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A REVIEW ON WATER POLLUTION- SOURCES, EFFECTS ON HUMAN BEINGS AND PREVENTIVE MEASURE

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Abstract — Nowadays Water pollution has becomes a global problem, ongoing evaluation of water resource policy is needed to counter this problem. World Health Organization (WHO) refers polluted water as water, which has been impaired by anthropogenic pollutants that render it unsafe for both domestic and other essential purposes like agriculture and industrial uses. These main pollutants, which include bacteria, viruses, parasites, fertilizers, pesticides, pharmaceutical by products, nitrates, phosphates, plastics, fecal waste, heavy metals, and even radioactive substances harm human health and natural environment and cause diseases like diarrhea, cholera, dysentery, typhoid, and poliomyelitis. The pressure on the water environment due to the progress of industrialization in favour of urbanization has become extremely high, and as a result, the availability of clean water has decreased. Contaminated water is of great concern to aquatic organisms, plants, people, and climate, and it actually changes ecosystems. Conservation of our water environment, which is incorporated into sustainable development, must be promoted by all sectors. The main aim of this paper is to explain about importance of water, sources of water pollution and impacts of water pollution on human beings. Also explain about preventive measures for water pollution control.

Keywords- WHO, Anthropogenic pollutants, Nitrates, Heavy metals, Radioactive substances**.**

I. INTRODUCTION

Water is considered contaminated if certain substances or conditions are present and the water cannot be used for a particular purpose, making it unsuitable for drinking, bathing, cooking, or any other purpose. Pollution is the introduction of a contamination into the environment **[1].** Water pollution can be defined as contamination of water making it unsafe and unhealthy to people and animals that drink or wash in it **[2].** It is especially harmful to people who draw water directly from rivers and dams for household use and drinking water. Water pollution causes huge damage to the environment and the well-being of man **[3].** Environmental Pollution is one of the biggest challenges facing civilization today.

Wastewater contains many inorganic and organic substances that are toxic to the various life forms of the ecosystem **[4].** Wastewater from the processing or chemical industry contributes to water pollution. Industrial wastewater usually contains certain easily identifiable compounds. In India, one-third of all water pollution is known to be in the form of industrial sewage, solid waste and other hazardous waste. Industrial wastewater poses a potential danger to the natural water system**[5,6].**Increased pollution by pollutants from industrial water also causes enormous damage to rivers and poses significant health risks, both when bathing directly and when drinking river water**[7].** Contamination by industrial wastewater adversely affects the health of farmers as well as workers living near the chemical synthesis industry, as well as field workers **[8].**Worldwide growth and rapid industrialization have made the interrelationships between pollution, public health and the environment more and more recognized and understood. Due to rapid industrialization, people die from water-borne diseases around the world each year **[9, 10].** Surface water is the industry's leading source of wastewater disposal **[11].** Allegedly untreated or treated wastewater has increases surface water pollution. Almost all rivers in most sections have been found to be polluted by either industry **[12-14].**

All industries in India operate according to the strict guidelines of the Central Pollution Control Board (CPCB), but the environmental conditions are by no means satisfactory. Different industries have different standards and guidelines, depending on the potential for contamination. Most major industries have industrial wastewater treatment plants. However, this is not the case for small industries that cannot afford to invest heavily in environmental protection equipment due to low rates of return. As a result, there is ample evidence in India associated with mismanagement of industrial waste **[9, 15-17].** Most of these non-compliance industries are the petrochemical industry, sugar mills, distilleries, leather processing industries, paper mills, pesticide and pesticide manufacturing industries, and the pharmaceutical industry. Therefore, at the end of each period, the pollution problem is ominously worried. The problem of water pollution is exacerbated by toxic heavy metals **[18, 19].**

Water pollution caused by human activities is one of the biggest environmental problems in the world. Persistent toxins fall into two main categories: persistent organic pollutants and heavy metals. Persistent toxic chemical pollutants have become global concern. International environmental groups, governments and researchers around the world are paying close attention to this issue. A large number of hazardous substances such as heavy metals, petrochemicals, pharmaceuticals, nano materials, pesticides, and herbicides are released into the aquatic environment intentionally or unintentionally during industrialization and urbanization, endangering wildlife and human health **[20].**

II. SOURCES OF WATER POLLUTION AND ITS EFFECTS ON HUMAN BEINGS

Pollution is said to be a point source, when the contaminant entering the water comes from an identifiable source such as a ditch, industry, storm sewer, or sewage treatment plant **[21].** When source of water pollution is not known or pollution does not come from single discrete source pollution is known as non-point source pollution **[22].** Non point source pollution control is very difficult and can come from a variety of sources such as pesticides, industrial fertilizer waste, etc. Pollution from non-point sources is a major cause of water pollution.

