

POLLUTION OF SURFACE AND GROUNDWATER AND HUMAN HEALTH

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Abstract

Water is one of the basic elements for human life. Without water there is no life in the world .If more people live in one place, then water will be polluted more than the place where less number of people live. Water gets polluted by various factors. Human activities such as domestic sewage, industrial products, agricultural works like employing fertilizers, etc, contaminate water either directly or indirectly. It has been found that water pollution is of two types: Surface water pollution and Ground water pollution. Surface water refers to water in water bodies like oceans, lakes, rivers, etc. The surface water is normally used for cultivation, industrial use, public water supply, etc. Large quantities of water are remained in underground rock structures which is called aquifers. The water stays in acquires is called as ground water. It is an important fresh water resource. It is a vital source of water for drinking and other purposes. Though water pollution contaminates the surface water, it is also found to pollute the ground water considerably. For instance, agricultural run-off enters into the ground and contaminates both surface as well as groundwater. Therefore both surface and groundwater get polluted. Due to the pollution of surface and ground water, we have many occurrences of water-borne diseases like dysentery, cholera, etc. In fact number of persons suffering from water-borne diseases. Hence we can conclude that surface and groundwater pollution affect human health. This paper focuses on 'Pollution of Surface and Ground Water and Human Health'. It tries to explain how human activities make surface and ground water polluted and at what extend it affects people's health.

Keywords: pollution, surface and ground water pollution, health.

INTRODUCTION

Water is a life-giving source. It sustains human life and helps people to live neatly. Without water cleanliness is impossible since it helps to clean all the dirty places especially human bodies. Water is a liquid substance which contains many materials such as Oxygen, etc. It is a proved fact that we cannot get anywhere pure water. We may have 60% of good water in one place. In some other place, we may get 15% of good water. It depends upon the tensity of the population and the environmental condition of a particular place. More obviously, water can be polluted easily. Water gets polluted means water in both places such as surface and underground is polluted. Human activities affect both surface and Ground water. The unpleasant consequences of it are explained in this article.

MEANING AND DEFINITION OF POLLUTION

Today, environmental problem is a growing problem which affects all. The environment can be divided into two parts: Geographical environment and social environment (environment created by human beings). "The geographical environment consists of those conditions of the nature outside the human being which nature provides for him."(K.Singh, 1968, p.52). From the

above definition, we can understand that the geographical or natural environment is something outside of man's life. The geographical environment includes air, water, soil, etc. Man, using the geographical environment with the help of science, not only develops it but also changes it. Many of the changes in the geographical environment are negative consequences. (K.Singh, 1968, p.51). One of the negative consequences is pollution. The word pollution is the "deterioration in the chemical, physical and biological properties of water brought about mainly by human activities." (K.V.Paliwal, 1991, p.36). This pollution can be taken by natural causes or human activities.

MEANING AND DEFINITION OF WATER POLLUTION

When suspended solids, organic and inorganic substances, microbes and other biota are high in the water, they degrade the quality of it and make it unfit for any use. It is called water pollution. Water pollution can be defined as , "... a body of water poisoned by toxic chemicals which eliminate living organisms or even exclude all forms of life".(P.S.Verma, V.K.Agarwal, 2003, Pp. 504-514).

SIGNS OF WATER POLLUTION

Bad taste of drinking water, growth of aquatic weeds in water bodies, oil and grease floating on water surface, changes of water colour and of taste are the various signs of water pollution.

SURFACE WATER POLLUTION

Water presents in both surface area and underground area.

MEANING OF SURFACE WATER

The salt less water is a freshwater. The fresh water is of two types: a). Surface 2.09% b).Ground water 0.61%. The freshwater available on the surface of the earth is named 'surface water'. "The water coming through precipitation (rainfall, snow) is called surface water." (R.Murugesan, 2011, p.16). The surface water makes up to 2.09% of the total water available on the earth. Out of 2.09%, 2.03% remains as ice in the polar region. It is normally a renewable resource. Rain is the main source of surface water. Surface water is available in a river, streams, lakes, dams, soil moisture, etc.

Two types of Surface Water

Surface water can be divided into two:

- 1). Lentic Water;
- 2). Lotic water.

1)Lentic water is the standing water or stagnant water. Examples of Lentic water are Ponds, lakes, dams, etc;

2). Lotic water refers to the running water or flowing water. For instance: River.The surface water is normally used for cultivation, industrial use, public water supply, etc.(N.Arumugam and V.Kumaresan, 2010, p.44).

