JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

A Review Study on "The Assessment of Groundwater Quality is A Crucial Aspect of Environmental

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Abstract : Groundwater deficiency in Manendragarh, a crucial natural resource for drinking water, is causing a water emergency. The groundwater aquifer, the primary water supply hotspot for residential, farming, and modern use, is facing decline due to low precipitation, urban expansion, and population growth. Understanding the general water quality in the region is challenging due to various physical and substance factors. This review paper aims to assess the quality of groundwater resources in the Manendragarh region. (Khan et al. 2015).Water quality refers to its physical, chemical, and organic properties, determining its suitability for consumption, irrigation, and industrial use. Standards are used to assess water quality, with research focusing on how anthropogenic activities, particularly agricultural and industrial processes, can lead to groundwater contamination.

I. THE RESEARCH PROBLEMS, WHY WATER QUALITY ASSESSMENT NEED

The groundwater and surface water analysis for physical and chemical properties is very important for public health studies. These studies are also chief part of pollution studies in the atmosphere. Literature review shows that there has been no published report in ground water quality studies in rural parts Jhagrakhand, Ledri, Dola, Lalpur, and Manendragarh its surrounding coal field area

What factors affect the water quality? (Coal, Agricultural Chemicals, pesticides, by products)

Water quality is influenced by factors like coal, agricultural chemicals, pesticides, and by products. Scientists develop water quality standards to assess the effects of impurities on specific water use and protect specific usages. These standards are based on aquatic and suspended particulate material, bottom residue, and biota quality, with dissolved oxygen being a crucial factor.

Quality of water at different location of Korea district of Chhattisgarh. (Dwivedi et al. 2014).Korea's river water and underground water are degrading due to coal mining and urbanization. The Hasdeo River, which supplies water to the country, is also being polluted by municipal dirt and garbage, as well as heavy metals from coal mines near the area.

Worth of the study

The study will assess iron, lead, chromium, cadmium, arsenic levels in Manendragarh's groundwater and surface water to raise awareness about environmental management importance. Results will inform authorities, guide future studies, and guide remedial actions to eliminate high levels.

Groundwater quality and potential chemicals (Jung, 2001)Contaminants in the bionetwork, such as zinc, microbial impurities, and uranium, pose potential health risks to humans. Groundwater quality suffers from anthropogenic changes like industrial discharge, pesticide use, and landfills, which release toxic chemicals and lead to health risks when present in high levels.

II. STUDIES ON PHYSICO-CHEMICAL AND HEAVY METAL CHARACTERISTICS OF WATER

Shah et al. (2008) The study analyzed physico-chemical parameters of aquatic samples from 40 villages in Gujarat, India, comparing them with World Health Organization standards. Results showed poor stream superiority for drinking and irrigation purposes.

Reza and Singh(2009) The study examined the impact of industrial activities on ground water quality in the Angul-Talcher region of Orissa. Results showed that pre-monsoon water quality was better, with some samples being slightly alkaline due to industrial activities. Most parameters showed similar seasonal trends, with higher values in post-monsoon seasons.

Shahnawaz et al. (2009) The study analyzed 90% of groundwater samples from blocks, revealing that they were pH-neutral, slightly alkaline, and contained all necessary ions for drinking water, including TDS, TH, Calcium, Magnesium, Sulphate, fluoride, and Fe.

Nair (2010) The study evaluated the portability of bore and open well water in Alappuzha district, finding excess hardness, alkalinities, and fluoride absorption in some areas, causing concern among local inhabitants.

Umadevi et al. (2010 The study involved collecting 40 water samples from four zones and analyzing their correlations. Results showed some areas had lower pH values, significant concentrations of cautions and anions, and excess levels of magnesium and chloride.)

Shivasharanappa et al. (2012) The study assessed the groundwater superiority of Bidar city and its industrial area using physicochemical analysis of samples from thirty-five wards. Results showed high-quality groundwater, with correlation and regression models suggesting potential models for predicting water quality.

Mukhopadhyay and Mukherjee (2013) The study evaluated water samples' physico-chemical and microbiological limits from March-April 2013, comparing them to Indian Standard 10500-91. Results showed increasing alkalinity, TDS, total hardness, fluoride, calcium hardness, and fecal coliform concentrations.

Ahmad et al. (2014) The study examined the groundwater quality in three Bhojpur blocks, Barahra, Ara, and Shahpur, focusing on Gangetic simple. Sixty-six samples were analyzed for physico-chemical parameters, and it was found that levels of calcium hardness, TDS, EC, turbidity, TH, and iron exceeded WHO limits.

Nikhade et al. (2014) The study investigates the impact of industrial sewage on groundwater and river superiority in Ballarpur, Maharashtra, using computational picture analysis of samples from treated industrial seepage, comparing results with WHO and BIS limits.

