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Ground Water Pollution

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ABSTRACT

The purpose of this paper is to describe and analysis of ground water pollution. When many people think of a water source, they think of lakes, rivers and streams; in other words, surface water. However, of all of the usable freshwater in the world, approximately 97 percent of it is ground water. Scientists agree that there is a lot of water under the earth's surface! The crucial role groundwater plays as a decentralized source of drinking water for millions rural and urban families cannot be overstated. According to some estimates, it accounts for nearly 80 per cent of the rural domestic water needs, and 50 per cent of the urban water needs in India. Groundwater is generally less susceptible to contamination and pollution when compared to surface water bodies. Also, the natural impurities in rainwater, which replenishes groundwater systems, get removed while infiltrating through soil strata. But, In India, where groundwater is used intensively for irrigation and industrial purposes, a variety of land and water-based human activities are causing pollution of this precious resource.

1. Introduction

Groundwater is water that accumulates underground. It can exist in spaces between loose particles of dirt and rock, or in cracks and crevices in rocks. Different types of rocks and dirt can contain different amounts of water. The saturation zone is the portion of the soil and rock that is saturated with water, while the unsaturated zone is the portion of the soil and rock that is not saturated. The top of the saturated zone is called the water table.

When it rains, the water infiltrates the soil and percolates downwards until it reaches the water table. Some types of soils allow more water to infiltrate than others. Permeable surfaces, such as sand and gravel, allow up to 50 percent of precipitation to enter the soil. Rainwater can take years or even decades to reach the water table. Due to the immense volume of groundwater, once rainwater reaches the water table, it often remains there for an extremely long period of time. Some water that is currently stored in the ground may be rain that fell hundreds or thousands of years ago.

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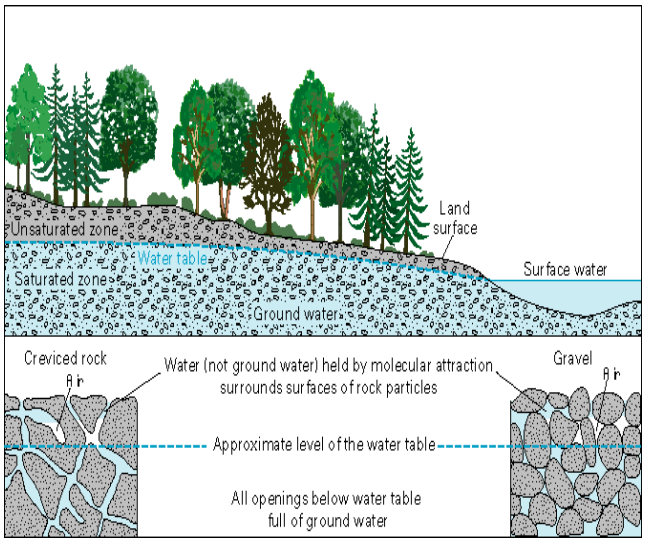


Which is better: groundwater or surface water?

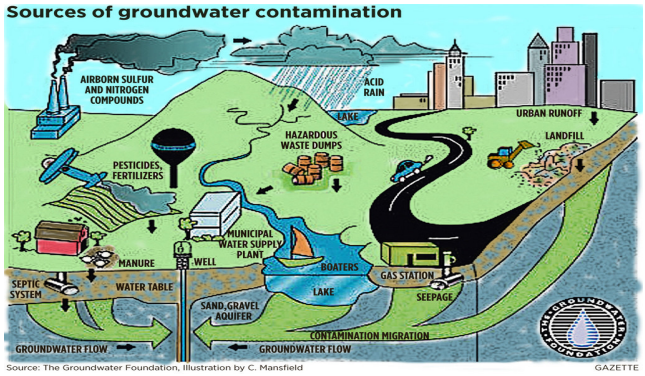
Generally, both groundwater and surface water can provide safe drinking water, as long as the sources are not polluted and the water is sufficiently treated. Groundwater is preferable over surface water for a number of reasons. First of all, groundwater is reliable during droughts, while surface water can be quickly depleted. Groundwater is, in general, easier and cheaper to treat than surface water, because it tends to be less polluted. Through wells, groundwater can be tapped where it is need, whereas surface waters are concentrated in lakes and streams. On the basis of our research, and the water taken from near WIT college river (surface water) and house (under- ground water).

