

Managing the challenge of water pollution in India: A critical review

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Water pollution must be avoided since it releases harmful chemicals into the environment and has negative consequences for humans, plants, animals, and aquatic life. Water contamination has a slew of negative consequences. It has the potential to cause death, illness, and increase disease susceptibility. This paper provides an overview of water contamination in India, health issues and ways to manage water pollution.

Key word: Nutrients, Bacteria, Chemicals

Water contamination in India has risen drastically in recent decades as a result of growing industrialization and urbanization. A large section of population in India has been affected by poor water quality caused by pollution. Even at low concentrations, several toxins and diseases harm the water. Silt, clay, animal wastes, minerals, and other contaminants pollute natural water. The provision of safe drinking water is a basic human requirement. The regulatory machinery, on the other hand, has trailed behind. The key proximate causes include severe gaps in standard establishment, such as a lack of criteria for ambient water quality, insufficient monitoring, and ineffective enforcement by pollution control boards. To control water contamination, a coordinated effort to resolve regulatory inadequacies will be required. Clean drinking water is becoming a rare commodity. Water is becoming an economic and political issue. The economic and political issue as the human population fights for this resource.

Water pollution is the contamination of water bodies. It occurs when pollutants are dumped into water bodies, either directly or indirectly, without proper treatment to remove dangerous substances. Any chemical, physical, or biological alteration in the quality of water that has a deleterious effect on any living organism that drinks, uses, or lives in it is referred to as water pollution.

Contaminants such as agricultural and harmful industrial wastes, as well as other residues, pollute water bodies such as lakes, rivers, underground water, and seas. Contaminants dissolved in water render the water unsafe for human consumption.

The two main sources of water contamination are Sources, both point and non-point Point sources are well-defined sources that produce pollutants or effluents directly into distinct bodies of fresh water. This category includes household and industrial garbage. Pollution sources at the site of origin can be efficiently controlled. Non-point causes of water contamination, on the other hand, are dispersed or spread across wide areas. These sorts of sources are responsible for the bulk of toxins in streams and lakes because they transfer pollutants indirectly through environmental changes. Contaminated water from agriculture farms, building sites, and abandoned mines, for example, reaches streams and lakes. Non point sources of water pollution are difficult to control.

Surface water pollution refers to pollution of above-ground aquatic systems such as lakes, streams, and rivers. Nutrients, bacteria, plastics, and chemicals such as antibiotics, heavy metals, and pesticides are all known to pollute surface water (1). These contaminants have a variety of environmental consequences. Excess nutrients in rivers and coastal seas, for example, can cause dangerous algal blooms and hypoxia.

Furthermore, human activities contribute to the contamination of surface water. Surface water contamination can come from a variety of causes, including agriculture, mining, manufacturing effluent, landfills, human/animal waste, and localized pollution. Downstream of the contaminated area, causing serious health and environmental issues for people, animals, and plants.

Oxygen Depletion It is the phenomenon that occurs in aquatic environment as dissolved agent in water (2) When too much biodegradable material is introduced to water, the number of microbes grows and consumes all of the oxygen available resulting to oxygen depletion .

Aerobic bacteria die when oxygen levels in the water fall too low, while anaerobic microorganisms thrive. Because they create toxins such as ammonia and sulphides, some anaerobic microbes are toxic to people, animals, and the environment (3)

Suspended matter: Because of their molecules are too large to combine with the water molecules, some suspended matter do not dissolve in water. Particulate matter is a type of substance that can contaminate water. The suspended particles fall to the bottom, forming a thick layer of silt. This is hazardous to marine species that dwells in rivers and lakes. Biodegradable compounds are frequently suspended in water and can cause difficulties by increasing the number of anaerobic microbes in the environment. Toxic compounds in the water can impair aquatic life's growth and survival.

Nutrients: Plants require nutrients in order to grow and develop. Many nutrients can be present in wastewater and fertilizers, and if significant amounts wind up in water, they can produce excessive weed and algae development. Drinking water can be contaminated, and as a result, filters might become blocked. Other aquatic animals may be harmed as a result of the algae's use of oxygen in the water, which leaves none for the rest of the marine life.

Ground water : Groundwater pollution happens when man-made materials such as gasoline, oil, road salts, and chemicals contaminate the water, rendering it hazardous for human consumption.

