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WATER POLLUTION AND SOCIETY

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Water is the basic ingredient in the entire life cycle. The living cell is mostly water. Comprising over 70% of the Earth's surface, water is undoubtedly the most precious natural resources that exists on our planet. Without the seemingly invaluable compound comprised of hydrogen and oxygen, life on Earth would be non-existent; it is esstential for everything on our planet to grow and prosper. It is well known fact that most of the pollution tragedies and all environmental problems in our country are posing challenge to all Scientists and Chemistry researchers in protecting the Environment at Global level.

The state of climate today is the result of human activity in the recent past and our activity today will affect the climate of the future. Until recently, no one thought that human activity could affect the world on global scale. Oceans, rivers and the atmosphere have always been taken to be the free dumping sites for the waste generated on the earth. The Indian Scenario is a grim picture of environmental degradation.

There is ample evidence of the adverse effects of water pollution from all over the country. These range from the recurring epidemics of waterborne diseases like Cholera, Jaundice, Typhoid and Dysentery to fish kills and loss of agricultural production. The most revered river the Ganges is highly polluted. There are 114 cities on the bank of the Ganges. None of these cities have set up the effective sewage treatment plants. Untreated sewage and factory waste is discharged in the river. Out of 3,119 cities in India only 8 cities have been provided with sewage treatment plants. 209 cities have partial arrangement for treating sewage and the remaining cities have no facility for treating sewage. Our rivers, lakes, estuaries and coastal waters have been turned into sewers and the country is already facing, an acute water crisis.

Indiscriminate discharge of untreated industrial effluents on land have irreversibly contaminated the ground water sources. In many industrial belts of Andhra Pradesh North Arcot district of Tamil Nadu, Poli and Brichhri of Rajasthan and various other parts of the county, a large number of wells contain highly polluted water and local people have to fetch drinking water from far away places.

Environmental Pollution is a social problem. The success of environmental protection and preservation depends upon the success of environmental education in the society. Awareness of the problems due to pollution and commitment to their solution will definitely help to protect our environment. It is always easier to control Pollution at the earliest stages rather than incurring huge expenditure at later stages. We need to learn from the experience of developed countries and take into consideration the environmental quality in the initial stages of industrialization and urbanizationThe objective of Environmental Education is to enlighten the public, particularly scientific community about the importance of protection and conservation of our environment and there is need to restrain human activities which leads to indiscriminate release of pollutants in the environmental segments.

Water quality is closely linked to water use and to the state of economic development. In industrialised countries, bacterial contamination of surface water causes serious health problems in major cities at the global level. Estimates suggest that nearly 1.5 billion people lack safe drinking water and that at least 5 million deaths per year can be attributed to waterborne diseases. With over

70 percent of the planet covered by oceans, people have long acted as if those very bodies of water could serve as a limitless dumping ground for water. Raw sewage, garbage, and oil spills have begun to overwhelm the diluting capabilities of the oceans and most coastal waters are now polluted..The growing scale of cultural and technological development in the society poses new threats to water quality.

Toxic trace elements found in natural waters and waste waters, some of these are essential at low levels, serving as nutrients for animal and plant life, but are toxic at higher levels. Nitrates (the salts of nitric acid) in drinking water can cause a disease in infants that sometimes results in death. Cadmium in sludge-derived fertilizer can be absorbed by crops, if ingested in sufficient amounts, the metal can cause an acute diarrhea disorder and liver and kidney damage. The hazardous nature of inorganic substances such as mercury, arsenic and lead has long been known or strongly suspected. Most of the world's great biological systems are in a state of collapse because we have logged, trawled, or cultivated them to maximize short-term production.

Water pollution is a large set of adverse effects upon water bodies (lakes, rivers, oceans, groundwater) caused by human activities. Although natural phenomena such as volcanoes, storms, earthquakes etc. also cause major changes in water quality and the ecological status of water, these are not deemed to be pollution. Water pollution has many causes and characteristics. Increases in nutrient loading may lead to eutrophication. Organic wastes such as sewage and farm waste impose high oxygen demands on the receiving water leading to oxygen depletion with potentially severe impacts on the whole eco-system. Industries discharge a variety of pollutants in their wastewater including heavy metals, organic toxins, oils, nutrients, and solids.

