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WATER SECURITY: THE "NEW/OLD" THREAT OF POOR GROUNDWATER MANAGEMENT

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The importance of underground water resources is undisputed. However, there is still a paucity of studies on such reservoirs. As a result, estimates of the size of global reservoirs are not consensual and can range from 1 to 60 million km3 (Gleeson *et al*., 2016; Richey *et al*., 2015). However, these reservoirs certainly represent more than 90% of the total freshwater available to living organisms. The lack of information on this fundamental element for life on Earth is evident in the scientific literature (Bierkens *et al*., 2015; Clark *et al*., 2015; Gleeson *et al*., 2021; Lall *et al*., 2020; Sood and Smakhtin, 2015).

Despite the limitations of global groundwater circulation compared to global atmospheric circulation, groundwater is the largest reservoir of liquid freshwater in the hydrological cycle and can be transferred over long distances on continental scales for periods ranging from days to hundreds of years (Condon *et al*., 2021).

The large availability of reserves does not make groundwater the first source of exploitation for logistical and economic reasons. Nevertheless, the use of groundwater for domestic, agricultural, and industrial supplies is growing rapidly around the world. In the United States, for example, hundreds of thousands of wells are drilled each year, primarily for agricultural irrigation. In India, some 31 million hectares are irrigated. In some countries, groundwater supplies more than half of the irrigated land, such as Iran (58%) and Algeria (67%). Libya relies exclusively on this water source for irrigation (ABAS, 2001). In addition, countries such as Saudi Arabia, Denmark, and Malta are supplied exclusively by groundwater. In other countries, such as Austria, Germany, Belgium, France, Hungary, Italy, the Netherlands, Morocco, Russia, and Switzerland, underground reserves are estimated to meet more than 70% of freshwater needs.

Finally, the greater difficulty of geological diffusion and consequent renewal of water in reservoirs makes the groundwater compartment an extremely vulnerable system to potential contamination from human activities (Fraga *et al*., 2013). Urbanization, agricultural practices, industrial activities, and climate change pose significant threats to groundwater quality and can lead to contamination of these reservoirs. Contaminants such as toxic metals, hydrocarbons, pesticides, nanoparticles, microplastics, and other emerging contaminants pose a threat not only to human health but also to ecosystems and sustainable socioeconomic development (Li 2020; Li and Wu, 2019).

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On the other hand, new pollutants are appearing every day, highlighting the scientific community's delay and persistent lack of knowledge about the impacts generated by anthropogenic activities. This ignorance is not only limited to the existence of polluting compounds (such as the recent and emerging challenge of microplastics) but also manifests itself in a superficial understanding of the dynamics of biogeochemical cycles and the potential impacts on the various components of terrestrial ecology. As for microplastics, several studies have already demonstrated their ability to reach remote systems, such as isolated mountain ranges (Napper *et al*., 2020; Pastorino *et al*., 2021; Cabrera *et al*., 2022) and underground water reservoirs (Singh and Khagwat, 2022).

Approximately one-third of the human population depends on groundwater for survival (International Association of Hydrogeologists, 2020), making this resource essential for populations living in arid and semi-arid regions where surface water availability and precipitation are limited (Li *et al*., 2017). Ensuring a safe and sustainable supply of groundwater for consumption is one of the critical drivers of a nation's sustainable development. The question remains: is there still time to understand the problems already underway, and then take management actions to remedy them?

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