Chapter 8
Monitoring Surface Water Variations at the Ain Kwachia Dam in Morocco's Northwest Central Plateau With the Use of Remote Sensing and GIS

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ABSTRACT

Morocco's water situation is unique, with arid climatic zones dominating most of the country. This means that water resources need to be managed equitably, and decisions need to be taken to ensure the sustainability of this natural potential, which is essential for life in general. This is the case for the management of water

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scarcity, especially rainwater, by hydraulic works in the central plateau in north-west Morocco, with a view to combating water stress, particularly since climate change is having an impact on rainfall, with a succession of drought years in our study area. The aim of this research is to highlight the role of the Ain Kwachia dam located on the Khellata river in terms of the storage of surface water from rainfall, by quantifying the surface area occupied by its water using satellite images obtained from remote sensing, and mapping the evolution of the dam using a GIS geographic information system over the period from 2013 to 2023. The results show that this structure has made it possible to store rainwater, with an increase of 65.22% in 2022 and 43.80% in 2023.

1. INTRODUCTION

The situation of water resources is under discussion, with a serious state of decline in terms of quantities at surface level as well as underground. This reality of water resources is due to several factors, namely climatic in terms of global warming (Wang et al. 2024), (Jiang et al. 2024), (Wu et al. 2024) as well as anthropogenic with the excessive use of water resources in economic activities during the production chain (Elfoul et Ghachi 2018). Faced with this particular hydrological situation in terms of dwindling freshwater resources, as well as water scarcity, short-term mitigation and medium- to long-term adaptation (Ongoma et al. 2024) measures remain necessary to ensure the sustainability of water resources (Hekmatnia et al. 2023), (Sherif et al. 2023), and of course environmental stability, as well as the biodiversity of ecosystems, and to combat water vulnerability. The water resources situation in countries with climates tending towards aridity, especially those located in the 30-degree part of the northern hemisphere and in the southern hemisphere, i.e., north and south of the equatorial line, respectively, as is the case on the Asian continent (Chen et al. 2024), also that the African continent, especially the Mediterranean area (Villani et al. 2024), as well as the South American continent (Garreaud et al. 2009).

In the Moroccan context, the water situation is in deficit after a succession of drought years (Thi et al. 2023), following climate change and its impact on the whole country, in addition to the dominance of arid climatic stages (Boutallaka et al. 2024). This is also the case for the Ykem watershed located to the north-west of Morocco's central plateau (Gramz et al. 2024), an area characterized by a homogeneous topography in terms of heights varying between 200 m and 400 m, over a considerable length between the Atlantic coastal dunes to the north and the intermediate part of the central plateau to the south. Economic activities in this area revolve around the irrigated agricultural sector, the case of farms also raising poultry, in addition to that of industry in terms of factories manufacturing nutrients