SOURCES OF SURFACE WATER POLLUTION

We can codify the main sources of surface water pollution:

A). DOMESTIC SEWAGE

Domestic sewage occurs from wastes from domestic activities of humans. These wastes contain 70% of organic materials like proteins, fats and 30% of inorganic materials like salts, minerals, etc. These pollutants are a source of pollution to surface water sources, such as lake, rivers, sea, etc., (M.M.Salphey, 2013). That is when domestic sewage is dumped in the drainage wastes and sewers in the water bodies causes water pollution. (Anubha Kaushik and C.P.Kaushik, 2010) p.155). In fact, domestic sewage, human as well as animals wastes, plastics, and other non-degradable materials are dumped into the rivers. All most all rivers carry 85% of the surface run-off. The evil results are the quality of water is decreased and hazardous to human health. (S. Ignacimuthtu, (2012)

b). INDUSTRIAL EFFLUENTS

All industries produce some organic and inorganic chemical wastes. Industrial wastes contain different types of chemical compounds. They are acids, phenols, carbonates, alcohol etc., Large quantities of industrial wastes are discharged into water without any proper treatment. Industrial wastes consist of toxic chemicals, acids, metallic salts are polluting water. (Anubha Kaushik and C.P.Kaushik, 2010, p.155). Industrial wastes are acid extreme acidity which will kill fish and other organisms. They are dumped into water, thinking that they are getting rid of. But, in reality, they become pollutants. (M.P.Singh (2004). Generally, surface waters near the industrial areas where atmosphere is polluted by factory smoke and other discharged materials are polluted heavily.

Effects

The contaminated water by them has capacity to produce serious illnesses such as paralysis, blindness and other major disorders of the circulatory system. Millions of people suffer from water-washed diseases like skin diseases, eye disease, schistosomiosis guinea, etc. When one uses the contaminated water for taking bath, washing the clothes and other purposes, may get skin diseases. Further, when such kind of water is used for irrigation, the pollutants will get transmitted through the crops, plants and other items which are cultivated in the land, and the unpleasant result will be serious illness. (S. Ignacimuthtu, 2012).

3). AGRICULTURAL POLLUTION

The modern agricultural trends lead cultivators to use large quantities of fertilizers, pesticides, and insecticides in order to get huge amount of productivity. When the rain comes, good amount of these chemicals are washed away and finally reach the water bodies, thereby causing water and soil pollution.

Effects

The unpleasant result will be health hazards to humans, birds, animals, fish and other aquatic organisms. (Anubha Kaushik and C.P.Kaushik, 2010, p.155). Pesticides and herbicides which enter into water may kill some living organisms. Fishes which live in the water may consume chemicals from these pesticides and die. Or passes that poison to man who eats them. (R.S.Shukla and P.S.Chandel, 2007).

ELECTRONIC WASTE (E-WASTE)

Electronical waste denotes discarded electrical devices. The computer manufacturing company

uses various toxic materials to produce computer parts. They cannot be disposed of like normal garbage. Yet the computer wastes and its equipments are thrown on the landfills or overseas. The computer manufacturing releases dioxin “(a carcinogen and hormone disruptor), halogens and chlorofluorocarbons (CFCs)-(ozone depleting and global warming gases) lead, mercury, and other pollutants.” (Benny Joseph, 2014, p.197). Further, Junk IT hardware and other electronic equipment like mobile phones, and microwaves are also classified under e-waste. The disposal of e-waste is a growing issue all over the world. Practically, e-waste is composed of thousands of different substances including lead, mercury, cadmium, and brominated flame retardants. It is very difficult to separate them for reuse or recycling.

Effects

Many of the components of e-waste are hazardous to both environment and human beings. They stay on the soil or land and take much time (even years) to decompose. The chemical out of which it was made, enter into the soil, when rain comes and thereby enters into the underground water and pollute it. Finally, the ground water will have chemical materials. (Benny Joseph, 2014, p.197).

Apart from these, marine pollution, plastic pollution, etc affect surface water pollution.

GROUND WATER POLLUTION

MEANING AND DEFINITION OF GROUND WATER

The water exists underground is named ‘Ground water’. “Ground water is fresh water located in the pore space of soil particles. Water derived from precipitation can continue to flow downward beyond the soil water belt. This slow, downward flow under the influence of gravity is termed percolation. This percolating water reaches into the ground as ground water”(R.Murugesan, 2011, p.16).

