AN OVERVIEW OF RESEARCH ON POLLUTION IN INDIA'S GROUND WATER

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ABSTRACT:

In many nations, including the United States, groundwater is the primary supply of water used for residential, agricultural, and industrial uses. The contamination of the ground water may be traced back to both human and industrial activity. This is the critical issue facing the world today. The leaching process has resulted in the contamination of groundwater because of the combination of waste from industries, municipalities, and agricultural practices that comprise pesticides, insecticides, fertilizer residues, and heavy metals.

The contamination of groundwater has far-reaching repercussions. In this article, we will provide an overview of the contamination of ground water that is caused by both industrial and human activity. Both point sources and non-point sources of pollution have an impact on the quality of the water. These include the runoff from sewage treatment plants, discharge from industrial facilities, runoff from agricultural fields, and runoff from metropolitan areas.

The natural eco system must be preserved and improved upon, hence it is essential to do research on the water's quality. The evaluation of the ground water using a variety of technologies that have been developed, as well as management methods that should be carried out on a frequent basis, should help to conserve the water resources.

Keywords: *Ground water, Water pollution, Heavy Metals, Water Quality Index.*

I. INTRODUCTION

When it comes to molding the landscape and controlling the climate, water is by far the most influential factor. It is one among the most significant substances that have a significant impact on living things. Around the globe, groundwater is drawn from for a variety of uses, including the provision of drinking water to homes and businesses, as well as the cultivation of crops. The local temperature, geology, and irrigation techniques are only few of the natural and manmade factors that may have an impact on water quality [1]. Because of the fast expansion in the world's population and the quickening pace of industrialization, there has been a substantial rise in the demand for clean water over the course of the last several decades [2]. It is believed that one third of the total population of the globe drinks water that comes from the ground. The natural quality of ground water is often quite high; it is devoid of pathogens, color, and turbidity, and it may be taken directly without any treatment being necessary [3]. In India, the pressure

placed on the country's groundwater supplies has risen as a direct result of intensive agricultural practices. The local temperature, geology, and irrigation techniques are only few of the natural and manmade factors that may have an impact on water quality [1]. Poor wastewater management has resulted in substantial water quality difficulties in many regions of the world, despite the fact that the majority of emphasis on a worldwide scale has been focused on water quantity, water usage efficiency, and water allocation challenges.

planet, making the current water situation even more severe. The most significant contributors to water contamination are found to be human settlements, industrial activities, and agricultural practices. The industrial sector is responsible for dumping millions of tonnes of heavy metals, solvents, toxic sludge, and other pollutants into water bodies each year [4]. On a global scale, eighty percent of municipal wastewater is released directly into water bodies without being treated. Large amounts of agrochemicals, organic debris, drug residues, sediments, and salty drainage are released into water bodies by agricultural operations. The polluted water that is produced as a direct consequence offers concerns that have been proved to aquatic ecosystems, human health, and productive activities [5]. Both point sources and non-point sources of pollution have an impact on the quality of the water. These include the runoff from sewage treatment plants, discharge from industrial facilities, runoff from agricultural fields, and runoff from metropolitan areas. The quality of the water may also be negatively impacted by natural disasters such as floods and droughts, as well as by user behavior that demonstrates a lack of understanding and education [6]. In recent years, there has been a growing worry about the impact that human activity is having on the quality of groundwater. This concern stems from the fact that the impact has been rising. The depletion of groundwater resources in some regions of the nation is a contributing factor in the deterioration of water quality [7]. India is home to 16% of the world's population and has 2.2% of the world's total land area as well as 4% of the world's freshwater resources. It is estimated that one third of the world's population relies on groundwater as their primary source of potable water [8]. Because of various developmental operations, both surface and underground water

sources are becoming more contaminated [9]. The percolation of harmful substances via the soil and into the ground water may lead to the contamination of drinking water [10]. Pollution of the water supply is the responsibility of industries. Sanitary waste and process water are both types of wastewater that are produced by industrial processes. Both the quality of life and the environment have seen significant declines as a direct result of the fast and unrestrained expansion of industrialisation, which has also given birth to a variety of environmental issues. Every single human being has an essential need for clean water to drink. The acceleration of industrialisation is having a negative impact, both directly and indirectly, on our environment [11]. Different kinds of industries may be found in a variety of nations. Both liquid and solid garbage are disposed of in this location's rivers and soil in an unfiltered manner. Some industrial wastes are so dangerous that they are carefully regulated, which makes them a costly issue to deal with. Because of this, some businesses attempt to decrease costs associated with dealing with trash by dumping chemicals illegally in an effort to save money [12].

