively, to control the pollution of these waters (blog. ipleaders, 2021). The governing bodies are:

1. Central Board - Central Pollution Control Board (CPCB)

2. State Board - State Pollution Control Board (SPCB)

Subject to Section 2(e). of the Act, "pollution" means any contamination of water or any alteration of the physical, chemical, and biological properties of water or the discharge of sewage into water likely to cause nuisance or render that water harmful to public health or safety or domestic, industrial or other lawful or harmful to the life and health of aquatic animals and plants (blog. ipleaders, 2021).

WATER (PREVENTION AND CONTROL OF POLLUTION) CESS ACT, 1977

Since industrial waste is the main source of water pollution, this waste is usually dumped into rivers, resulting in high levels of water pollution. This law provides for a levy and the collection of a fee on the water consumed or polluted by industrialists and local authorities. The objective of this law is to increase the resources of central and state offices for the prevention and control of water pollution. In this law, the Water (Prevention and Control of Pollution) Cess Rules were formulated in 1978 to set standards and specifications for the type and location of meters that each water user must install (blog. ipleaders, 2021).

GOVERNMENT INITIATIVES TO TACKLE WATER POLLUTION

Recently, the National Green Tribunal (NGT) directed the Ministry of Jal Shakti to devise an appropriate National River Rejuvenation Mechanism for effective monitoring of steps to curb pollution and for rejuvenation of all polluted rivers stretches across the country (Drishtiias, 2021).

- National Water Policy (2012): It aims to take cognizance of the existing situation, propose a framework for the creation of a system of laws and institutions, and a plan of action with a unified national perspective.

- Established by the Ministry of Water Resources, it emphasizes the importance of water for human existence and economic development activities.

- It offers frameworks for conserving water resources through optimal, economical, sustainable, and equitable means (Drishtiias, 2021).

- National Water Mission (2010): It ensures integrated water resource management leading to water conservation, less wastage, equitable distribution forming better policies (Drishtiias, 2021).

- National Mission for Clean Ganga (NMCG): It envisages a five-tier structure at the national, state, and district levels to take measures for prevention, control, and abatement of environmental pollution in river Ganga.

- It aims to ensure a continuous adequate flow of water to rejuvenate the river Ganga (Drishtiias, 2021).

- Namami Gange Project: It integrates the efforts to clean and protect the Ganga River in a comprehensive manner (Drishtiias, 2021).

National Directorate for the Protection of Rivers

The National Conservatory Directorate of Rivers is the subordinate body to the Ministry of Jal Shakti which implements the protection of rivers and lakes across India under the National Rivers Conservation Plan and the National Conservatory Lakes Plan with endorsement by respective state governments (blog. ipleaders, 2021). The objectives of these plans are:

- Improve the quality of rivers and recognize them as an important source of fresh water in the country.

- Implementation of pollution reduction programs and labeling of the ethical use of water.

- Assess the concentration of pollutants in identified streams such as plastics, metals, chemicals, etc.

- Establish guidelines for prioritizing the conservation of the area and provide an action plan for doing so.

- Identify, prioritize and improve the capacity of regional institutions/organizations for long-term involvement in river conservation (blog. ipleaders, 2021).

A total of 34 rivers were covered by this program, namely: Tamrabarani, Vaigai, Vennar, Adyar, Betwa, Dhipu & Dhansiri, Bhadra, Cooum, Narmada, Godavari, Gomati, Khan, Krishna, Rani Chu, Kshipra, Mahanadi, Mandovi, Mahananda, Musi, Pamba, Sabarmati, Brahmani, Cauvery, Satluj, Subarnarekha, Pennar, Tapti, Tunga, Cauvery, Chambal, Damodar, Tungabadra, Wainganga, Yamuna (blog. iLeader, 2021).

The National River Conservation Plan focuses on treating the wastewater that flows into the river, treating and establishing wastewater treatment plans to treat such raw wastewater, to build sanitation facilities that can

prevent defecation on the river banks. This project will increase awareness and understanding of river conservation, protect aquatic life, expand anthropogenic influence and hydrological regime, and concentrate major pollutants in rivers. This project will help preserve rivers and pave the way for systematic prevention of river protection across India (blog.ipleaders, 2021).

EFFECTS OF WATER POLLUTION ON HUMAN HEALTH

Many water-borne diseases are spreading from man to man (Halder, et al., 2015). 10% of the population depends on food and vegetables that are grown in contaminated water (Baker, 2010). Health risk associated with polluted water includes different diseases such as respiratory disease, cancer, diarrheal disease, neurological disorder, and cardiovascular disease (Ullah, et al., 2014). Nitrogenous chemicals are responsible for cancer and blue baby syndrome (Krishnan, et al., 2006). The mortality rate due to cancer is higher in rural areas than in urban areas because urban inhabitants use treated water for drinking while rural people don't have facilities for treated water and use unprocessed water. Poor people are at greater risk of disease due to improper sanitation, hygiene, and water supply (Jabeen, et al., 2011). Contaminated water has large negative effects on those women who are exposed to chemicals during pregnancy; it leads to an increased rate of low birth weight as a result fetal health is affected (Currie, J., et al., 2013). Poor quality water destroys crop production and infects our food which is hazardous for aquatic life and human life (Khan, et al., 2011). Pollutants disturb the food chain (Halder, et al., 2015), and heavy metals, especially iron affects the respiratory system of fishes. An iron clog to fish gills and it is lethal to fish, when these fishes are eaten by humans leads to a major health issue (Ahmed, et al., 2016). Metal contaminated water leads to hair loss, liver cirrhosis, renal failure (Salem HM, et al., 2000), and neural disorder (Chowdhury, et al., 2016, Zimmermann, et al., 2015, and Haseena, M., et al., 2017).

CONCLUSION

River pollution is a growing problem in India today. Factors polluting the river need to be controlled industrial, agricultural, oil, social, religious, Disposal of Untreated Sewage, Littering, urban, Human Activities, domestic, etc. India's Water Conservation Act should be followed properly. Industrial water needs to be reused after proper treatment. The government should make proper efforts to make the river water clean, and the government and the NGOs together should tell the importance of the river to the people.

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