Ground water forms 6.2% of the total water available on earth and is about 30 times more than surface water such as streams, lakes, etc. In fact the ground water is the part of the surface water. It is an important fresh water resources. It is a vital and indispensable source of water for drinking and other domestic purposes. The largest available source of the fresh water exists in underground. Even though the ground water is not static, it moves slowly. (N.Arumugam and V.Kumaresan, 2010, p.45)

SOURCES OF GROUND WATER

The main source of the underground water is precipitation. Ground water is obtained by the percolation of rain water and surface water. The rain water falling on the earth infiltrates into ground, travel down and forms ground water. In addition to this, water from deep in the earth which is carried upward in intrusive rocks and water which trapped in sedimentary rocks will form ground water. They are highly mineralized.(V.Rajendran, , 2016,no.1.47).

TWO WAYS OF DISCHARGING GROUND WATER

a). Natural way

The ground water is discharged in a natural way. That means it occurs as flow in lakes, rivers oceans and springs.

b). Artificial discharge

Taking ground water through pump in fact constitutes the major artificial discharge of it.(V.Rajendran, , 2016, no.1.47).

AQUIFER

The permeable layer of rock or sediment that consists of ground water is called an aquifer. For example, sand and gravel are very good aquifers. There are three types of aquifers: confined aquifers, unconfined aquifers and perched aquifers. (N.Arumugam and V.Kumaresan, 2010, p.45)

1). Confined aquifers

Confined aquifers are formed between two layers of impermeable layers of rock. They may be situated deeply away from bore wells. They are recharged at the point of intersection of rocks.

2). Unconfined aquifers

Unconfined aquifers are present below permeable part of the earth. While confined aquifers are not recharged by percolation, unconfined aquifers are recharged by percolation of rainwater.

3). Perched aquifers

Perched aquifer is rare one. It sometimes occurs within unconfined aquifer. "If within the zone of saturation, an impermeable deposit below a previous deposit is found to support a body of saturated material then this body of saturated material which is a kind of aquifer is known as "perched aquifer". (V.Rajendran, 2016, no.1.47). The ground water velocity depends on various factors like type of soil, gradient, etc. (N.Arumugam and V.Kumaresan, 2010, p.45).

CAUSES FOR GROUND WATER POLLUTION

This water is polluted by different types of anthropogenic activities.

- a). Untreated or poorly treated waste water and garbage;
- b). Industrial wastes stagnated on the floor for long time;
- c). The application of huge amount of fertilizers;
- d). Leakages from underground storage; tanks containing hazardous substances; Quite honestly, the intensive cultivation of crops different types of fertilizers and pesticides to enter into the ground water. This is known as leaching. Fertilizers and pesticides, in addition to domestic and industrial wastes are identified as significant sources of ground water pollution. (Patric Raja (2005);
- e). Poorly designed and improperly maintained septic tanks (Erach Bharucha, 2005, Pp.134-135).
- f) The infiltration of liquid from refuse dumps specially in the low lying areas bring ground pollution. In fact ground water is not much affected by pollution, since the soil covers them. This soil stops the various contaminants which pollute the ground water. Yet, septic tanks, industry such as textile, chemical, tanneries, mining, etc, become causes for ground water pollution. (Anubha Kaushik and C.P.Kaushik, , 2010, p.155)

Ground water pollution is accruing in places where water sources are near the ground level (Benny Joseph, 2014, p.143). Nevertheless the problem of pollution in underground water is not that much of the surface water. The ground water is somewhat free from the suspended solids. The extent of ground water depends upon the soil capacity of the infiltration; rainfall pattern and distance from the causes of water pollutants. It is also true that only soluble effluents pollute the ground water. The amount of pollution is likely to be more in the sandy soils with high water tables and in human's habitations.

SURFACE AND GROUND WATER POLLUTION AND ITS IMPACTS ON HUMAN HEALTH

It is widely accepted that the poor health is the product of inadequate nutrition, lack of a protected water supply, and insanitary housing conditions. These conditions lead to water-borne diseases. Deprivation like lack of access to important amenities like safe water, sanitation, non-polluting domestic fuels, lead to high rate of ill-health, and higher mortality levels. (A.R.Nanda and Almas Ali, 2006).