ADDITIONAL FORMS OF WATER POLLUTION

Three last forms of water pollution exist in the forms of petroleum, radioactive substances, and heat. Petroleum often pollutes waterbodies in the form of oil, resulting from oil spills. The previously mentioned Exxon Valdez is an example of this type of water pollution. These large-scale accidental discharges of petroleum are an important cause of pollution along shore lines. Besides the supertankers, off-shore drilling operations contribute a large share of pollution. One estimate is that one ton of oil is spilled for every million tons of oil transported. This is equal to about 0.0001 percent. Radioactive substances are produced in the form of waste from nuclear power plants, and from the industrial, medical, and scientific use of radioactive materials. Specific forms of waste are uranium and thorium mining and refining. The last form of water pollution is heat. Heat is a pollutant because increased temperatures result in the deaths of many aquatic organisms. These decreases in temperatures are caused when a discharge of cooling water by factories and power plants occurs.

CAUSES OF POLLUTION

Many causes of pollution including sewage and fertilizers contain nutrients such as nitrates and phosphates. In excess levels, nutrients over stimulate the growth of aquatic plants and algae. Excessive growth of these types of organisms consequently clogs our waterways, use up dissolved oxygen as they decompose, and block light to deeper waters. This, in turn, proves very harmful to aquatic organisms as it affects the respiration ability or fish and other invertebrates that reside in water.

Pollution is also caused when silt and other suspended solids, such as soil, wash off plowed fields, construction and logging sites, urban areas, and eroded river banks when it rains. Under natural conditions, lakes, rivers, and other water bodies undergo Eutrophication, an aging process that slowly fills in the water body with sediment and organic matter. When these sediments enter various

bodies of water, fish respiration becomes impaired, plant productivity and water depth become reduced, and aquatic organisms and their environments become suffocated. Pollution in the form of organic
material enters waterways in many different forms as sewage, as leaves and grass clippings, or as runoff from livestock feedlots and pastures. When natural bacteria and protozoan in the water break down this organic material, they begin to use up the oxygen dissolved in the water. Many types of fish and bottom-dwelling animals cannot survive when levels of dissolved oxygen drop below two to five parts per million. When this occurs, it kills aquatic organisms in large numbers which leads to disruptions in the food chain.

Pathogens are another type of pollution that prove very harmful. They can cause many illnesses that range from typhoid and dysentery to minor respiratory and skin diseases. Pathogens include such organisms as bacteria, viruses, and protozoan. These pollutants enter waterways through untreated sewage, storm drains, septic tanks, runoff from farms, and particularly boats that dump sewage. Though microscopic, these pollutants have a tremendous effect evidenced by their ability to cause sickness.