II. MAJOR ISSUES OF GROUND WATER POLLUTION

Contaminated Land- Heavy metals, hydrocarbons, and organic solvents are just some of the pollutants that are regularly found on land that has been polluted as a result of industrial activity. This may result in severe groundwater contamination. When compared to other nations, the United Kingdom's polluted soil is a significant contributor to the country's groundwater contamination. Serious groundwater pollution incidents have been caused by the legacy of contamination left behind as a consequence of previous and contemporary human activities, and these incidents will continue to be caused by this legacy [13, 14].

Heavy Metals- Trace quantities of heavy metals may often be found in groundwater. Mining, urban and industrial effluents, agricultural wastes, sewage sludge, fertilizers, and fossil fuels are some of the most prevalent causes of pollution. Other prominent sources include: Because of their tendency to bioaccumulate, heavy metals are very hazardous. The term "bioaccumulation" refers to the process through which the concentration of a chemical in a biological organism gradually increases over time, in contrast to

the concentration of the chemical in its surrounding environment [15]. Even in trace amounts, individuals may be exposed to heavy metals, which can cause severe health problems. Chromium (Cr), Mercury (Hg), Lead (Pb), Cadmium (Cd), Zinc (Zn), Arsenic (As), copper (Cu), and nickel (Ni) are examples of naturally occurring heavy metals that are particularly hazardous.

Landfill- It has been shown that landfills provide one of the most significant dangers to the groundwater resources [16-17]. The leachate that is collected from landfills has the potential to pollute groundwater to a considerable degree. There are around 4000 active landfill sites in the UK, some of which date back to the 1970s; as a result, there is cause for worry over the potential for groundwater contamination. In recent years, a number of studies [18-23] have been conducted because of the influence that landfill leachate has on both the surface water and the groundwater.

Microbiological Contaminants- The sewage of either people or animals may introduce microbiological contaminants into groundwater, and this pollution can be harmful. Pathogenic bacteria, viruses, and protozoa are only some of the many different kinds of infectious agents that may be found in sewage. In the event that these pollutants are present in a water supply, they have the potential to pose a significant risk to the general population's health. Leaking sewers, cesspits, septic tanks, soak ways, mineshafts utilized as a disposal route, landfills, even horn sewage put to the soil as a fertilizer are all potential entry points for microbiological pollutants into the subsurface environment. There is a widespread presumption that polluted groundwater poses a risk for the transmission of infectious diseases, and some isolated contamination instances have been documented.

Pesticide- Insecticides, fungicides, and herbicides are all examples of pesticides, all of which find widespread use in agriculture, as well as in public and private sectors of business. Because of their ability to accumulate in the food chain and their toxicity, pesticides provide a potential risk to human health that might be severe. This is particularly the case because of the persistence of pesticides in the environment. The contamination of ground water by nitrogen fertilizers and pesticides as a result of its broad and frequent application to land, in addition to specific point sources, has emerged as a major cause for worry in recent years. The European Union's

Drinking Water Directive established the maximum allowable concentration of specific pesticides in drinking water at a very low level (0. 1 micrograms per centimeter).

