Chapter 2
Global Water Resource Challenges

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ABSTRACT

Water is a fundamental resource for human survival, health, and development, yet it faces mounting pressures from rapid population growth, urbanization, industrialization, and climate change. Despite its abundance, covering 71% of the Earth's surface, freshwater constitutes less than 1% of the world's accessible water, and its availability is increasingly compromised by pollution, overextraction, and uneven distribution. This chapter explores the multifaceted nature of global water challenges, focusing on the interrelated issues of scarcity, contamination, climate variability, and governance. It highlights the impacts of salinity, groundwater depletion, waterborne diseases, and inequitable access. Case studies illustrate the socio-environmental consequences of poor water management and a lack of transboundary cooperation. The chapter further examines technological and policy solutions. By integrating scientific evidence, global frameworks, and local practices, the chapter advocates for inclusive, interdisciplinary, and adaptive approaches to water governance.

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INTRODUCTION

Water is one of the most essential natural resources for sustaining life, ecosystems, and human civilization. Of all the water on Earth, about 97.5% is saline and located in oceans, while less than 1% is accessible for direct human use (UNEP, 2016). With population growth, industrial expansion, and rapid urbanization, the demand for freshwater is increasing dramatically. By 2050, global water demand is expected to rise by 20–30% (WWAP, 2019). This increase is exacerbated by pollution, climate change, and inadequate governance, making water scarcity a growing concern.

Water management has shifted from supply-side solutions (dams, wells, diversions) to IWRM, balancing economic, social, and environmental objectives (GWP, 2010). Access to safe water and sanitation is also a critical human rights issue. According to the WHO/UNICEF Joint Monitoring Program (2023), over 2 billion people lack safely managed drinking water services, and nearly 3.6 billion lack safely managed sanitation. These disparities are especially pronounced in Sub-Saharan Africa, parts of South Asia, and rural and conflict-affected areas. Women and girls often bear the burden of water collection, limiting education and economic opportunities. Regional disparities in water availability further complicate the global picture. While some countries, such as Canada, enjoy abundant renewable water resources, others, including Jordan and many African nations, face chronic water scarcity. This uneven distribution creates geopolitical tensions, impacts food and energy security, and exacerbates poverty and inequality.

Water is also central to the achievement of multiple Sustainable Development Goals (SDGs), particularly SDG 6, which aims to "ensure availability and sustainable management of water and sanitation for all." Yet, progress toward this goal remains off track in many regions. Without accelerated efforts and increased investment, billions of people will continue to face water-related hardships in the decades to come. Climate change is introducing a new dimension to water insecurity by altering precipitation patterns, intensifying extreme weather events, and affecting water quality. Droughts, floods, and glacier melt are already impacting water availability in both developed and developing countries.

Moreover, water issues are inherently interdisciplinary, intersecting with public health, agriculture, energy production, urban planning, and biodiversity conservation. For instance, contaminated water sources contribute to the spread of waterborne diseases, while unsustainable irrigation practices can degrade soil and reduce agricultural productivity. Urban water management must address stormwater runoff, pollution, and infrastructure aging to safeguard both human health and environmental quality.

This chapter explores the global water resource challenge in depth, examining the drivers, consequences, and regional disparities of water scarcity. It also highlights the