Chapter 9
Assessing the Spatio-Temporal Evolution of Lake Aguelmam Azigza Using Remote Sensing and GIS: Middle Atlas – Morocco

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ABSTRACT

This study investigates the spatio-temporal evolution of Lake Aguelmam Azigza from 1977 to 2024 using remote sensing and GIS techniques. Utilizing Landsat satellite imagery and the modified normalized difference water index (MNDWI), the study reveals a significant fluctuation in the lake's surface area over the analyzed period, with a concerning overall decline of 66.32%. The lake's surface area decreased from 49.11 hectares in 1977 to 16.54 hectares in 2024. This decline is likely attributed to climate change-induced factors such as drought and variations in precipitation, highlighting the vulnerability of Moroccan water resources. The research emphasizes the need for proactive measures, including resource monitoring and drought mitigation strategies, to ensure the sustainability of water resources in the region. Despite limitations related to data availability, the study provides valuable insights into the dynamics of Lake Aguelmam Azigza and underscores the urgency of addressing the challenges posed by climate change on water resources in Morocco and similar regions.

1. INTRODUCTION

The Mediterranean region, particularly the Moroccan Middle Atlas, is recognized as being highly susceptible to the impacts of climate change. This vulnerability is well-documented in the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, AR5, 2013), which emphasizes the profound implications for water resources and ecosystems. Projections for the period 2070-2099 indicate a drastic reduction in annual rainfall, potentially decreasing by as much as 30%. This decline is expected to lead to a corresponding reduction in water resources, estimated to be between 30% and 50% (Milano, 2012). The Moroccan Middle Atlas, situated at the intersection of arid and temperate climatic zones, exemplifies the complexity of climatic interactions in the Mediterranean. This region is influenced by a convergence of mid-latitude and subtropical processes, further shaped by the Atlantic Ocean, the Mediterranean Sea, and the Sahara Desert. Such diverse influences contribute to substantial spatial and temporal variability in precipitation