

Nature of Water Pollution and Its Environmental Impact in Present Day Scenario

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ABSTRACT: *Water pollution now a days has become a serious concern for environment, mostly due to the presence of unprocessed effluents, chemicals and pesticides in it. Water is a natural resource, which is essential for living beings. Water is used in many purposes from drinking to industrial and agricultural areas. Due to water pollution, water quality is deteriorating day by day. Therefore, polluted water is a threat to human life as well as animals and plants. Water pollution affects not only the aquatic life but also is a threat to all-biological communities. Toxic level in polluted water provokes a number of diseases. Pollution free water is the only hope for the healthy life. The present article approaches a comprehensive study on different ways of water pollution and its impact on environment and human health.*

KEYWORDS: *Water pollution, Agriculture, Pesticide, Coal mine, Textile Industry, Environment.*

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I. INTRODUCTION

Water is the most essential element among the natural resources. No living organism including human can survive without water on the planet Earth. Even food production and consequent economic development entirely depends on the availability of pollution free water. Ocean water though saline is the largest reservoir of water on Earth, which cannot be used for consumption without processing. The only natural source of potable water is underground water. Improper and irrational use of water by humankind leads to the acute shortage and may result in severe consequences in future. World's food supply is dependent on irrigation, which demands enormous amount of water supply. Development of any country, industrial and consequent economic growth depends mainly on proper availability of good quality water both from underground and surface sources. This quality of water is deteriorating due to the rise of urbanization, rise in population, industrial progress, climate change and other natural phenomena such as volcanoes, algae blooms, storms and earthquakes. The resulting water pollution due to the natural phenomena and human activities is a serious threat to the well-being of both the Earth and its population [1]. Water pollution is the contamination of natural water bodies by the presence of toxic chemical, physical, radioactive or pathogenic microbial substances from agriculture, industry, domestic areas which change in the quality of water that has a harmful effect on any living thing that drinks or uses or lives in it. Polluted water is a major source of skin irritation to cancer-like disease. According to World Health Organization (WHO), 80% diseases are water borne [2]. Drinking water in many countries falls short of stipulated WHO standard. Considerable number of disease and deaths occur from the consumption of polluted water.

II. DIFFERENT TYPES OF WATER POLLUTION

One of the basic amenities for the survival of living beings is water. Now a days rapid industrialization leads to the contamination of water which is a big threat and serious environmental concern. Due to water pollution, the changes in the chemical and physical properties of water are not favourable to all those living organisms using water for their survival [3]. Two primary sources of water pollution are of point source and non-point source. Point source of pollution occur when the polluting substances are discharged directly into the water. A pipe emitting toxic substances from industry directly into a river is an example of point source of pollution. Non- point source of pollution occurs when there is runoff of pollutants into a water source. Polluted runoff from agricultural areas draining into a river is an example of non-point source of pollution . The growth of human population, industrial production and agricultural practices is the major cause of water pollution [4].

2.1 WATER POLLUTION ARISING FROM AGRICULTURE

According to a report published in 1990 from the Environment Protection Agency (EPA), > 50% of the water pollution of streams and rivers arise due to discharging and mixing of pollutants from agricultural fields [5]. Cropland are prepared for farming by adding fertilizer, animal waste, herbicides, insecticides and fungicides to protect the plant from insect or fungal attack. However, these chemicals are not good for environment. Some

of the residues of the chemicals remain in the soil after the plant uptake. These residues may contaminate subsurface water or surface water by adsorbing to sediment. For example, fertilizer consisting of nitrogen may be converted first into ammonium and then into nitrates. Then Nitrates can transform into nitrites and both are threats to human health [4]. Hydrophilic nature of Nitrogen fertilizers make it highly water-soluble, which may cause runoff and leaching in ground water [6-8]. In the same way, pesticides, which are used to protect plants from pests, also leaches to ground water thus polluting ground water. Mainly, water-soluble pesticides leach more. Another favourable conduit for leaching is sandy soil [9-10]. Selenium (Se) is a heavy metal that occurs naturally in soil. Irrigation practices leads to its accumulation in the soil. This accumulated selenium spreads to water reservoirs by percolation [11]. Prolong exposure to these residues leads to the harmful effect to the living organism.

