

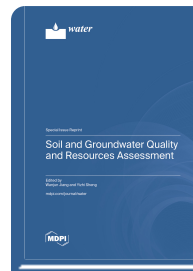
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Soil and Groundwater Quality and Resources Assessment

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Edited by
Wanjun Jiang
Yizhi Sheng

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Groundwater, a critical resource for global freshwater security, sustains ecosystems and societies but faces escalating threats from climate change, overexploitation, and geogenic/anthropogenic contamination. This volume synthesizes multidisciplinary research on hydrological dynamics, contaminant transport, and sustainable management to address water scarcity and environmental decline. Employing hydrogeochemistry, isotopic tracing, and modeling, it examines dual crises: quantity depletion (e.g., coastal saline intrusion and arid aquifer overdraft) and quality degradation (e.g., arsenic–fluoride co-enrichment and heavy metals). Case studies (Miyun Reservoir and Erlan fields) illustrate climate variability, land-use impacts, and hydrogeological controls on groundwater resilience.

The work integrates traditional tools (isotopes and numerical models) with emerging innovations (non-traditional isotopes and bioremediation), offering mechanistic insights into pollutant fate (e.g., capillary-retained NAPLs and microbial BTEX degradation) and strategies to balance resource use (geothermal reinjection and in situ uranium leaching) with ecological preservation. By analyzing contamination pathways (seawater intrusion and agro-industrial inputs) and quantifying anthropogenic–geogenic drivers, it equips stakeholders with adaptive management tools. Synthesizing 17 studies, this book emphasizes interdisciplinary collaboration to address emerging contaminants and equitable allocation, guiding resilient water systems in a climate-challenged era.

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