WATER POLLUTION: CAUSES, EFFECTS AND REMEDIES

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ABSTRACT

Water is one of the necessities for existence of mankind. It is also one of the most abundantly available resources. But indifference of mankind and its abuse of the plentiful resource made water scarcity a problem for many nations around the globe. Water pollution is one major problem that demands utmost attention to deal with emerging water crisis. This paper is an attempt to describe various causes and remedies for water pollution.

Keywords -- Water Pollution, Plentiful Resource, Remedies For Water Pollution

I. INTRODUCTION

As stated by Wikipedia, Water pollution is the contamination of water bodies (e.g. lakes, rivers, oceans, aquifers and groundwater). Water pollution occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds.

Water pollution affects plants and organisms living in these bodies of water. In almost all cases the effect is damaging not only to individual species and populations, but also to the natural biological communities.

As we see around the earth, there is plenty of water. Infact 70% of earth is covered with water. But hardly 2% of it is drinkable. We all know that water is very essential for existence of human beings. With the growing population and mismanagement of water resources, scarcity of water has become a bane in India and the rest of the world. The water is available to us from various resources. But unmindful use of these resources has led to a water crisis. Also with the growing industrialization and urbanization, pollution of water has become a major problem that needs to be tackled.

II. WATER POLLUTION

The various sources of water include; groundwater, surface water. Both these resources are in danger due to overuse and misuse.

The following figure shows the major contributors to water pollution.

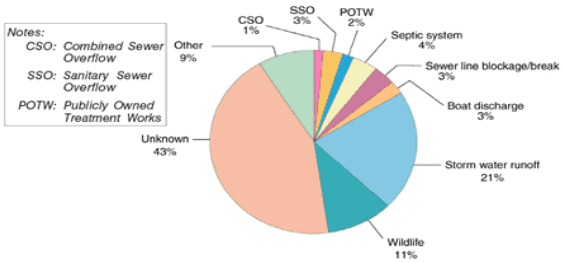

Figure : 01

The ground water is susceptible to contamination from sources that may not directly affect surface water bodies, and the distinction of point vs. non-point source may be irrelevant. A spill or ongoing releases of chemical or radionuclide contaminants into soil (located away from a surface water body) may not create point source or non-point source pollution, but can contaminate the aquifer below, defined as a toxin plume. The movement of the plume, called a plume front, may be analyzed through a hydrological transport model or groundwater model. Analysis of groundwater contamination may focus on the soil characteristics and site geology, hydrogeology, hydrology, and the nature of the contaminants. A number of contaminants are responsible for ground water contamination including a wide variety of chemicals and pathogens. Most these lead to reduction in normal oxygen content in water and hence make it unfit for consumption.

Many areas of groundwater and surface water are now contaminated with heavy metals, POPs (persistent organic pollutants), and nutrients that have an adverse affect on health. Water-borne diseases and water-caused health problems are mostly due to inadequate and incompetent management of water resources. Safe water for all can only be assured when access, sustainability, and equity can be guaranteed. Access can be defined as the number of people who are guaranteed safe drinking water and sufficient quantities of it. There has to be an effort to sustain it, and there has to be a fair and equal distribution of water to all segments of the society. Urban areas generally have a higher coverage of safe water than the rural areas. Even within an area there is variation: areas that can pay for the services have access to safe water whereas areas that cannot pay for the services have to make do with water from hand pumps and other sources.

In the urban areas water gets contaminated in many different ways, some of the most common reasons being leaky water pipe joints in areas where the water pipe and sewage line pass close together. Sometimes the water gets polluted at source due to various reasons and mainly due to inflow of sewage into the source.

Ground water can be contaminated through various sources and some of these are mentioned below.

Pesticides. Run-off from farms, backyards, and golf courses contain pesticides such as DDT that in turn contaminate the water. Leechate from landfill sites is another major contaminating source. Its effects on the ecosystems and health are endocrine and reproductive damage in wildlife. Groundwater is susceptible to contamination, as pesticides are mobile in the soil. It is a matter of concern as these chemicals are persistent in the soil and water.

***Sewage*.** Untreated or inadequately treated municipal sewage is a major source of groundwater and surface water pollution in the developing countries. The organic material that is discharged with municipal waste into the watercourses uses substantial oxygen for biological degradation thereby upsetting the ecological balance of rivers and lakes. Sewage also carries microbial pathogens that are the cause of the spread of disease.

***Nutrients*.** Domestic waste water, agricultural run-off, and industrial effluents contain phosphorus and nitrogen, fertilizer run-off, manure from livestock operations, which increase the level of nutrients in water bodies and can cause eutrophication in the lakes and rivers and continue on to the coastal areas. The nitrates come mainly from the fertilizer that is added to the fields. Excessive use of fertilizers cause nitrate contamination of groundwater, with the result that nitrate levels in drinking water is far above the safety levels recommended.

Good agricultural practices can help in reducing the amount of nitrates in the soil and thereby lower its content in the water.

Synthetic organics Many of the 100 000 synthetic compounds in use today are found in the aquatic environment and accumulate in the food chain. POPs or Persistent organic pollutants, represent the most harmful element for the ecosystem and for human health, for example, industrial chemicals and agricultural pesticides. These chemicals can accumulate in fish and cause serious damage to human health. Where pesticides are used on a large-scale, groundwater gets contaminated and this leads to the chemical contamination of drinking water.