Can groundwater become contaminated?

Groundwater can become contaminated, by many of the same pollutants that contaminate surface water. Pollution of groundwater occurs when contaminants are discharged to, deposited on, or leached from the land surface above the groundwater.

Even if there are no industrial and domestic pollution sources in the area, it is important to realize that the water may not be free from contaminants, and should be tested before human consumption. Arsenic, for example, is found in high concentrations in different parts of the country, and other contaminants, such as dissolved organic material, iron, manganese, ammonium and high salt levels are prominent in groundwater sources.

Pollution can come from two types of sources; point and non-point. Point sources are identifiable and localized sources of pollution. Point sources that can contaminate groundwater include landfills, buried gasoline or oil storage tanks, septic systems, industrial sources and accidental spills. Non-point sources tend to be in the form of pesticides and nutrients that enter the soil as a result of intense agricultural operations or the widespread use of road salts and chemicals. The diagram below illustrates some of the many ways in which groundwater can become contaminated.



2. Review of Literature

Objective: Our aim is to get reduced ground water pollution.

Causes Of Ground Water Pollution

Leaks and spills at factories and commercial facilities:

Spills and leaks can result from accidents, lack of employee training, improper planning, and inadequate maintenance. They are especially problematic if proper procedures are not in place to clean them up once they occur. Materials which can cause problems if spilled, include gasoline, other petroleum products, hazardous chemicals, and a variety of other materials.

It s difficult to eliminate accidental spills, but they can be reduced and the damage they cause can be minimized by proper design and maintenance of facilities and proper employee training. The Emergency Planning and Community Right-to-Know Act of 1986 (SARA Title III) requires states, communities, and businesses to have plans for responding quickly in the event of an accidental spill. Workers must be informed as to what hazardous chemicals they may be working with, and what to do in case of an accident. This act has prevented or reduced many instances of groundwater contamination.

Fertilizers:

Like pesticides, misuse of fertilizers can cause groundwater pollution. Overuse can allow nitrates from fertilizer to seep into the water table. In

sensitive groundwater areas, rainfall seepage can cause fertilizer to migrate and contaminate an aquifer.

Careful use can avoid or minimize these problems.

Improper use and disposal of pesticides:

Pesticides used on farms and even on individual lawns can create serious groundwater pollution. Improper pesticide use can cause people and animals to become ill, kill plants, and have adverse effects on aquatic life in nearby streams. Improper pesticide use can include excessive or ill-timed application, improper storage, or improper disposal of excess pesticides. If you overuse pesticides on your yard, you could be polluting your own groundwater. It s been estimated that individuals use over 100 times as much pesticides and fertilizer on their yards as farmers use on the same amount of land.

Avoiding pesticide pollution of groundwater is relatively easy. Follow instructions carefully. Reduce pesticide use in areas known to be recharge areas for groundwater. Use natural pest control methods rather than chemicals. Homeowners can substitute biocontrol agents, like praying mantises or ladybugs, for pesticides. Other natural insect repellents include plants like mint (which discourages ants), garlic, and marigolds.

My Work:

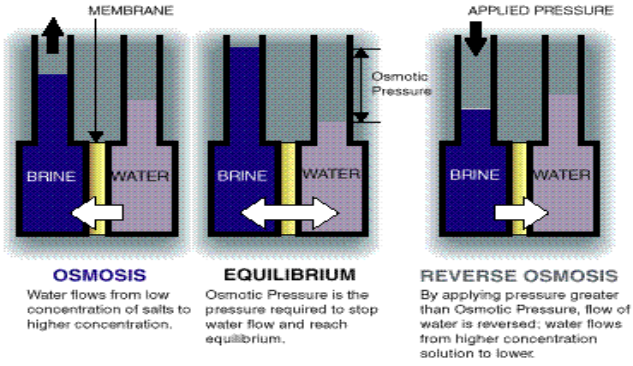
Because surface water and groundwater are often closely interconnected, runoff can contaminate both. An approach of protection is necessary. For example, introducing regulations specifying which pesticides can be used in a well-head area, or specifying how to apply pesticides; prohibiting landfill or gasoline stations over groundwater that feeds into well-heads. If the groundwater is already contaminated a barrier can sometimes be inserted into the ground to prevent further immigration of the pollutant, or chemical or biological reactions can be induced to neutralize or immobilize the contaminant.