Sewers, Soakaways & Septic Tanks- Because sewage and waste water are discharged directly into the subsurface environment from sources such as sewers, soak ways, and septic tanks, groundwater may become contaminated as a consequence of these sources. There is a correlation between the operation and structure of the waste water containment and treatment system as well as the hydrogeology of the surrounding area when it comes to the incidence of sewage pollution. The inadvertent release of significant quantities of sewage into the groundwater underneath cities and less urbanized regions, from whence the sewage is first produced, is caused by leaks in the sewers. These breaches may occur for a number of different reasons. Bacteria, viruses, and nitrates are the three types of pollutants that are most often discovered in groundwater underneath these systems. Several studies have been conducted on the topic of polluted ground water. a variety of technical study articles on the evaluation of the quality of ground water for hand pumps in a variety of places across a variety of cities and nations. The following is a summary of the work that was reported on the evaluation of the ground water quality index. The creation of water quality indices in several nations has included the use of aggregated data on water quality, and this practice is still ongoing. According to the findings of the research, the Water Quality Index (WQI) is a useful and unique rating that can portray the total water quality condition in a single word. This rating is important for selecting an appropriate treatment approach to fulfill the concerns that have been raised. [2]. The Water Quality Index (WQI) was developed by selecting the 10 water quality variables that are most frequently used. These variables include dissolved oxygen (DO), pH, coliforms, specific conductance, alkalinity, and chloride, among others. The WQI has been widely applied and accepted in countries throughout Europe, Africa, and Asia.

The research is being done on the physicochemical properties of the ground water in the state of Uttar Pradesh (India). The physicchemical parameters such as pH, D.O., E.C., T.D.S., alkalinity, turbidity, Ca (calcium) and Mg (magnesium) hardness, total hardness, NO3 (nitrate), F (fluoride), Fe+3 (iron), and Cl- (chloride) have been

measured and analyzed. When compared to WHO guidelines, it was discovered that some parameters do not fall within the acceptable range. The following characteristics are evaluated in order to calculate the Evolution of water quality index: pH, E.C., T.D.S., Total hardness; D.O.; C.O.D.; B.O.D.; Cl-; NO3; and Mg. The WQI for these samples varied anywhere from 244 to 383.8 on the scale. According to the findings of the investigation, the groundwater in the region requires some level of treatment before it can be consumed.

Conducting research on the city of Bidar in Karnataka to determine the qualities of their ground water and their water quality index (W.Q.I.). The parameters that are measured include pH, total hardness, calcium (Ca), magnesium (Mg), chloride (Cl), nitrate (NO3), sulfate (SO4), total dissolved solids (T.D.S.), iron (Fe+3), fluoride (F), sodium (Na), potassium (K), alkalinity, manganese (Mn), dissolved organic carbon (D.O.), total solids (Zn), and total (Zn). The findings of the tests were utilized to provide suggestions for models to use in the examination of water quality. Physico-chemical investigation of the quality of the drinking water in 32 different places around Delhi. The city of Delhi is very ancient. In addition to being densely inhabited, it is one of the most significant commercial hubs in all of India. Even in modern times, it is difficult for people living in rural areas of Romania to have access to reliable sources of drinking water. Therefore, in 2002, only 65% of the population of Romania had access to drinking water. This percentage was allocated as follows: 90% of the population lived in urban areas, while just 33% lived in rural areas.

III. CONCLUSION

Toxic elements and chemicals enter the body mostly via the consumption of contaminated water, food, and air. Ground water contamination is becoming a bigger concern to the environment, particularly as populations and industrial economies increase. The generation of reliable and accurate information through water quality monitoring (WQM) is the first step toward developing measures to prevent and cure deterioration in the quality of groundwater. This information is used to gain an understanding of the actual source or cause of contamination, as well as the type of contamination, and the level of contamination. There is a need for more study to evaluate the effects on human health. It is necessary to raise awareness among the general public. The amount of potentially dangerous

substances that are present in drainage effluents have to be subjected to monitoring and control of some kind. Demineralization using RO system can remove all hazardous impurities from drinking water and would be cost effective in many situations where TDS, nitrate, and fluoride in groundwater are above permissible levels. Preventive and curative measures against pollution and contamination of groundwater may continue to receive low priority for years to come. Demineralization can remove all hazardous impurities from drinking water. It is possible to remove heavy metals from groundwater using treatment technologies that are quite inexpensive. In order to ensure the smooth running of CETP facilities, new methods for the treatment of industrial waste water need to be developed. Nonetheless, there are a number of obstacles to overcome in order to limit the contamination of ground water; however, it is necessary to raise awareness and put in place a variety of water purification methods.

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