2.1 Sewage pollution

Domestic wastewater is a major source of pathogens. Because pathogens are excreted in feces, all wastewater in cities and towns contains one type or another of pathogens, potentially posing a direct threat to public health. Decaying organic matter is another type of water threat. The dissolved oxygen in the water is depleted as the organic matter in the wastewater is degraded naturally by bacteria and other microorganisms. This jeopardizes the water quality of lakes and streams, where fish and other aquatic life require high levels of oxygen to survive. Sewage-treatment processes reduce the levels of pathogens and organics in wastewater, but they do not eliminate them comphepatitis, cholera, dysentery, typhoid, poliomyelitis, cancer, cardiovascular, arsenicosis, trachoma (Eye Infection), schistosomiasis, other medical conditions. There are numerous plant and animal species that depend on water for survival, making them most vulnerable to water pollution. Water pollution can have disastrous effects on the environment as well as affects the entire food chain: Fishes and the other aquatic animal mistake these pollutants for food, consume them and later pass them to humans when eaten. Fishing in contaminated water and using wastewater for animal husbandry and agriculture can also introduce toxins into food, which can be unhealthy if ingested. The consequences of water pollution include the destruction of biodiversity, which results in the depletion of aquatic ecosystems.

Waterborne diseases are infectious diseases transmitted primarily through contaminated water. Most intestinal infections are transmitted through feces. Pathogens, including viruses, bacteria, protozoa, and parasites, are pathogens found in the stool of an infected person. These diseases are more common in areas with poor sanitation. These pathogens travel through water sources and interfaces directly through Persons handling food and water. Because these diseases are highly contagious, those caring for infected patients must be very careful and hygienic. Hepatitis, cholera, amoebic dysentery and typhoid are the more frequent water borne diseases that involve large populations in the tropical regions **[41].** Inadequate access to water and sanitation affects women's health in many ways in addition to communicable diseases, including increased psychosocial stress, urinary incontinence and constipation, maternal mortality and preterm birth. **[40].** Minamata disease is one of the first and most serious cases of diseases resulting from environmental contamination caused by waste water discharge from an industrial plant. Methylmercury (MeHg) contained in the plant's waste water contaminated marine life in the surrounding waters and was, in effect, poisoning those who ingested the affected fish and seafood **[41].**

2.2 Industrial effluents

Industrial wastewater is a major source of direct and often persistent releases of pollutants into aquatic ecosystems with long-term consequences for ecosystem functioning, including changes in food availability and serious threats to the biosphere's ability to self-regulate. These industrial discharge or wastes include heavy metals, pesticides, polychlorinated biphenyls (PCBs), dioxins, poly-aromatic hydrocarbons (PAHs), petrochemicals, phenolic compounds and microorganisms**[23- 25].** Industrial processes are causing the production of large amount of toxic and stable pollutants, which are all collected into the water out coming from the plant. The disposal of these contaminated effluents into receiving waters can cause environmental damages, directly influencing the aquatic ecosystem and even human being **[26].**

Industrial waste containing high concentrations of micronutrients has the potential to promote the subsequent growth of E. coli and other forms of microorganisms. Some of the heavy metals in this wastewater have been found to be carcinogenic, while others, equally present, are toxic depending on the amount and duration of exposure. Undoubtedly, wastewater from industrial enterprises and residential areas discharged into other environments without proper treatment can disrupt the ecological balance of such environments **[27].**

2.3 Ground water pollution

When pollutants which are present on ground enter the water bodies under earth they cause ground water pollution. If feces containing pathogens enter the ground, they become unfit for drinking. Groundwater contaminated with pathogens can contain viruses, protozoa, and bacteria, and in some cases, parasite eggs. Consumption of this water causes diseases like diarrhoea and cholera [**28].** Similarly nitrates also causes ground water pollution causing disease in children called blue baby syndrome in rural population of Bulgaria and Romania. It is observed that when nitrates concentration exceeds above 10 mg/L (10 ppm) in ground water chances of blue baby syndrome increases **[29].** Excessive use of nitrate fertilizers can cause water pollution because plants use very little nitrate. This is because most of it accumulates in the soil and later reaches the groundwater, where it washes and contaminates **[30-32].** Ground water polluted with high levels of fluoride causes dental and skeletal problems **[33].**

