Chapter 5
Role of Artificial Intelligence in Water Management

Tarak Nandy
https://orcid.org/0000-0002-6370-0640
UCSI University, Malaysia

Sananda Bhattacharyya
https://orcid.org/0000-0001-8034-7634
Maldives Business School, Maldives

ABSTRACT

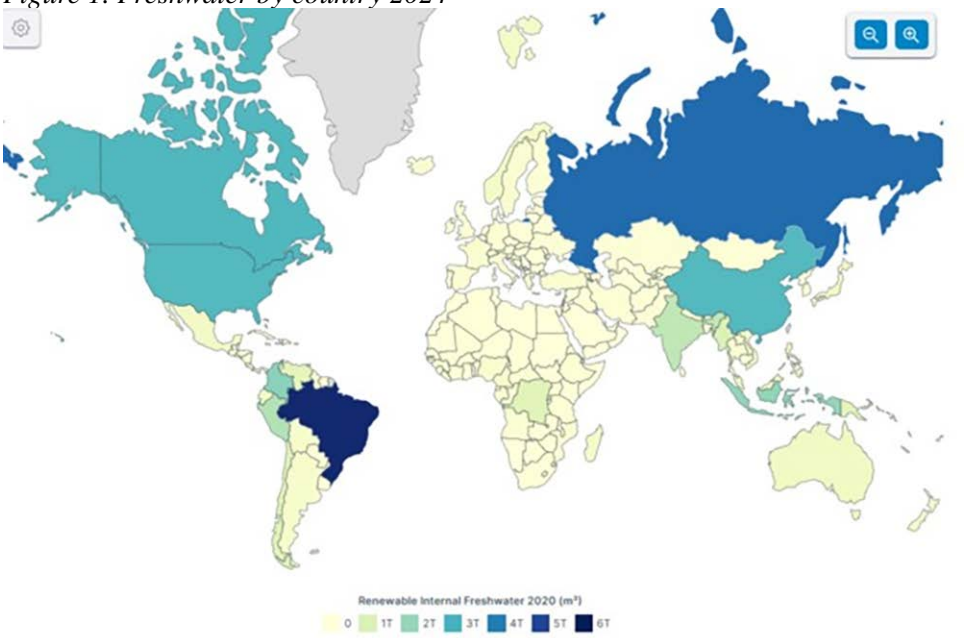
Artificial Intelligence (AI) is revolutionizing water management by addressing critical challenges such as water scarcity, pollution, and inefficient resource allocation. This chapter explores the transformative role of AI technologies, including Machine Learning (ML), Deep Learning (DL), Internet of Things (IoT), Predictive Analytics, and Computer Vision, in optimising water systems. Key applications include demand forecasting, leak detection, water quality monitoring, smart irrigation, and flood prediction, all of which enhance efficiency, sustainability, and resilience. Case studies, such as Barcelona's AI-powered water management system, demonstrate real-world successes in reducing water loss and improving operational performance. However, challenges must be addressed to ensure equitable and scalable solutions. The chapter also highlights future trends to further integrate AI into water governance. By fostering collaboration across sectors, AI can play a pivotal role in achieving water sustainability goals, ensuring safe and access to this vital resource for future generations.

DOI: 10.4018/979-8-3373-2700-6.ch005

INTRODUCTION

Water is a vital resource for life, ecosystems, and economic activities. However, the world is facing a growing water crisis due to population growth, climate change (Absalan et al., 2024), and inefficient management practices. Global water demand has been increasing at an alarming rate, driven by agricultural, industrial, and domestic needs (see Figure 1) (Review, 2025). These changes are further straining already limited water resources, particularly in arid and semi, arid regions. The resource of internal renewable freshwater is degrading day by day (Food and Agriculture Organization, 2025b). The freshwater resources (shown in Figure 2, Figure 3) clearly demonstrate the threats of the water crisis in future (Food and Agriculture Organization, 2025a). On the other hand, water scarcity is not just a problem of quantity but also quality. Pollution from industrial discharge, agricultural runoff, and untreated wastewater has contaminated water sources, making them unsafe for consumption and harming aquatic ecosystems.

Figure 1. Freshwater by country 2024



(Review, 2025)

Alternatively, AI has emerged as a powerful tool to address these challenges by enabling smarter, data, driven, and sustainable water management solutions (Ercan Oguztürk, 2025). This chapter explores the role of AI in revolutionizing water manage-