Singh et al. (2015) The study analyzed hydrochemical and qualitative aspects of surface water funds in the Jharia Coal field section, Dhanbad. Eighteen samples were collected during the 2013 post-monsoon season, showing slightly alkaline water with high TDS concentrations. The water is valuable from natural and anthropogenic sources.

Gupta et al. (2016) The study utilized GIS to analyze water properties in nine block five villages in Dhanbad district. The analysis included pH, EC, TDS, salinity, Fe, Manganese, and Zn concentrations. The study also assessed heavy metal contamination in soils due to mining operations.

pH

The pH level in drinking water indicates its acidity, with a neutral pH level indicating a balance between acid and alkalinity. Acidic water can leak metals and cause aesthetic issues. A pH level above 8.5 indicates high alkalinity reserves, which does not pose a health risk but can cause aesthetic issues like bitter coffee taste.

Nitrate

Groundwater quality is influenced by factors like climate, slope, drainage conditions, and dwelling time. Agriculture can lead to higher nitrate levels, while phosphates from rocks, fertilizers, and sewage can enter groundwater. Heavy metals in groundwater are related to soil characteristics and anthropogenic causes, affecting water movement.

Human activities increase contaminating ionic levels in water, posing risks to humans, flora, and fauna. Assessing groundwater quality is crucial for predicting future disasters. A case study in Aurangabad, India, collected 55 samples from dugwells and borewells. The study analyzed pollutants, revealing nitrate as the major pollutant, with industrial wastewaters and solid fertilizers and pesticides contributing to pollution.

Cobalt

Hend Samir Atta et al (2022) The Ismailia Canal's increasing human activities pose a threat to the groundwater system, necessitating the Water Quality Index (WQI) to assess drinking groundwater suitability. The WQI uses Pearson correlation to build a relationship matrix between 20 variables, including electrical conductivity, pH, TDS, sodium, potassium, calcium, magnesium, chloride, carbonate, sulphate, bicarbonate, iron, manganese, zinc, copper, lead, cobalt, chromium, cadmium, and aluminium. The water type is Na–Cl in the southern area due to Miocene aquifer salinity, and Mg–HCO3 in the northern area due to seepage and excess irrigation water.

Alice Makonjo Wekesa et al.A groundwater quality assessment in November 2018 in Nyamira County, Kenya, involving water samples from three springs, Kiangoso, Kerongo, and Tetema, revealed excellent quality at Kiangoso, while Kerongo and Tetema had good quality. The water quality index was less than 30, making it suitable for drinking, irrigation, and industrial use. These findings are crucial for future management of groundwater in the Manga region.

Devendra Dohare et al.(2014).Groundwater contamination due to human and industrial activities is a serious issue. This study assessed the water quality index (WQI) in Indore City and its industrial area using physiochemical analysis of samples. 27 parameters were considered, including pH, color, total dissolved solids, electrical conductivity, total alkalinity, total hardness, and more. The results were compared with the Indian Standard Drinking Water specification.

Dimple et,al (2022).Groundwater, a vital natural resource, is under pressure due to increased water demand and natural processes. Poor quality groundwater affects crop yield and soil characteristics. Improper irrigation water use leads to soil and water issues, necessitating careful management in salt-affected soil. This review aims to understand water quality's effects on soil and crops, and to identify alternative solutions to address potential water quality issues reducing yield.

Peiyue L et al.Groundwater is a crucial global resource for drinking water, relying on approximately one-third of the population. However, urbanization, agricultural practices, industrial activities, and climate change pose significant threats to groundwater quality. Contaminants like toxic metals, hydrocarbons, and pesticides threaten human health, ecological services, and sustainable socioeconomic development.

Basu A et,al (2014)Groundwater contaminants are primarily geogenic, resulting from the dissolution of natural mineral deposits. Rapid global population growth, urbanization, industrialization, agricultural production, and economic development have led to the negative impacts of anthropogenic contaminants, particularly in countries in the eastern hemisphere.

Zhang Y et al.(2018)Addressing groundwater contamination in different countries requires varying measures, techniques, and policies due to varying nature, climatic regions, and geological features, as seen in agricultural regions causing nitrate pollution.

Ahmed A et al 2020)Technological advancements have revolutionized groundwater contamination studies, utilizing geophysical and geoinformatics techniques, GIS, remote sensing, artificial intelligence, big data analysis, drone surveys, and molecular and stable isotope analysis technologies. These advancements require groundwater scientists to adopt and apply them effectively.

Ren X et al(20210 utilized statistical approaches and multivariate analysis techniques to study hydrogeochemical processes affecting groundwater in the Guanzhong Basin, China, providing useful groundwater management options for local decision-makers.

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