2.4 Urban storm water runoff

It is due to highly populated cities. It comes from homes and office places **[34].** In suburban and urban areas pavement and buildings covers much of land surface so whenever there is snow melt or rain the water does not soak into ground. Storm water causes water pollution by carrying large amounts of pollutants such as soil, oil, lawn fertilizer and chemicals

directly into rivers and streams. In the case of natural landscapes, these pollutants are trapped in the pores of the soil and water is filtered. This storm water also has high flow rates, which wash more sediment off the levee, causing water pollution **[34].**

2.5 Agricultural pollutants

As in rural areas population is less so it mostly contains fertilizers, pesticides and eroded soil and these pollutants reach to water bodies through runoff after rain and flood **[34].**Agricultural runoff cases fresh water body's eutrophication. Phosphate is the main contributors to eutrophication its high concentration promotes Cyanobacteria and Algae growth which ultimately reduces dissolved oxygen in water Harmful toxins which accumulate in food chain are produced by cyanobacterial blooms **[35].** Nitrogen-rich fertilizer compounds cause dissolved oxygen starvation in rivers, lakes and coastal areas, which has a devastating effect on marine fauna. Nitrogen fertilizers are highly soluble in water and lead to groundwater contamination by increasing runoff and leaching rates **[31].**

Similarly, pesticides are used to control pests, and these pesticides are washed with groundwater to contaminate groundwater. Water-soluble pesticides leach more. Sandy soils also promote leaching **[36].**

2.6 Oil spillage

Oil spills to sea level due to accidents or leaks from cargo tankers transporting gasoline, diesel fuel and their derivatives, seriously polluting sea water. Offshore oil exploration also results in oil pollution of water. Residual oil spreads over the water surface, forming a thin layer of water-oil emulsion.

2.7 Acid rain pollution

Atmospheric Sulfur dioxide and nitrogen dioxide emitted from natural and human-made sources like volcanic activity and burning fossil fuels interact with atmospheric chemicals, including hydrogen and oxygen, to form sulphuric and nitric acids in the air. Acids rains reaches earth in the form of precipitation. As soon as acid rain reaches the ground, it flows through the waterways that carry acidic compounds into the water. Acid rain that collects in the aquatic environment lowers the pH of water and affects the aquatic biota.

2.8 Atmospheric pollutants

Small particles present in the air reaches water bodies through rain. It contains carbon dioxide generated by the combustion of fossil fuels. Its amount increases and combines with water molecules to form sulphuric acid. Particulates also play very important role in effecting water pollution these particulates reach to water bodies through rain **[22, 34].** Pathogens are the microorganisms which causes disease. Most bacteria in nature are not pathogenic or beneficial, but few are pathogenic, and these pathogenic bacteria also contaminate drinking water. Coliforms are a bacterial indicator species used to identify water pollution.

2.9 Pesticides and herbicides

Herbicides and pesticides are also contributes to water pollution. Their leaching also pollutes ground water. The soil is sandy and the pesticides are water soluble, there will be more leaching. Similarly, pesticides and herbicides also flow into natural water through spills. When these pesticide residues enter natural water, they disturb the flora and fauna there. Pesticides which don't degrade easily or take time to degrade are more harmful **[37].**

2.10 Sediment pollution

Sedimentation due to runoff effects water quality. It reduces the penetration of light into the water, resulting in disruption of the flora in the water. Fish and other animals eating this flora are also disturbed, disrupting the entire food chain. Pollutants such as pesticides and phosphorus are transported and accumulated by sedimentation. Sediment particles also attach to the gills of the fish, making it difficult for the fish to breathe. In this way, it can cause the death of the fish. Similarly sediments carry dangerous chemicals like pesticides and petroleum products to water bodies thus polluting them **[34].**

2.11 Saltwater intrusion

Saltwater intrusion is another very important factor that pollutes groundwater. It occurs when saltwater from coastal seas enters groundwater. Navigation channels, drainage channels and agriculture channels also play important role in salt water intrusion **[38].**

2.12 Religious and social beliefs

Human habits are also responsible for the water pollution. After religious worship, many people in the river through ashes, old figurines and other objects. Most religious beliefs and social activities have contributed to the pollution of our rivers since ancient times. Carcasses of cows and other animals are dumped in the river. The corpse is cremated on the riverbank. A partially burnt corpse is thrown into the river. All this is done according to ancient rituals, from religious beliefs. These practices pollute river water and affect water quality. The problems peculiar to the city of Varanasi stem from the Hindu belief that the dead here cremated will receive salvation. As a result, hundreds of bodies are cremated on the banks of the river every day.