Acidification. Acidification of surface water, mainly lakes and reservoirs, is one of the major environmental impacts of transport over long distance of air pollutants such as sulphur dioxide from power plants, other heavy industry such as steel plants, and motor vehicles. This problem is more severe in the US and in parts of Europe.

III. CHEMICALS IN DRINKING WATER

Chemicals in water can be both naturally occurring or introduced by human interference and can have serious health effects.

Fluoride. Fluoride in the water is essential for protection against dental caries and weakening of the bones, but higher levels can have an adverse effect on health. In India, high fluoride content is found naturally in the waters in Rajasthan.

Arsenic. Arsenic occurs naturally or is possibly aggrevated by over powering aquifers and by phosphorus from fertilizers. High concentrations of arsenic in water can have an adverse effect on health.A few years back, high concentrations of this element was found in drinking water in six districts in West Bengal. A majority of people in the area was found suffering from arsenic skin lesions. It was felt that arsenic contamination in the groundwater was due to natural causes. The government is trying to provide an alternative drinking water source and a method through which the arsenic content from water can be removed.

Lead. Pipes, fittings, solder, and the service connections of some household plumbing systems contain lead that contaminates the drinking water source.

Recreational use of water. Untreated sewage, industrial effluents, and agricultural waste are often discharged into the water bodies such as the lakes, coastal areas and rivers endangering their use for recreational purposes such as swimming and canoeing.

Petrochemicals. Petrochemicals contaminate the groundwater from underground petroleum storage tanks.

Other heavy metals. These contaminants come from mining waste and tailings, landfills, or hazardous waste dumps.

Chlorinated solvents. Metal and plastic effluents, fabric cleaning, electronic and aircraft manufacturing are often discharged and contaminate groundwater.

The surface water is polluted due to flow of contaminated discharge from factories, sewage etc. It also gets contaminated by release of detergents, food processing wastes, insecticides and pesticides, volatile organic compounds, excessive use of fertilizers etc.

Water also gets polluted due to the rise or fall in the temperature of a natural body of water caused by human influence. This type of water pollution is called thermal pollution which results in change in physical qualities of water. Transportation also adds to water pollution with ships, mechanized boats leaving traces of oil in water.

IV. SOME FACTS ON WATER POLLUTION

Following are some facts on water pollution:

- Fourteen billion pounds of garbage, which is mostly plastic, is dumped into the ocean every year.
- The Ganges River in India is one the most polluted rivers in the world with sewage, trash, food, and animal remains.
- According to United States Environmental Protection Agency (U.S. EPA) estimates, 1.2 trillion gallons of untreated sewage, stormwater, and industrial waste is dumped into U.S. waters annually.
- About 700 million people globally drink contaminated water.
- Aquatic animals face an extinction rate of five times more than that of terrestrial animals.
- Over 30 billion tons of urban sewage is discharged into lakes, rivers and oceans every year.
- The massive oil spill that was caused by British Petroleum (BP) in the year 2010 caused over 1,000 animals to die. Many of them were on the endangered species list.
- According to UNICEF, more than 3,000 children die every day all over the world due to consumption of contaminated drinking water.
- Pollution is one of the biggest killers in the world, affecting over 100 million people.
- Lack of proper sanitation in water leads to diseases like cholera, malaria and diarrhea.
- At least 320 million people in China do not have access to clean drinking water

V. MEASUREMENT OF WATER POLLUTION

Water pollution can be measured by various means viz. physical, chemical and biological. In physical testing properties such as temperature, solid concentrations and turbidity are measured. In chemical testing, water samples are analyzed using principles of analytical chemistry. Methods include pH, Biochemical oxygen demand, chemical oxygen demand measurements. Biological testing involves the use of plant, animal, and/or microbial indicators to monitor the health of an aquatic ecosystem. They are any biological species or group of species whose function, population, or status can reveal what degree of ecosystem or environmental integrity is present.

VI. HOW TO PROTECT CLEAN WATER

Dirty water is the world's biggest health risk, and continues to threaten both quality of life and public health in the United States. When water from rain and melting snow runs off roofs and roads into our rivers, it picks up toxic chemicals, dirt, trash and disease-carrying organisms along the way. Many of our water resources also lack basic protections, making them vulnerable to pollution from factory farms, industrial plants, and activities like fracking. This can lead to drinking water contamination, habitat degradation and beach closures. The water can be protected by enacting and enforcing strict laws. The governments over the world have made discharge of effluents in running water an offence. All industrial waste water and water from sewerage must pass through treatment plants before being allowed to be discharged in running water.

Other measures include:

- Green infrastructure and low impact development approaches and techniques help manage water and water pollutants at the source, preventing or reducing the impact of development on water and water quality. Learn about these cost-effective, sustainable, and environmentally friendly approaches to wet weather management.
- States, territories, and tribes must protect water bodies and to address water bodies that do not meet water quality standards (i.e., impaired waters). Find information on regulations, guidance, and technical resources relating to impaired waters and TMDLs.
- Source water contamination prevention by making source water contamination a cognizable offence.
- Sedimentation and other techniques can be used to control water pollution.

Also we need to avoid wastage of water. Rain water harvesting is one such measure that will go a long way in enhancing the depleting water table. Waste water treatment is another way to preserve water. Recycling the water by using water not fit for drinking for other purposes such as watering lawns etc will also help to conserve water.

VII. CONCLUSION

Water is an essential ingredient for human existence. We need to conserve water and not waste and pollute the precious resource. With advancement of science and technology a number of methods are available to treat and cure water. We must therefore pledge not to pollute and waste this precious resource.

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