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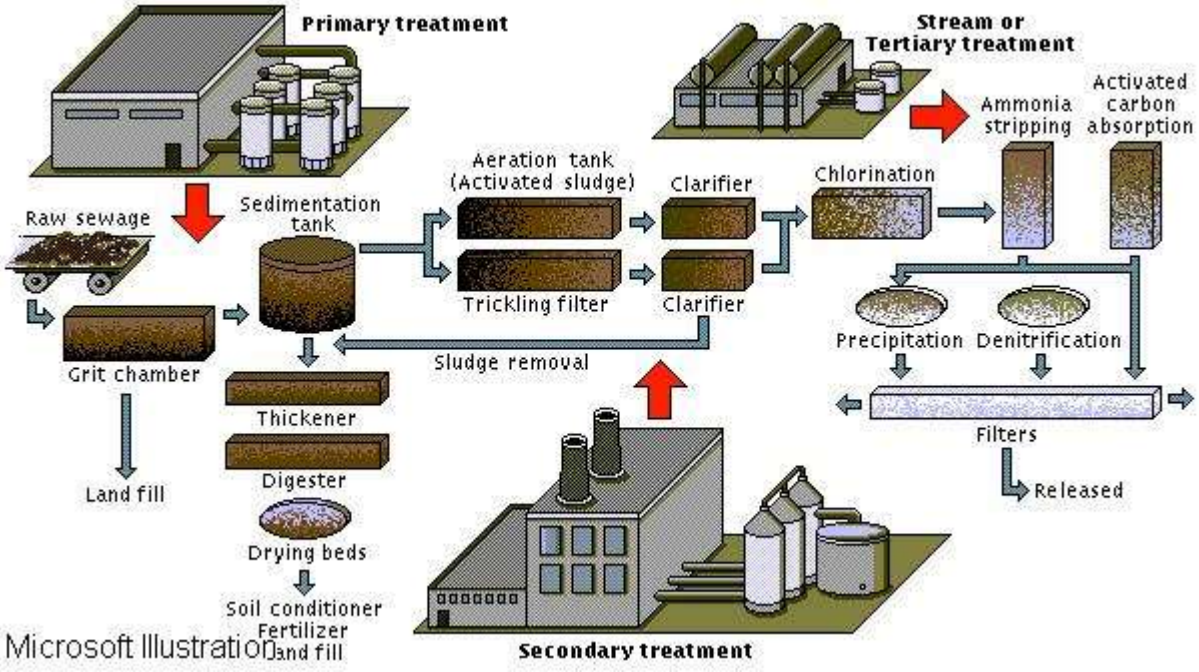
CLASSIFYING WATER POLLUTION

The major sources of water pollution can be classified as municipal, industrial, and agricultural. Municipal water pollution consists of waste water from homes and commercial establishments. For many years, the main goal of treating municipal wastewater was simply to reduce its content of suspended solids, oxygen-demanding materials, dissolved inorganic compounds, and harmful bacteria. In recent years, however, more stress has been placed on improving means of disposal of the solid residues from the municipal treatment processes. The basic methods of treating municipal wastewater fall into three stages: primary treatment, including grit removal, screening, grinding, and sedimentation; secondary treatment, which entails oxidation of dissolved organic matter by means of using biologically active sludge, which is then filtered off; and tertiary treatment, in which advanced biological methods of nitrogen removal and chemical and physical methods such as granular filtration and activated carbon absorption are employed. The handling and disposal of solid residues can account for 25 to 50 percent of the capital and operational costs of a treatment plant. The characteristics of industrial waste waters can differ considerably both within and among industries.

The impact of industrial discharges depends not only on their collective characteristics, such as biochemical oxygen demand and the amount of suspended solids, but also on their content of specific inorganic and organic substances. Three options are available in controlling industrial wastewater. Control can take place at the point of generation in the plant; wastewater can be pretreated for

discharge to municipal treatment sources; or wastewater can be treated completely at the plant and either reused or discharged directly into receiving waters.