This amounts to nearly 15,000 tons of ash per month which is dumped into the river **[39, 40].** Mass bathing in a river during religious festivals is another environmentally harmful practice. Studies show that biochemical oxygen demand (BOD) increases dramatically when thousands of people take a holy bath at the same time. Today, it is common for people to immerse their offerings in plastic bags. This is extremely dangerous and further increases river pollution.

III. PREVENTIVE MEASURE FOR WATER POLLUTION

In accordance with the Water Pollution Prevention Act, various measures are being taken to prevent water pollution and achieve required environmental water quality standards.

3.1 Effluent control and effluent standards

The first step towards water pollution control was effluent control on waste discharged into public waters from factories. This subject was addressed in the Environment (prevention) rules, 1986 under (schedule VI). The rule lays down uniform national effluent standards for specified facilities from which effluents are discharged into public water. Industrial plants and public sewage systems, must meet these wastewater standards at the time they are treated through waste treatment if they are discharged into public water bodies. In response industries have developed and promoted waste treatment technology **[44].** Wastewater must be treated at the source itself, but even if it is discharged into a stream after treatment, it will not affect contaminants already present in the stream **[45].**

3.2 Development of sewerage systems

Sewer System is designed to discharge municipal wastewater into rivers or coastal waters after proper treatment. Therefore, they play an important role in improving living conditions and maintaining water quality. The government has to work for develop sewage systems in urban areas and introduce advanced treatment methods for confined water bodies. It has also been important to promote advanced methods of night soil treatment and develop community-scale sewerage systems according to local conditions

3.3 Countermeasures against eutrophication

Eutrophication of water bodies is caused primarily by excessive enrichment of nutrients such as phosphorus, along with uncontrolled growth of primary producers and depletion of oxygen reserves due to decomposition of organic matter by algae. Eutrophication problems caused by nutrients such as nitrogen and phosphate. The first and most important step in protecting and restoring water bodies is to reduce nitrogen and phosphorus loads on freshwater systems. This can be done by changing agricultural practices, such as limiting fertilizer use and optimizing nutrient use. Used to meet crop demand, plan fertilizer use, and build more sustainable agricultural farm. Furthermore, reduction of atmospheric nitrogen sources, better treatment of wastewater and wastewater, better control of diffuse urban nutrient sources such as street runoff and storm sewers, and introduction of wetlands as nutrient sinks can be mentioned as part of the solution to eutrophication the problem **[46].**

3.4 Preventing groundwater contamination

In the past, groundwater was widely used because it was readily available at a relatively low cost, with good quality groundwater, a constant amount, and a constant temperature. However, if it was recovered excessively, the water table began to fall, causing the water in the coastal area to become salty and cause ground subsidence.

There is no easy way to solve the problem of water pollution. In general, there are three different things that can help you deal with a problem: education, law, and economics, and they work together as a team. Awareness Campaign The first step in solving a problem is to make people aware of it. In the early 1990s, when British surfers were fed up with sewage-contaminated water illnesses, they formed a group called sewage surfers to force governments and water companies to purify their sewage. Citizens who are tired of walking on polluted and infected beaches often meet to organize beach cleaning sessions in the community. Campaign for tougher penalties against factories that pour pollution into rivers can be run Awareness can make a positive difference **[45].**

3.5 Law and Order

There are many causes for water pollution. These causes can be eliminated or at least controlled through public awareness and consistent implementation of legislative measures. It is a person's right to drink clean water. It is also the duty of the nation to provide clean water to the people. The right to clean water is not specifically mentioned in Chapter III of the Fundament Rights of the Constitution of India **[47].**