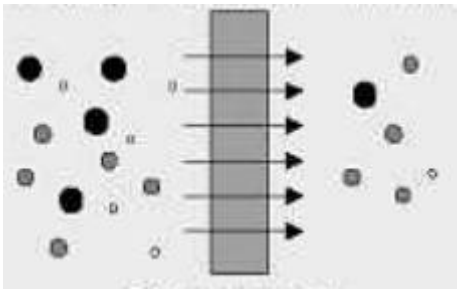
Once polluted, groundwater is extremely costly to clean up. It is often not feasible with today's technology, although pump-and-treat is commonly used with the goal of restoring the water drinking quality: water is pumped to the surface, treated to remove pollutants and then returned to its source.

Methods of treating contaminated water include reverse-osmosis, ozonation, coagulation-precipitation, aerobic biological treatment and activated carbon. Sometimes groundwater is treated in situ, that is, it is not removed from the aquifer: for example, installing tons of iron filling mixed with sand in the path of contaminated groundwater. Some organic pollutants, in fact, react with the iron as the water flows through this permeable barrier and decompose into begin products.

Reverse Osmosis: By applying a pressure that exceeds the osmotic pressure, the reverse effect occurs. Fluids are pressed back through the membrane, while dissolved solids stay behind.

To purify water by Reverse Osmosis membrane, the natural osmosis effect must be reversed. In order to force the water of the brine stream (high salt concentration) to flow towards the fresh stream (low salt concentration), the water must be pressurized at an operating pressure greater than the osmotic pressure. As a result, the brine side will get more concentrated. The operating pressure of water is around 60 bar.

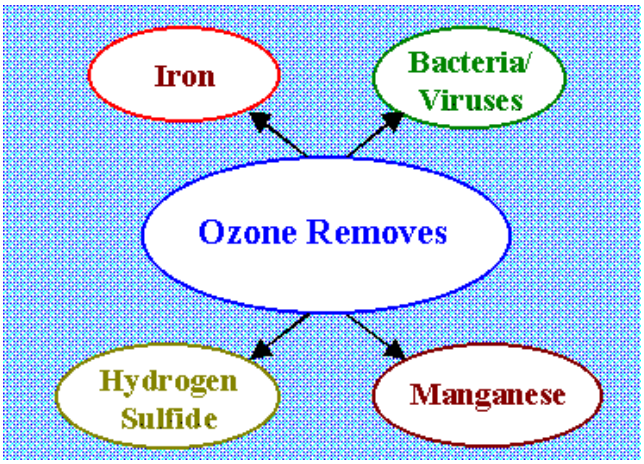




Ozonation: It is a powerful oxidizing agent that can reduce levels of many impurities in water, including colour, taste and odour. Ozone can also be used as a disinfectant and is a good alternative to chlorine for some applications.

Ozone is an unstable gas comprising of three oxygen atoms. As a result of this instability, the gas will readily degrade back to oxygen, and during this transition a free oxygen atom, or free radical, is formed. The free oxygen radical is highly reactive and short lived. Under normal conditions it will only survive for milliseconds. Ozone is a colourless gas that has an odour similar to the smell of the air after a major thunderstorm.

Ozone has a greater disinfection effectiveness against bacteria and viruses compared to chlorination. In addition, the oxidizing properties can also reduce the concentration of iron, manganese, sulfur and reduce or eliminate taste and odour problems. Ozone oxides the iron, manganese, and sulfur in the water to form insoluble metal oxides or elemental sulfur. These insoluble particles are then removed by post-filtration. Organic particles and chemicals will be eliminated through either coagulation or chemical oxidation. Ozone is unstable, and it will degrade over a time frame ranging from a few seconds to 30 minutes. The rate of degradation is a function of water chemistry, pH and water temperature.



