Effect and Control of Water Pollution a Panacea to National Development

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Abstract: Water is a good solvent, which is the reason why many chemical substances dissolved in it, this paper critically discussed on water pollution and its two sources, effect of water pollution such as sewage, pesticides, animal wastes and the measures control of water pollution as a whole. The paper concluded that, Government alone cannot solve the entire problems related to water pollution and recommended among other, that Government should provide farmers with education on how to use pesticides, fertilizers and other related farms input.

Keywords: Water Pollution, Effect, Control, National Development

1. Introduction

The importance of water for sustenance of life cannot be overemphasized; whether it is use as running water in our homes, rearing cattle and growing crops in our farms or the increased uses in industries remain immeasurable [1]. Water is that chemical substances essentially for every living organisms to survive. Therefore, it is important to know that depletion of this commodity either though contamination or careless uses results in serious consequences [1]. Clean drinking water is important for overall health and plays a substantial role in human and other aquatic organisms. The people most vulnerable to water-borne diseases are those who use polluted water for drinking and other domestic purposes [2].

Sanitation and sewage systems are poor; several people do not care of how to dispose of their trash or refuse. In most houses, only toilet is discharge through a septic system and all other household liquids are discharged directly to drains. Rainfall could wash this waste in to the surface water and underground water mostly consumed to meet the domestic need of the people [3].

2. Water Pollution

The term pollution is derivation of the word "polluted" which means to make something no longer pure, especially by adding harmful or unpleasant substances to it [4].

According to [1] water is considered polluted if some substances or conditions are present to such a degree that, the water cannot be used for a specific purpose. WHO [2] defined water pollution as any change in the physical, chemical and biological properties of water that has a harmful effects in livings is term "water pollution".

Water pollution occurs when unwanted materials with potential to threaten human and other natural system find their ways into rivers, lakes, wells, streams, boreholes or even reserved fresh water in homes and industries. The pollutants (i.e the substance that causes pollution) are usually pathogens, silts and suspended solid particles such as soils, sewage materials, discomposed foods, cosmetics, automobile emissions, construction debris and eroded banks from rivers and other waterways. Some of these pollutants are decomposed by the action of micro-organisms through oxidation and other processes [5].

When this contaminated water is directly consumed without proper treatment (a common practice to local communities), spread of diseases such as typoid, dysentery, cholera, hepatitis e.t.c will occur [5]. Similarly, pollution poses a serious risk to life especially when the water is a source of drinking and for domestic purposes [1].

2.1. Sources of Water Pollution

In Nigeria, the common sources of water that are available to local communities are fast being severed by a number of anthropogenic factors of which pollution (water) remain the most dominant problem [5]. Most of fishes especially the species desired as food by man are among the sensitive species that disappear with the least intense pollution. Water quality can be affected by pollutants from the following sources:

Point-Source Pollution: Point sources are identifiable point or place, such as a pipe or channel which discharge directly in to a body of water. This might be from wastewater treatment plants, factories and industrial plants, latrine, septic tanks etc. for example, a pipe from an industrial facility discharging effluent directly into a river.

Nonpoint-Source Pollution: Nonpoint sources are those where pollution arises over a wider area and it is often difficult to locate the exact place of origin. For example, fertilizers or pesticides washed from a field by rain may seep into a river or stream at many places both on the surface and through the soil. Other examples of nonpoint sources include acid deposition, runoff of livestock feedlots, logged forests, urban street, lawn and etc. Pollution arising from nonpoint sources account for a majority of the contaminations in streams and lakes which serves as a sources of drinking water for most farmers in the rural areas.

The various sources of water include; groundwater, surface water. Both these resources are in danger due to overuse and misuse. 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 [11].

Many areas of groundwater and surface water are now contaminated with heavy metals, POPs (persistent organic pollutants), and nutrients that have an adverse-effect 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 [11]. 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.

2.2. 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.

2.3. Some Facts on Water Pollution

Following are some facts on water pollution:

(1) Fourteen billion pounds of garbage, which is mostly plastic, is dumped into the ocean every year.
(2) The Ganges River in India is one the most polluted rivers in the world with sewage, trash, food, and animal remains.
(3) 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.
(4) About 700 million people globally drink contaminated water.
(5) Aquatic animals face an extinction rate of five times more than that of terrestrial animals.
(6) Over 30 billion tons of urban sewage is discharged into lakes, rivers and oceans every year.
(7) 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.
(8) According to UNICEF, more than 3,000 children die every day all over the world due to consumption of contaminated drinking water.
(9) Pollution is one of the biggest killers in the world, affecting over 100 million people.
(10) Lack of proper sanitation in water leads to diseases like cholera, malaria and diarrhea.
(11) At least 320 million people in China do not have access to clean drinking water

2.4. 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.

2.5. 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 [11].

Other measures include:

(1) 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.

(2) 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.

(3) Source water contamination prevention by making source water contamination a cognizable offence.

(4) 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.

2.6. Effect of Water Pollution

The major consequences of water pollution in Nigerian communities are socio-economic, health and environmental problems. On one side, the government is experiencing terrible and devastating cost inconsistencies; polluted water containing sediments and parasites is very expensive to be treated to the desired standard for any household or even industrial application. This can also be coupled with the financial implications of eradicating the associated diseases [5]. Indiscriminate disposal and dumping of waste has become a common practice in Nigerian cities. Most of the waste dumps are located close to residential areas, markets, farms, roadsides and creek. The composition of the waste dumps varies widely, with human activities located close to dump site [6].