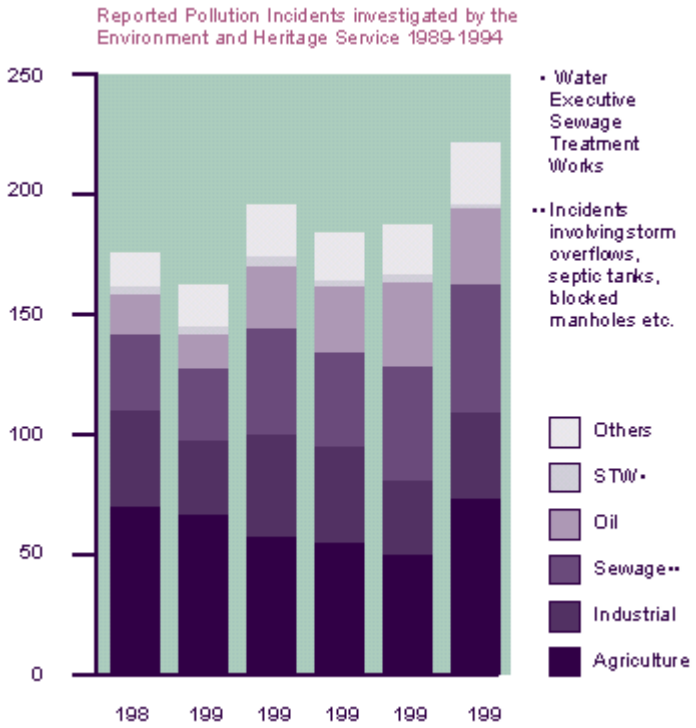
Wastewater Treatment

Raw sewage includes waste from sinks, toilets, and industrial processes. Treatment of the sewage is required before it can be safely buried, used, or released back into local water systems. In a treatment plant, the waste is passed through a series of screens, chambers, and chemical processes to reduce its bulk and toxicity. The three general phases of treatment are primary, secondary, and tertiary. During primary treatment, a large percentage of the suspended solids and inorganic material is removed from the sewage. The focus of secondary treatment is reducing organic material by accelerating natural biological processes. Tertiary treatment is necessary when the water will be reused; 99 percent of solids are removed and various chemical processes are used to ensure the water is as free from impurity as possible.

Agriculture, including commercial livestock and poultry farming, is the source of many organic and inorganic pollutants in surface waters and groundwater. These contaminants include both sediment from erosion cropland and compounds of phosphorus and nitrogen that partly originate in animal wastes and commercial fertilizers. Animal wastes are high in oxygen demanding material, nitrogen and phosphorus, and they often harbor pathogenic organisms. Wastes from commercial feeders are contained and disposed of on land; their main threat to natural waters, therefore, is from runoff and leaching. Control may involve settling basins for liquids, limited biological treatment in aerobic or anaerobic lagoons, and a variety of other methods.

GROUND WATER

Ninety-five percent of all fresh water on earth is ground water. Ground water is found in natural rock formations. These formations, called aquifers, are a vital natural resource with many uses. Nationally, 53% of the population relies on ground water as a source of drinking water. In rural areas this figure is even higher. Eighty one percent of community water is dependent on ground water. Although the 1992 Section 305(b) State Water Quality Reports indicate that, overall, the Nation's ground water quality is good to excellent, many local areas have experienced significant ground water contamination. Some examples are leaking underground storage tanks and municipal and fills.



Discharges can also have thermal effects, especially those from power stations, and these too reduce the available oxygen. Silt-bearing runoff from many activities including construction sites, forestry and farms can inhibit the penetration of sunlight through the water column restricting photosynthesis and causing blanketing of the lake or river bed which in turns damages the ecology. Pollutants in water include a wide spectrum of chemicals, pathogens, and physical chemistry or sensory changes. Many of the chemical substances are toxic or even carcinogenic. Pathogens can obviously produce waterborne diseases in either human or animal hosts. Alteration of water's physical chemistry include acidity, conductivity, temperature, and excessive nutrient loading (eutrophication). Even many of the municipal water supplies in developed countries can present health risks.

Clearly, the problems associated with water pollution have the capabilities to disrupt life on our planet to a great extent. Several legislations and laws have been passed to try to combat water pollution thus acknowledging the fact that water pollution is, indeed, a serious issue. But the government alone cannot solve the entire problem. It is ultimately up to use, to be informed, responsible and involved when it comes to the problems we face with our water. Although we as humans recognize this fact, we disregard it by polluting our rivers, lakes and oceans. Subsequently, we are slowly but surely harming our planet to point where organisms are dying at a very alarming rate. In addition to innocent organisms dying off, our drinking water has become greatly affected as is our ability to use water for recreational purposes. In order to combat water pollution, we must understand the problems and become part of the solution. As we head into the 21st century, awareness and scientific education will most assuredly continue to be the two most important ways to prevent water pollution. If these measures are not taken and water pollution continues, life on earth will suffer severely.