2.2 WATER POLLUTION FROM INDUSTRY

The major cause of water pollution is industrialization and increase in population. In the industrial areas, industrial wastages including heavy metals, resin, pellets, organic toxins, oils, nutrients, and solids are the main source of water pollution both surface water and ground water. They are directly discharged into the waterways and water is polluted.

2.2.1 WATER POLLUTION FROM COAL MINING AREAS

Coal mining activities can directly affect the water pollution or indirectly through coal mining processes, which may show its impacts at a later stage in the life of the mine. Due to lack of proper planning and negligence of regulations an appreciable amount of environmental degradation and ecological damage leads to water pollution. In coal mining areas, presence of pyrites in coal seams coming in contact with water used in the mining process and oxygen, undergo oxidation to form sulphuric acid, thereby increasing the acidity and pH of the used water. When this water is discharged from the mine, it contaminates the other water bodies and the ground water. In mining areas, wind pick up the dust particles along with loose materials that are formed during the mining process and deposit them on water bodies. Loose materials are also carried by the streams, running through the mines that meet the main course or end into a water reservoir causing water pollution in both cases. Overburden dump in coal mining areas may contain pollutants in the form of heavy metals or other chemicals. These waste materials may leach out during the rains and pollute the different water bodies in surrounding areas.

2.2.2 WATER POLLUTION FROM PETROLEUM INDUSTRY

In petroleum industry, huge amount of water is used, especially in the oil production and processing sector, but modern refineries work with a nearly closed water cycle where fresh water losses only for evaporation. The main impact of water pollution comes from uncontrolled leaks and spills, and during transportation of crude oil and products. Polluted water in the petroleum industry is usually generated in the various production and processing operations. Leaks of oils and fuels during the production, process, storage equipment or pipelines, may contaminate nearby water bodies and facilitate the water pollution [12].

2.2.3 WATER POLLUTION FROM TEXTILE INDUSTRY

There are several effluent discharges from textile industry such as heavy metals, dyes, surfactants etc. Not only textile industry, dye is also used in cosmetics, food, pharmaceutical, printing industry [13-14]. Textile industry mainly emerge out dye in the stream, which hamper aquatic life as well as the ecosystem. Presence of dye in wastewater is easily recognizable. Small amount of dye pigments the water. Dye is an Aromatic compound with different functional groups. Aromatic rings of dye bearing π – electron acts as chromophore, which absorbs mainly visible light (400-700 nm) spectra [15]. This chromophore imparts colour to the dye. Dyes are mainly non-biodegradable, so prolonged time existence in environment makes it hazardous. Several natural and synthetic dyes have toxic effect due to the amide and benzide emission. Carcinogenic nature of dyes has a direct impact on aquatic life [16]. Presence of dye reduce the penetration of sunlight to reach in the deep water and thereby its severe implication is observed in aquatic life. Not only marine life suffers by untreated dye effluents from industry but the human life, animal being, plants are also affected due to its toxicity.

2.3 WATER POLLUTION FROM URBAN AREAS

Water pollution becomes worse because of overpopulation in urban areas. City sewage is also the main source of water pollution. Sewage is the wastewater of society and the ejection of unprocessed sewage into a river is enormous and extremely harmful. Sewage usually contains laundry waste, dishwashing waste, urine and faeces. These sewages are decomposed by decomposer especially bacteria. Decomposer uses dissolved oxygen during respire. As a result, amount of dissolved oxygen and Biological Oxygen Demand (BOD) in water is reduced considerably, affecting the lives of aquatic animal [4].

2.4 POLLUTION OF WATER FROM ATMOSPHERE

Atmospheric pollutants also indirectly contaminate water. Small particle presents in atmosphere reaches to water bodies through rain. Particulates plays very important role in effecting water pollution by reaching to water bodies through rain. Fumes emitted from vehicles or industry and burning of fossil fuels increase the amount of carbon dioxide. This carbon dioxide combined with water molecules, makes it acidic in nature. Sulphur dioxide produced from volcanoes and industries also reacts with water molecules to form sulphuric acid. Sulphur dioxide is also produced by combustion of coal and petroleum products. Similarly, Nitrogen dioxide also combines with water to form nitric acid. These gases and small particle present in the air, which pollute water [17-18].