Livestock farming, popularly referred to a domestication of animals which is commonly practice in the Northern and North central regions of Nigeria also has a major polluting impact on the water. The animals waste (such as sheets, feaces) and livestock feedlots are washed in to the strams and rivers during the rainy season, which serves as sources of drinking water for most farmers in the rural areas and thus constitutes health problems such as cholera e. t. c [4].

Human infectious diseases are among the most serious effects of water pollution. Water-borne diseases occur when parasites or the other disease-causing microorganisms are transmitted via contaminated water, particularly water polluted by pathogens originating from excreta. This causes the most serious parasitic diseases such as amoebiasis, giardiasis, ascariasis, and hookwarm [7]. Sewage is the water-borne waster of the society and the discharge of untreated sewage in to a river is very enormous and unhealthy [1]. In similar development, the effects of untreated sewage is that, it support the growth of pathogens that can cause diseases e.g. cholera, kills aquatic organisms and makes water unfit for human consumption (e.g drinking).

Pesticides are recognized worldwide as a veritable means controlling pest, at the same time such chemicals are highly toxic to other species in the environment. The principal pathway that causes ecological impacts is that of water contaminated by pesticide run off. The two principal mechanisms are:

(a). Bioaccumulation: This is the movement of chemicals from the surrounding medium into organisms. Some pesticides such as "Dichlorodiphenyltrichloroethane" (DDT) are "Lipophilic" – meaning that they are soluble in, and accumulated in, fatty tissue such as edible fish tissue and human fatty tissue. Other pesticides such as glyphosate are metabolized and excreted [8].

(b). Biomagnification: This term describe the increasing concentration of chemical pesticides as food energy is transformed within the food chain [8].

Some pesticides enter the bodies of tiny, bottom dwelling organisms such as crustaceans. A hundred of these organisms are eaten by one small fish. A hundred of these small fish are eaten by one big fish. Each organisms stores the pesticides in its tissues, so at each step along the food chain, the amount of the pesticides passed on to the next organism increase.

Virtually all types of pollution are harmful to the health of living organisms. In fact, water pollution in Nigeria arises from various activities each of which presents it own set of hazards [9].

(1) Litter
(2) Toxic waste disposal at sea, rivers, streams, lakes etc.
(3) Oil spillage
(4) Industrial waste dumped into our water
(5) Heavy metals
(6) Mineral processing plants (Coal Production)
(7) Sediments
(8) Pesticides
(9) Herbicides and Fertilizer
(10) Animal waste
(11) Household chemicals etc

3. Control of Water Pollution

According to Galadima [5] lack of efficient law-enforcement instruction has significantly resulted to wasted disposal into fresh waterways by sellers of different food and cosmetics in our market. This could be fully addressed by improving awareness and ensuring total compliance with the applied laws and practices. Prosecutions of defaulters would be very important here.

Waste food materials, papers, decaying vegetables and plastics should not be thrown in the open or underground drains. Also effluents with high organic content and slurries from distilleries and industries should be sent to biogas plant

for generations of energy. Similarly, sewage should be treated before it is discharged into the rivers or ocean, this is possible through the uses of modern technologies [10]. Adequate funding and proper health education in all communities in Nigeria are necessary. The current state of the system, involving very few "Community Health Extension Worker (CHEW)" per locality should be fully funded and enhanced by ensuring that many youths enrolled into the community health studies. This could be achieved by standardizing school of health technologies, nursing and universities at large [4].

Other ways by which water pollution can be controlled include:

(1) Industries should be sited far away from the residential areas.
(2) Administration of water pollution control should be in the hands of the states or federal government
(3) Public awareness must be initiated regarding adverse effects of water pollution using the media
(4) Basics and applied research in public health engineering should be encouraged
(5) Oil slicks should be skimmed of from the surface with oil separators or suction devices. Sawdosts may be spread over oil slicks to absorb the oil components and then the materials are incinerated [10].
(6) Fishers that adopt chemicalize-fishing system, polluting rivers and lakes should be educated, treated with warm cautions and legal action for defaulting [4]
(7) The Niger Delta Development Commission (Establishment) act of 2000 empowers the Niger Delta (Joint) Development Commission to conceive, plan and implement development projects for waterways and water supply [3].

4. Conclusion

Actually, the problems associated with water pollution have the capabilities of affecting human and aquatic organisms to a great extent. Government alone cannot solve the entire problems related to water pollution. It is basically responsible for every member of the community when it comes to the problems facing the water we drink and use.

People must become familiar with our local water resources and learn about ways for disposing harmful materials. The three (3) tiers of government in the country should ensure that, awareness, education, and effective agricultural waste disposal methods are promulgated through the use of attractive media.

Recommendation

Water is essential to all living organisms; therefore, its importance to national development cannot be over-emphasized. This paper recommended that:

(1) Government should provide farmers with education on how to used pesticides, herbicides, fertilizers and other related farms input
(2) Qualified and experienced people must be consulted

from time to time for effective control of water pollution in the country
(3) Federal, state and local government should establish agencies to monitor our environment and equally to be sure that our environment is kept clean and free from refuge dumps
(4) Nigerian government should develop a knowledge and informative package consisting of theoretical, technical and managerial solution for the treatment and reuse or recycling of waste arising from man's activities [6].
(5) No type of waste (Treated, partially treated or untreated) should be discharge in to any natural water body and
(6) Scientific techniques should be adopted for environmental control of catchment areas of rivers, ponds or streams.

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