WATER BORNE DISEASES

The polluted and ground water with arsenic, fluoride and nitrate affect human health. They create in human beings water-borne diseases. (Anubha Kaushik and C.P.Kaushik, 2010, p.155).

THE MEANING OF WATER-BORNE DISEASES

Diseases caused by polluted surface and ground water are called Water-borne diseases. "... a high level of turbidity, magnesium, BOD, total coliform bacteria, TDS and iron of both ground and surface water and a low level of residual free chlorine would cause water-borne disease." (Minati Sahoo, Dharmabrata Mohapatra, and Dukhabandhu Sahoo, Asian Journal of Water, Environment and pollution, Vol.16, No.3 (2019, p.66).

According to WHO report, almost 80% diseases are associated with polluted drinking water. Hence, the contaminated drinking water becomes source of epidemic diseases such as cholera, typhoid, Diarrhea, dysentery, yellow fever, hepatitis schistosomiasis, etc. They are categorized under water-borne diseases. Vishwa Jit Gupta affirms that from the result of the anthropogenic activities, such as irrigation, industrial works, etc., the water-borne diseases are originated.(Vishwa Jit Gupta, 2005, p.292).

TYPES OF WATER -BORNE DISEASES

There are different kinds of water-borne diseases. Some of them are dealt with in the following few pages.

Diarrhea

Diarrhea is result of drinking improper and contaminates unpotable water. Erachunderlines: "Water contaminated with human feces surrounding a rural water source, or from municipal sewage, septic tanks and latrines in urban centers, are important factors in the spread of these diseases. The feces of domestic animals also contain microorganisms that can cause diarrhoea through water."(Erach Bharucha, 2005, p.223).According to WHO,"1 billion people do not have access to clean water sources and 2.4 billion have no basic sanitation. In South-east Asia, diarrhea is responsible for 8.5% of all deaths. In 1998, diarrhoea was estimated to have killed 2.2 million people, most of whom were under 5 years of age (WHO 2000)."(Erach Bharucha, 2005, p.223).

Harmful Effects

It gives rise to loose motions. This disease is caused by gastrointestinal infections. Depending on the type of infections, the diarrhoea may be watery or passed with blood. It threatens human life due to the acute loss of fluid and electrolytes like sodium and potassium. Death, due to diarrhoea, may occur if proper care is not taken (G.K.Ghosh, 2008, p.160).

Typhoid

The bacteria called 'Salmonella' is the common species associated with water-borne diseases of man. The above bacteria are transmitted directly by drinking of contaminated water. These bacteria can survive in the downstream for sometimes, after discharging into rivers. This same bacteria cause for typhoid (*Salmonella typhi*) and paratyphoid (*Salmonella paratyphi*) (P.K.Goel (2009). This disease prevails much in the regions where people get their supplies from surface water sources which are contaminated by human faces, urines and other activities.(V.Rajendran, Environmental Engineering-1(2016),p.69).

Effects of Typhoid

It makes the affected people to bed ridden for more than a month. It gives mental stress, tiredness, family problems, etc.

Jaundice

The virus called 'infectious hepatitis' causes for Jaundice. This virus is the result of the drinking of the polluted water. This infectious hepatitis can also be transmitted by consumption of fish living and growing in sewage polluted water.

Effects

While explaining the effects of it, Goel points out: "The hepatitis virus infects liver to induce haphazard production of accessible, which gets entry into blood causing yellowness in the body."(P.K.Goel, 2009, p.237).

Cholera

Inadequate drinking water quality, improper disposal system for sewages and poor disposal of human waste and drinking of polluted water have become the cause of appearance of water-borne diseases like cholera(Erach Bharucha, 2005, p.218), (N.M.Awasthi and P.R.Pande, 2011, p.134) . Cholera is both an epidemic and endemic disease. It is caused by *Vibrio cholerae*. The transmission occurs from man to man through contaminated water, and polluted food. This infection spreads through water contaminated by infected human faecal material.(V.Rajendran, Environmental Engineering-1(2016),p.69).During the time of floods, and disasters like famine and wars, cholera spreads quickly.(P.K.Goel, 2009, p.236).

Detrimental Effects

The main symptoms of cholera are diarrhea. Cholera is characterized by production of severe diarrhea eliminating 'rice-water' stools in large quantities. It can be dangerous due to profuse watery diarrhea, vomiting and leg cramps. If any one does not take proper treatment, death can occur within few hours. In this way Cholera kills human life. (A.John De Britto, D.Patric Raja, and B.Victor, 2005, p.154) .