Coagulation-Precipitation: In the precipitation process, chemical precipitants, coagulants, and flocculantation are used to increase particle size through aggregation. The precipitation process can generate very fine particles that are held in suspension by electrostatic surface charges. These charges cause clouds of counter-ions to form around the particles, giving rise to repulsive forces that prevent aggregation and reduce the effectiveness of subsequent solid-liquid separation processes. Therefore, chemical coagulants are often added to overcome the repulsive forces of the particles. The three main types of coagulants are inorganic electrolytes (such as alum, lime, ferric chloride, and ferrous sulfate), organic polymers, and synthetic polyelectrolytes with anionic or cationic functional groups. The addition of coagulants is followed by low-sheer mixing in a flocculator to promote contact between the particles, allowing particle growth through the sedimentation phenomenon called flocculant settling.

Flocculant settling refers to a rather dilute suspension of particles that coalesce, or flocculate, during the sedimentation operation. As coalescence or flocculation occurs, the particles increase in mass and settle at a faster rate. The amount of flocculation that occurs depends on the opportunity for contact, which varies with the overflow rate, the depth of the basin, the velocity gradients in the system, the concentration of particles, and the range of particles sizes. The effects of these variables can only be accomplished by sedimentation tests.

Activated Carbon: Activated carbon, also called activated charcoal, activated coal, or carbo activatus, is a form of carbon processed to have small, low-volume pores that increase the surface area available for adsorption or chemical reactions. Activated is sometimes substituted with active.

Advantages of Ground Water

Ground water is free from pathogenic bacteria (which cause diseases). It does not involve the suspended particles, which make the water turbid, unlike surface water of river or stream which contain a lot of particles in it. Ground Water requires nearly no treatment for its usage. While surface water requires many process like sedimentation, filtration, disinfection etc.

Disadvantages of Ground Water

- Ground water are usually hard i.e it contains in it calcium ions (and some other Di and Tri valent ions which cause hardness of water) hence ground water provide us an small beneficial amount of calcium. But this water is not good for boilers of industries as this may form a calcium layer (called as scaling) within the boiler and it may burst. Although ground water is good but it may contain a lot of dissolved solids and metals in it (usually in industrial areas) which may be harmful.
- If it contain calcium in greater amount, it cause weekness in bone (mainly in knees bones).
- The dominant basis of arsenic poisoning is from ground water that naturally contains high concentrations of arsenic. A in 2007 study found that over 137 million people more than 70 countries are probably affected by arsenic poisoning from drinking water.
- Infectious diseases caused by pathogens (usually microorganisms) from animal fecal origins, of which the most common occur in developing countries involving: Typhoid, Giardiasis, Amoebiasis, Ascariasis and Hookworm.
- Liver damage and even cancer (due to DNA damage) – caused by a series of chemicals (e.g., chlorinated solvents, MTBE).

- Neurological problems - damage of the nervous system – usually due to the presence of chemicals such as pesticides (i.e., DDT).

3. Conclusion

Groundwater pollution is bad and it's not good for people to drink the water that's polluted and for all organisms that need water to survive. There are millions of people that don't have good clean access to water and that they even have to drink the bad polluted water for them it survive, Sewage can cause groundwater pollution along with the toxic chemicals from Industrial business. There are a bunch of water pollutions like toxic and organic and thermal water. And solutions to stop the water pollution are to clean up the garbage and keep your yard clean. To try to stop the groundwater pollution clean up your yard and make sure there is no garbage left anywhere around in the area you live like the streets and neighbourhood. And make sure that the effluents of industrial wastes like harmful chemicals should get treated.

Overall, the best choice we can make as humans, instead of driving hybrids, eating "organic" foods, or even recycling everything is to REDUCE CONSUMPTION. We can change what we eat and drive, but until we reduce the amount of what we eat and how often we drive, we will still have the same chances for pollution.

