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Editorial: Groundwater salinity: origin, impact, and potential remedial measures and management solutions

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Editorial on the Research Topic
Groundwater salinity: origin, impact, and potential remedial measures and management solutions

Groundwater is a primary source for the survival of humankind, and thus, it is necessary to understand the proper management of this resource.

Groundwater salinity is a transnational and meaningful environmental issue in water resources. Salinity is currently increasing at a rate of 10% per year.

Salinization processes generally may affect alluvial, karst, and alluvial coastal aquifers. The over-exploitation of these aquifers causes salinization to meet the demands of irrigation and drinking water. In the past decades, the salinity of the aquifers has been attributed to modern seawater intrusion contributions (coastal aquifer) and to the contributions of deep saline waters, which are derived from fossil seawater and have evolved through water–rock interaction.

Pollution may overlap with concomitant salinization processes.

In future, decreasing meteoric water inputs, and increasing temperatures by global warming and climate change, will enhance the salinization processes in aquifers.

Thus, improving knowledge regarding the salinization processes is of prime priority, which affects the quality and quantity of karst groundwater.

Improving water quality is central to the UN Sustainable Development Goals (SDGs). Data collection and sharing have been communicated as essential for reaching associated water quality targets. Using observed salinity data in modeling approaches can contribute to better process understanding and reduce model prediction uncertainty, enabling better water quality projections under global change.

Therefore, comprehending water quality at larger scales and related interactions is critical to our future protection and restoration of assets.

The coastal areas are characterized by a solid demographic pressure that determines a high per-capita groundwater consumption, resulting in the overexploitation of aquifers and lowering piezometric levels. The consequence is altering the balance of fresh water/salt water. However, the latter may also derive from other processes, such as water-rock interaction, the presence of fossil salt water, contamination by wastewater and the contribution of marine aerosol.

Drinking water salinization and pollution is one but not only a direct consequence of the climate crisis that is already affecting every inhabited region of the globe, with dire consequences for individuals and global public health. The health of humans and ecosystems are closely linked and interdependent.

The related human's health effects range from a significant cause of cardiovascular diseases, hypertension, and methemoglobinemia in infants, skeletal and dental fluorosis, and laxative effects for sulfate at high levels.

This Research Topic (*Groundwater Salinity: Origin, Impact and Potential Remedial Measures and Management Solutions*) comprises four papers written by authors from five countries (Sri Lanka, India, United States, Sénégal, and France).

In the following paragraph, I will summarize the content and main results of the papers published on this Research Topic. The order of papers is based on publishing data.

Piyathilake et al. investigated the prevalence of chronic kidney disease of uncertain etiology (CKDu) in the Uva Province (UP) of Sri Lanka. Scientists assumed that protracted drinking water consumption with high levels of contaminants might be the causative aspect. Nevertheless, F and PO_4 levels of the groundwater were the geochemical risk factors considerably associated with the advance of CKDu in the study area.

Verma and Sharma documented the excessive pumping in the shallow aquifers for irrigation and household usage at Rajgir, Bihar, India. Groundwater flow, hydraulic conductivity, thickness, and the respective transmissivity of aquifers have been evaluated employing a one-dimensional model (BORE II) and Darcy's law for these shallow wells. This approach can be very economical and can be assumed mainly at household, commercial, or official building levels for recharging and storing the excess Water in aquifers for dealing with water scarcity issues and decreasing groundwater levels of this region.

Hocking and Bailey estimated the influence of driving forces on salt transport in Colorado's South Platte River (drainage area of 62,937 km^2) and explore possible mediation strategies to reduce salinity levels in both urban and agricultural river reaches. Results point to the extreme challenge of managing salinity in the South Platte River Basin and other similar basins and the aggressive urban approaches that must be implemented to maintain irrigation techniques in the downstream regions of the basin.

Ndoye et al. discussed the seawater intrusion in the Sahel region of Senegal. The main results are related to the Water–rock interaction that is the dominant geochemical process. In addition, the saline intrusion is also very evident in the area with degradation of groundwater quality. Therefore, the information obtained from the results will be helpful for managing groundwater resources, especially regarding saltwater intrusion and its progression.

Conclusions

The subject of this Research Topic is of great significance. The intelligent, linked and careful action of the authorities responsible for the territory would limit all those autonomous actions promoting the expansion of the salinization phenomenon. The four papers cover influential factors of the hydrological and hydrogeological features and hydrogeochemistry for estimating the reasons for aquifer salinity, including its disturbance. The results supply definitive horizon scanning of key pressing, emerging, or ongoing topics relevant to our communities, peeking at the future for setting overall groundwater resources.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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