One of the biggest problems with water pollution is its cross boundary nature. Many rivers cross the country and the sea extends throughout the continent. Pollution caused by industries and factories in countries with poor environmental conditions can pollute other neighboring countries, even if they have strict laws and higher standards. Environmental laws can make pollution more difficult, but to be truly effective, they must act across national and international borders. Wastewater discharged from factories into the aquatic environment often contains hot water and other toxic substances. This changes the temperature of the water, damaging the organisms there and destroying the ecosystem. It is necessary to enact stricter legislation on the treatment of this wastewater before it is dumped into water, breaking the link between private-sector commercial industries and corrupt governments. In India, the Water Law is made up of many components **[45].**

3.6 Make Better Policies

Most environmental experts agree that the best way to tackle pollution is to use the polluter pays principle. This means that the person who caused the pollution must somehow pay for cleaning. Buyers are said to have to pay for plastic bags. Widely used in Ireland to promote recycling and minimize waste. Factories that utilize rivers to dispose of waste need to place water pipes downstream under the river drains so that they are the first person when they cause pollution. After all, the polluter pays principle aims to ensure that people refrain from polluting by making it less expensive for them to behave in an environmentally responsible way. Life is ultimately a choice, and so is pollution. We can live with sandy beaches, dead rivers, and fish that are too toxic. Alternatively, we can work together to keep the environment clean and to keep the plants, animals, and people who depend on it healthy. By minimizing the use of pesticides, you can reduce water

pollution by yourself, such as by using safe detergents instead of pouring oil into the sewers. We can hold hands and involve the entire community by helping clean the beach and trash bags to keep the river clean. Then countries and continents will take action and enact and pass legislation to reduce pollution in the world. Working together can reduce pollution and make the world a more livable place **[45].** In addition, freshwater resources are slowly but surely polluted and are no longer available due to human-induced water pollution such as industrial activities. Increased water pollution, especially pollution of freshwater systems by many industrial and natural compounds that are very harmful to human health, is one of the major environmental problems facing the planet **[48].**

Countries around the world have formulated their water quality policies: Developed laws and established institutions to combat water pollution. The agency sets acceptable water quality standards and monitors surface and groundwater water quality across the country. Develop strategies to achieve acceptable water quality by establishing and enforcing limits on specific categories of pollutants emitted from industry, cities and other sources.

In India, the components of the above process are carried out without any necessary correlation, so the Central Pollution Control Board (CPCB) monitors water quality across the country and establishes Minimum Allowable Wastewater Standards (MINAS) for industrial and municipal discharges. You must comply with State Pollution Control Board (SPCB) regulations that are not related to water quality observed in various locations.

3.7 Water pollution legislation and institutions

The main laws related to water pollution are the Water Pollution Prevention Act of 1974, the Water Pollution Prevention Act of 1977, and the Environmental Protection Act of 1986 **[49].**The CPCB has the power to oversee the various SPCBs. It set emission standards and set environmental standards. The CPCB also conducts national research on pollution status and mitigation. The implementation of national environmental legislation and compliance with standards set by the CPCB is decentralized at the state level and the SPCB plays this role.

3.8 Regulatory standards for protection of water quality

The surrounding water quality of rivers, lakes, and groundwater is regulated by water quality standards that define water quality as grades A, B, and C according to the level of various water quality parameters. For control of industrial and municipal discharges the CPCB has issued a set of standards to be enforced by the SPCBs expressed in terms of effluent concentration and are called MINAS **[49].**

IV. CONCLUSION

Water is polluted by many factors, the most important of which is industrial waste. We must strictly comply with all laws regarding water pollution. Industries should behave with more responsible manners. We have to proactively educate our peers and communities on how to prevent water pollution. Public needs to be aware of the effects of water pollution. Volunteer groups should go door to door to educate people about environmental issues. Students can conduct health education to prevent water pollution so that common people can improve their quality of life.

To achieve this goal needed to upgrade all industrial, agricultural and domestic processes that use water to improve wastewater recovery and recycling, reduce evapotranspiration by encouraging the use of water-efficient mulch and crops, and encourage the use of high-efficiency toilets to reduce wastewater. In addition, more rational use of fertilizers and pesticides can reduce the impact on water resources. Third, additional water treatment plants need to be deployed and older plants need to be upgraded to increase capacity. To create more sustainable means of production, we need to move from control measures to precautionary measures in cities and all industrial sectors and change our attitude towards active waste management practices.

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