REFERENCES

- KAHHAT, R., KIM, J., XU, M., ALLENBY, B., WILLIAMS, E. & ZHANG, P. 2008. Exploring e-waste management systems in the United States. Resources, Conservation and Recycling, 52, 955-964.
- KIDDEE, P., NAIDU, R. & WONG, M. H. 2013. Electronic waste management approaches: An overview. Waste Management, 33, 1237-1250.
- KIDDEE, P., NAIDU, R., WONG, M. H., HEARN, L. & MULLER, J. F. 2014. Field investigation of the quality of fresh and aged leachates from selected landfills receiving e-waste in an arid climate. Waste Management, 34, 2292-2304.
- NANDAN, A. 2012. TO STUDY EFFECT OF ENDOSULFAN ON HEPATOCYTES OF SWISS ALBINO MICE. Indo-Global Research Journal of Pharmaceutical Sciences, 2, 353-355.
- BOKHOREE, C., BEEHARRY, Y., MAKOONDLALL-CHADEE, T., DOOBAH, T. & SOOMARY, N. 2014. Assessment of Environmental and Health Risks Associated with the Management of Medical Waste in Mauritius. APCBEE Procedia, 9, 36-41.
- CANIATO, M., TUDOR, T. & VACCARI, M. 2015. International governance structures for health-care waste management: A systematic review of scientific literature. Journal of Environmental Management, 153, 93-107.
- NANDAN, A. 2014a. Assessment of Occupational Health, Safety & Environmental Problems in Chemical Industries of Uttarakhand. INTERNATIONAL JOURNAL ON OCCUPATIONAL HEALTH & SAFETY, FIRE & ENVIRONMENT – ALLIED SCIENCE, 1, 20-22.
- NANDAN, A. 2014b. Bacterial Dynamics in Antibiotic Wastewater Treatment – A Review. INTERNATIONAL JOURNAL ON OCCUPATIONAL HEALTH & SAFETY , FIRE & ENVIRONMENT – A LLIED SCIENCE, 2, 8.
- NANDAN, A. 2014c. Bioremedial effect of Curcuma Longa on endosulfan induced kidney and liver of swiss albino mice. Indian Journal of Biotechnology and Pharmaceutical Research, 2, 23-27.
- NANDAN, A. 2014d. Isolation, purification and characterization of Streptolysin-O from Streptococci. Indian Journal of Biotechnology and Pharmaceutical Research, 2, 28-34.
- NANDAN, A. 2014e. Removal of fluoride from water by suitable low cost environmental friendly methods. Environmental Pollution Control Journal, 17, 41-44.
- NANDAN, A., SIDDIQUI, N. A., MONDAL, P., CHAUDHARY, K. & PANDEY, R. 2014. Hazards Associated to Synthesis Gas and its Mitigation Measures. Research Journal of Engineering and Technology, 5, 144-146.
- PRIYANKA, U. & NANDAN, A. 2014. Biodegradable Plastic–A Potential Substitute for Synthetic Polymers. Research Journal of Engineering and Technology, 5, 158-165.

- SIDDIQUIA, N., NANDAN,A, A., SHARMAA, M. & SRIVASTAVAA, A. 2014a. Assessment of Fire Prevention and Protection Measures in Group "C" Buildings of Dehradun City.
- SIDDIQUIA, N., NANDAN,A, A., SHARMAA, M. & SRIVASTAVAA, A. 2014b. Risk Management Techniques HAZOP & HAZID Study.
- BHAT, V., RAO, P. & PATIL, Y. 2012. Development of an Integrated Model to Recover Precious Metals from Electronic Scrap - A Novel Strategy for E-Waste Management. Procedia - Social and Behavioral Sciences, 37, 397-406.
- ÇETINSAYA ÖZKıR, V., EFENDIGIL, T., DEMIREL, T., ÇETIN DEMIREL, N., DEVECI, M. & TOPÇU, B. 2015. A three-stage methodology for initiating an effective management system for electronic waste in Turkey. Resources, Conservation and Recycling, 96, 61-70.
- CHIBUNNA, J. B., SIWAR, C., BEGUM, R. A. & MOHAMED, A. F. 2012. The Challenges of E-waste Management Among Institutions: A Case Study of UKM. Procedia - Social and Behavioral Sciences, 59, 644-649.
- DWIVEDY, M., SUCHDE, P. & MITTAL, R. K. 2015. Modeling and assessment of e-waste take-back strategies in India. Resources, Conservation and Recycling, 96, 11-18.
- GENTES, M.-L., MAZEROLLE, M. J., GIROUX, J.-F., PATENAUDE-MONETTE, M. & VERREAULT, J. 2015. Tracking the sources of polybrominated diphenyl ethers in birds: Foraging in waste management facilities results in higher DecaBDE exposure in males. Environmental Research, 138, 361-371.