Chapter 6
Integration of Remote Sensing and GIS for Optimal Site Selection of Dams in Arid to Semi-Arid Environments:
A Case Study of the Rheraya Basin and Enhancement of the Empirical Model With the Curve Number Model

Fatima Ezzahra El Ghazali
https://orcid.org/0000-0002-1980-3028
Cadi Ayyad University, Marrakech, Morocco

Abdellah Khouz
Higher School of Technology Essaouira, Cadi Ayyad University, Marrakech, Morocco

ABSTRACT

This chapter is dedicated to presenting the optimization method employed, which primarily utilizes the functionalities provided by GIS (geographic information systems) and remote sensing for data structuring, cross-referencing information layers, and spatial analysis across various themes. It incorporates a multicriteria hierarchical analysis approach, enabling the integration of multiple decision criteria into a unified model. This approach involves conducting comparative evaluations of each pair of

DOI: 10.4018/979-8-3693-9651-3.ch006

criteria and calculating their weights for the comparative assessment of each pair of options concerning each sub-criterion. Both methods employed showcase a robust multicriteria decision support tool. It is noteworthy that ensuring the validity of the SCS-CN procedure necessitates the incorporation of other supply models to enhance the accuracy of determining suitable locations for water accumulation structures.

I. INTRODUCTION

Surface runoff is influenced by several factors such as the duration and intensity of precipitation, soil type, land use, vegetation cover, slope, and the density of the hydrographic network (Faregh and Benkhaled 2016). Generally, significant runoff originates in a natural watershed. This watershed, which is an extremely heterogeneous and complex physical system, converts precipitation into flow in rivers and channels towards outlets, often urban areas (Brooks et al. 2003).

In studies on urban flooding caused by intense precipitation, the production function often simplifies to a runoff coefficient because the volume of water runoff affected by initial losses is negligible compared to the total volume (Brooks et al. 2003).

Global water demand, especially in developing countries like Morocco, is increasing due to population growth, rapid urbanization, climate change, and agricultural techniques and crop patterns that consume a lot of water(Abdelmajid et al. 2021). In this case, the production function is more complex due to environmental heterogeneity. The volume of water from the natural watershed is greater than that produced within the city, and estimating it is one of the challenges. Water scarcity tends to be a universal problem, with many regions suffering from severe water shortages (Malik et al. 2020).

The Haouz plain faces high demand for managing and supplying water resources. Water accessibility in this region is typically tied to heavy intensities and short periods of precipitation. (Ouassanouan et al. 2022) Generally, arid regions are characterized by irregular distribution of precipitation in terms of location and time, high temperatures, evaporation, and a lack of groundwater and surface water resources (Musy and Higy 2004). Water scarcity in the Haouz plain is the primary concern limiting water management and planning (Bzioui 2004).