Chapter 4
Real-Time Water Quality Monitoring:
Use of AI Sensors and Algorithms for Real-Time Monitoring of Water

Francisco R. Trejo-Macotela
https://orcid.org/0000-0003-2133-3456
Universidad Politécnica de Pachuca, Mexico

Daniel Robles-Camarillo
https://orcid.org/0009-0002-4990-8522
Universidad Politécnica de Pachuca, Mexico

Uriel A. Ramírez-Hernández
Universidad Politécnica de Pachuca, Mexico

ABSTRACT

This chapter discusses the significance of real-time water quality monitoring utilizing AI sensors and algorithms, emphasizing water as a renewable yet finite resource. With freshwater representing only 2.5% of Earth's water supply, its uneven distribution among continents necessitates efficient management. The increasing global population exacerbates pressure on these limited resources, particularly through leaks that contribute significantly to water loss during transportation. Advanced monitoring systems employing various sensor technologies—such as differential pressure, ultrasonic, and electromagnetic sensors—facilitate continuous tracking of essential water quality parameters. Algorithms, particularly neural networks and decision trees, enhance predictive modeling, enabling timely detection of contaminants. These innovations not only optimize resource management but also promote sustainability, ultimately protecting public health and the environment by facilitating

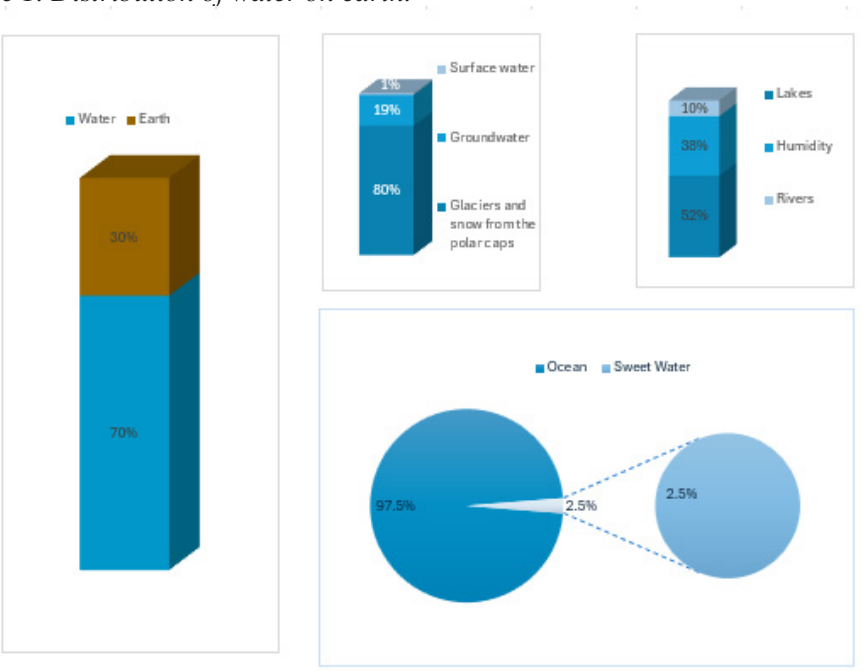
DOI: 10.4018/979-8-3693-8074-1.ch004

informed decision-making in water treatment and agricultural practices.

INTRODUCTION

Water is one of the vital elements on our planet, considered a renewable but finite resource. Covering over 70% of the Earth's surface, water is found in oceans, lakes, rivers, in the air, and in the ground. However, it's known that oceans account for nearly 97.5% of the planet's water, with only 2.5% being freshwater. Glaciers, snow, and ice caps from the polar regions represent almost 80% of freshwater, while groundwater represents 19%, and surface water, which is quickly accessible, only accounts for 1%. This small amount of easily accessible surface water is mainly found in lakes (52%), rivers (10%) and wetlands (38%), (Cirelli, 2012) as illustrated in Figure 1.

Figure 1. Distribution of water on earth.



An analysis conducted in 1999 regarding water resources in the world's population estimated the percentages by continent and population as follows (Figure 2): Asia with 60% of the population and only 36% of water, Europe with 13% of