In a nutshell, the water-borne diseases affect human health in different ways. They are hazardous to human life.

Health and Environment

An environment is the source of the health of the people. The health of the people totally depends on the environment as the foetus depends on his/her mother's life-support system. (M.L.Narasaiah, 2004, p.46).A human body's health can be promoted or damaged by the social

environment. If an individual has a good environment to live better life then their activities are also good and we can say that they are healthy. Hence health depends on his ecosystem. According to Philip, "... many cultures around the world contain a belief that *health is a kind of balance*, both between the individual and its environment and within the individual organism." (Philip W. Sutton, Antony Giddens, 2013, p.440). SVS Rana adds: "Disease is embedded in the ecosystem of man. Health, ... is visualized as a state of dynamic equilibrium between man and his environment." (SVS Rana, 2007, p.94).

THE CONCEPT OF PUBLIC HEALTH

The idea of public health emerged in order to eradicate diseases from the population. Obviously, sanitation and water system are important factors which protect the public health. (Philip W. Sutton, Antony Giddens, 2013, p. 442). The Public health is important aspects to be taken into account when we think about the water pollution. In fact it starts with sanitary engineering, the problems of sewage disposal and water supply. (Marston Bates, 1964, p.94). The morals of people are surely basic elements to the development of a healthy society. It is now seen that the health of both man/woman depends on the streams, forests, vegetables, food items and especially the quality of drinking water and good water supply. Hence water pollution is one of the important factors to be concentrated to keep people from the unpleasant consequences of water-borne diseases.

WAYS TO PREVENT WATER POLLUTION

There are many measures for preventing water pollution. They can be classified into individual and community roles.

INDIVIDUAL ROLE IN THE PREVENTION OF POLLUTION

One must recognize that each one has responsibility to develop and to keep the quality of the environment. One's personal activities can improve or worsen the quality of environment where he lives. Not only a good technology, but also the changes in people's life-style would contribute to a cleaner environment. For this, an individual should not only be aware of various and serious environmental issues and their consequences but also make a firm decision to develop environmentally ethical life-styles (Erach Bharucha, 2005, p.160). The ethical life-style means keep one's house area neat and clean, and proper disposal of wastes and to have minimum use of water.

Government and other agencies and policies must also help to prevent pollution such as water.

SOME PRACTICAL SUGGESTIONS REGARDING WATER POLLUTION

Some suggestions to control water pollution can be listed out here: a). minimum use of water would ensure the problem of water pollution; b). the new technology may be made in such a way that the waste of one industry becomes the raw materials of another; c). the most reliable way to prevent and control water pollution is to stabilize the aquatic ecosystem. It can be done through reduction of harvest in biomass, waste inputs, checking the hazardous industrial effluents, domestic sewage and trapping of nutrients; d). Public awareness regarding cleaning ponds, wells, rivers must be taught to the people; such kind of water sources must be given to the people so that they can be cleaned and properly maintained. (M.C. Dash, 1993, p.328); e). Ozone can be injected into contaminated water. It oxidizes pollutants and as a result the water gets purified; f). Factories and industries must have equipped with well pollution control; g). the

sewage treatment ponds like 'stabilisation pond' can be established; h). Education regarding on the pollution may be given to the people, so that they will come to know/ learn the ill-effects of polluting their own natural resources; i). New research work regarding on water pollution in specific areas can be encouraged. It should be studied systematically in order to eliminate water pollution in that area. (N.Arumugam, 2013, p.618) . Waste water should be treated well before it is discharged into the water bodies. (P.D.Sharma ,2004, p. 457). The most effective way of controlling water pollution is analyzing environmental pollution and then adopt a strategy for its control (S.M.Khopkar, 2005, p.12).

CONCLUSION

Water pollution is a perennial problem which affects human health in all possible ways. Even though water is a life giving source, human beings if do not use it properly, it will become life-killing source. Human activities such as domestic sewage, industrial wastes, electronic waste change this life-giving source into life-removing source. They pollute the water in such a way that nobody uses it further. Drinking of the polluted water becomes cause for water-borne diseases in human beings. The diseases like cholera, etc, affect human health. Without surface and ground water we cannot live. If both are polluted then where we search a pure water. We are living in the water-polluted world. It is everyone's duty to save water from pollution in order to live healthy life.

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