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Editorial

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Exploitation of Ground Water

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Introduction

Groundwater plays an important role within the water cycle, preserves a healthy ecosystem balance, and acts together of the first sources of beverage, irrigation, and inflow to several streams or rivers. However, uncontrolled and unregulated exploitation of groundwater, high population growth, rapid urbanization, expanding agriculture and increased industrial development is deteriorating this resource. Approximately 35% of the global population faces water stress, particularly in the central US, India, North-East China, and South Africa. Pakistan also faces an equivalent water-related challenge where the per capita water availability has decreased from 2172 to 1306 cubic meters per inhabitant in 25 years (1990–2015). Also, the majority of the population does not have access to safe drinking water (27.2 million) and sanitation (52.7 million), 0.039 million children under the age of five die every year from diarrhea, and three million people per year suffer from water-borne diseases. It shows the poor management of drinking water quality where the standards of various parameters set by the World Health Organization is recurrently neglected.

The drinking water is contaminated with chloride, toxic metals, nitrate, pesticides, and coliforms by various sources like unsafe handling and storage of households and industrial effluents, and agrochemical applications in agricultural fields. The water quality parameters can have various positive or negative effects. For example, nitrate concentration higher than 50 mg/L as nitrate causes methemoglobinemia and thyroid effects in bottle-fed infants and it is advisable that concentrations should be less than 20 mg/L as nitrate Hardness within the beverage features a significant protective effect from cardiovascular diseases, while calcium hardness may cause scale deposition in pipes and tanks. Nitrate in groundwater may originate from natural also as anthropogenic sources, for instance, geologic deposits within the sort of soda niter, standing water within the rice fields where blue-green algae assimilate atmospheric nitrate for tissue growth and after the degradation, released it to the soil and ultimately reach to the groundwater, nitrogen fertilizers within the agricultural fields, inappropriate human wastes disposal, and food processing industries. Despite the harmful effects on human health, chloride, which originates from landfill leachates, inorganic fertilizers in agricultural fields, infiltration of road de-icing salts, septic tank and industrial effluents, animal feeds, and irrigation drainage, produces a salty taste in water when it exceeds 250 mg/L and can cause damage to the aquatic system and terrestrial plant composition. Analyzing the physio-chemical properties of beverage could help in ascertaining the extent of pollution.

The process-based simulation methods, such as MOUSE (Model of Underground Solute Evaluation) and RUSTIC (Risk of Unsaturated/Saturated Transport and Transformation of Chemical Concentrations), predict the contaminant transport processes using mathematical models. These methods replicate the particular physical and chemical properties of the pollutant transport and predict the degradation because it travels through the subsurface. These computations aren't supported expert knowledge but on scientific principles, which control the movement of water and pollutant within the subsurface. The statistical methods, for example, regression analysis, discriminant analysis, classification and regression tree (CART), and hierarchal clustering analysis (HCA) utilize data from known locations and provide the categorization based on similarities or dissimilarities for an equivalent geographic location from which the info were collected. As the statistical methods are supported the particular measurement of the water quality parameters, the validity and credibility of this approach are better than the overlay and indexed methods. This study focuses on the statistical method and utilizes the clustering analysis with a simple approach that can easily be applied to any other area. The aim of the study is to determine the most commonly used physio-chemical properties of groundwater quality, including pH, electrical conductivity, total dissolved solids, bicarbonate alkalinity, total hardness, calcium hardness, magnesium hardness, turbidity, nitrate (mg/L), and chloride (mg/L) within the Peshawar, which is that the capital and most populated district of the province, utilize them within the clustering analysis, and classify the standard of groundwater into different and useful classes..

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