Materials from the surface of the land can pass through the soil and into the groundwater. Pesticides and fertilisers, for example, can make their way into groundwater supplies over time. Groundwater may also be contaminated by road salt, hazardous compounds from mining sites, and wasted motor oil. Untreated sewage from septic tanks, as well as harmful chemicals from underground storage tanks and leaking landfills, can contaminate groundwater. Tanks for storage

They can be above or below ground and can contain gasoline, oil, chemicals, or other forms of liquids. There is a risk of serious pollution if the toxins break out and enter the groundwater. There can be various sources of ground water pollution as like Septic systems are onsite wastewater disposal systems that are utilised by homes, offices, and other structures that are not connected to the city sewage system. Septic systems are designed to progressively drain human waste underground in a safe and environmentally friendly manner. A septic system that is incorrectly planned, situated, constructed, or maintained can cause major difficulties by leaking bacteria, viruses, household chemicals, and other toxins into the groundwater.

Drinking contaminated groundwater can be dangerous to one's health. Contamination from septic tank waste can cause diseases including hepatitis and dysentery. Toxins that have leached into well water supplies may cause poisoning. Contaminated groundwater can potentially impact wildlife. Exposure to dirty water can potentially have long-term consequences, such as some types of cancer.

Microbiological water pollution is a type of water contamination caused by microorganisms that occurs naturally. Many different kinds of microbes dwell in water and can make fish, land animals, and humans sick. Microorganisms such as bacteria, viruses, and parasites can be found in sewage that has not been properly handled, animal waste runoff, industrial sources such as slaughterhouses, food and paper processing companies, and landfills.

Industrial waste such as metals and solvents can pollute rivers and lakes. These are harmful to many types of aquatic life and can cause them to slow down, become infertile, or even die. In agriculture, pesticides are used to control weeds, insects, and fungi which pollutes the water.

Nitrogen, bleach, salts, pesticides, metals, bacteria-produced poisons, and human or animal medications are examples of chemical pollutants. Organisms in water are biological pollutants.

Fertilizers also pollute the water supply. Water contamination is mostly caused by nitrogenous fertilizers and phosphates. They necessitate high-tech scrubbing equipment and complex water treatment systems to remove the pollutants.

Recommendation:

Treatment of wastewater before it is returned into rivers is one of the most efficient means of minimising water pollution. Sewage will be pumped through the facility's several chambers to gradually lower its toxicity. Other way is to Reduce plastic waste. As per industry sources every year, an estimated 9-12 million tonnes of plastic enter the ocean, a figure that must be drastically lowered to prevent the ocean's water quality from deteriorating even more.

Septic tanks are valuable pieces of equipment that can effectively treat sewage by separating the liquids from the solids. Before the liquids run straight through these tanks, numerous biological processes will be used to adequately breakdown the solid ingredients into a drainage system for the land. Septic tanks reduce water pollution by effectively removing contaminants already present in the water.

Stormwater gathers up dangerous contaminants when it travels along sidewalks, roadways, and lawns, which are subsequently forced into storm drains, streams, and rivers.

Stormwater can be treated and controlled using a variety of methods, including sand filtration and electrocoagulation, as well as reverse osmosis and advanced oxidation

Water contamination is primarily caused by agriculture. Pesticides and fertilisers wash away with stormwater when it rains, bringing viruses and bacteria into the waterways. Agriculture, on the other hand, might be more environmentally beneficial.

Coagulation and filtration techniques in water treatment can remove some microbiological pollutants. Although disinfection has been shown to be successful against bacteria and viruses, protozoa such as Giardia and, in particular, Cryptosporidium have proven to be extremely resistant to chlorination alone.

Denitrification is a simple biological process that converts nitrates straight to nitrogen gas, preventing nitrate from being absorbed into the soil and contaminating groundwater.

It is critical to absorb or control spills in order to prevent dangerous chemicals from entering the watershed. Secondary containment berms and basins are used to catch and confine biohazard spills and leaks so that they can be properly disposed of.

Pollution of water and the environment is an issue that affects people not in India but all over the world. There are several strategies to avoid water pollution, but one of most important is to avoid disposing of non-biodegradable waste materials and industrial waste in water bodies, and to stop using pesticides and insecticides, among other things.

Reference

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