2.5 WATER POLLUTION FROM COASTAL AREAS

Saltwater intrusion in coastal areas is very significant cause for water pollution. Saltwater intrusion caused by various natural process like sea level rise and storm surge and anthropogenic hazards like pumping of excess fresh groundwater for domestic and industrial use. Navigation channels, drainage channels and agriculture channels also play important role in saltwater intrusion [11]. The water pollution in the coastal areas directly comes from land-based sources, such as oil, dirt, septic tanks, farms, ranches, motor vehicles etc. The dumping of radioactive waste from nuclear reactors, heavy metals and acids from industrial areas and drained sewage are also responsible for water pollution [19].

III. ENVIRONMENTAL IMPACT

Water pollution from agriculture, mining areas, industrial or domestic sewage, coastal areas imparts negative environmental effects. Polluted water can affect the bio-diversity of different areas. Increase or decrease in pH of the water can disturb or prevent the growth of the plants in the area. Similarly, increase in other physical and chemical parameters directly or indirectly disturb vegetation of the area. Excess use of pesticide and deficient management of pesticide application in agricultural land constitutes probable occupational hazards for farmers and environmental risks for agricultural ecosystems [20-21]. Pollution from the oil fields usually takes the form of oil spills that affect the fishing creeks with mass destruction of fish and other marine life [22]. Similarly, the oil and gas from industries draining into the waters may change the properties of water and affect the marine life.

IV. HUMAN HEALTH HAZARD

Polluted water is the main source of a number of diseases in human life. Now a days water is contaminated and polluted when micro-organisms of human or animal origin, toxic chemical substances, auxiliary compounds, industrial or domestic sewage, agricultural residues, heavy metals etc are discharged in water [23]. Water pollution results as toxicological outcomes which not only affects the life of present generation but it also affects the life of upcoming generations because its effects remains for long [24]. The consumption of such polluted waters can lead to severe health problems, diseases and even deaths in some cases. Human infectious diseases are among the most serious effects of water pollution. Pollutants in water include a wide spectrum of toxic chemicals and pathogens. Presence of pathogens in water can produce waterborne diseases [24]. Consumption of polluted water containing lead beyond permissible limits causes neurological disorders with in most cases may lead to deaths. Similarly, there are trace metals like arsenic, cadmium, cobalt, copper, iron, etc. in polluted water that can severely damage the nervous system. The other health problems also associated with the water pollution are gastro-intestinal irritation, dental and skeletal fluorosis.

V. PREVENTIVE MEASURE

Control of water pollution has reached primary importance in developed and a number of developing countries. The prevention of pollution at source, the precautionary principle and the prior licensing of wastewater discharges by competent authorities have become key elements of successful policies for preventing, controlling and reducing inputs of hazardous substances, nutrients and other water pollutants from point sources into aquatic ecosystems. Some water pollutants, which become extremely toxic in high concentrations are, may be needed in trace amounts. Copper, zinc, manganese, boron and phosphorus, for example, can be toxic or may otherwise adversely affect aquatic life when present above certain concentrations, although their presence in low amounts is essential to support and maintain functions in aquatic ecosystems. The same is true for certain elements with respect to drinking water. Selenium, for example, is essential for humans but becomes harmful or even toxic when its concentration exceeds a certain level. The concentrations above which water pollutants adversely affect a particular water use may differ widely. Water quality requirements, expressed as water quality criteria and objectives, are use-specific or are targeted to the protection of existing or planned uses within a catchment.

VI. CONCLUSION

The survival of any living being is not possible without water. For a healthy life, pure and pollution free water is essential. If in any area the water is polluted then people or the other living creatures drink that polluted water, because they have no other option nor can they live without it. Many laws, awareness and by the strong implementation of the legislative measures Government, NGO's should educate people about hazards of water pollution. Many NGO's organize competitions programme, poster making, slogan writing and an environment quiz for creating awareness about the environment, health problem due to the water pollution. Prevention and awareness of people is an essential part to curb water pollution, but it will require radical changes and awareness at all levels of society.

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