Chapter 1
From Scarcity to Security Multidimensional Perspectives on Water in a Changing World: From Scarcity to Security

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ABSTRACT

Water security has emerged as a critical and multidimensional challenge of the twenty-first century, encompassing biophysical limits, socio-economic dynamics, governance systems, technological resilience, and geopolitical stability. With the global population projected to rise from 7.7 billion to nearly 11.2 billion by 2100, ensuring adequate, safe, and equitable access to freshwater will become increasingly complex. Freshwater resources are fundamental not only for drinking and sanitation but also for sustaining agriculture, ecosystems, energy production, industry, and

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economic development. Climate change is intensifying blue-water variability and hydrological extremes, while agricultural expansion is altering green-water fluxes and increasing pressure on land–water systems. Strategically important headwater regions, though vital for downstream water supply, remain ecologically fragile and insufficiently protected. Simultaneously, urban and peri-urban areas face growing risks from infrastructure stress, contamination, groundwater depletion, and emerging cyber-physical threats, despite the potential of decentralized solutions such as rainwater harvesting and distributed storage. Water insecurity now reflects both quantitative scarcity and qualitative degradation, with severity varying across regions, particularly in arid and semi-arid zones. This chapter advances an integrated scientific and political understanding of water security, highlighting its multi-scalar, cross-sectoral nature and examining diverse regional experiences to underscore the urgency of resilient and equitable water governance.

1. INTRODUCTION

Water is the foundation of life and the structural core of all ecosystems, sustaining agriculture, industry, energy production, public health, and environmental stability (Çelik et al., 2013; Kılıç, 2020). No nation can achieve durable economic growth or political stability without securing reliable and safe water resources. Today, escalating water scarcity and pollution threaten millions of lives, particularly in low-income and climate-vulnerable regions. In this context, aligning water security with the United Nations Sustainable Development Goals (SDGs), especially SDG 6 (Clean Water and Sanitation), is essential. The 2030 Agenda for Sustainable Development (United Nations, 2015) and successive UN-Water World Water Development Reports (2019, 2023) underscore that water security is central to poverty eradication, ecosystem protection, climate adaptation, and global peacebuilding. Positioning water security within this framework strengthens its governance relevance and highlights its cross-sectoral implications for human and environmental security.

The geopolitical dimension of water security is increasingly evident in conflict-affected regions. In Syria, prolonged conflict has severely damaged water infrastructure, including major hydraulic structures such as the Tishrin Dam near Manbij, illustrating how water systems can become both casualties and instruments of war (Gleick, 2019; UNICEF, 2021). Such cases demonstrate the profound water–security nexus, where disruption of supply networks not only exacerbates humanitarian crises but also destabilizes governance and social cohesion. Similar tensions arise in transboundary basins, where upstream–downstream asymmetries create political friction. Disputes among Turkey, Iraq, and Syria over shared rivers exemplify