



APPLICATION OF GIS AND MULTICRITERIA DECISION MAKING IN SUPPORT OF EARTH-FILL DAM DESIGN

By

Ranim Bahjat Jamel Al Jubaely

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
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in
Irrigation and Hydraulics
Engineering

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Title of Thesis:

APPLICATION OF GIS AND MULTICRITERIA DECISION MAKING IN SUPPORT OF
EARTH-FILL DAM DESIGN

Key Words:

Dam site selection; Geographic Information System (GIS) ; Analytical Hierarchy Process (AHP) ; and Ordered Weighted Averaging (OWA) ; MCDM.

Summary:

First step of dam design in general is the selection of the most suitable site for dam construction, which is considered as a multi-faceted challenge. The main objective of this study is to develop a multi-criteria decision algorithm capable of selecting the optimum dam site and its main specifications when planning to design dams taking into consideration all available data in a short time and with high flexibility. The algorithm is composed of three stages of analysis. The first stage is to generate a suitability map for dam site inside the entire study area while the second stage is designed to select the most suitable location of the proposed dam among the highly suitable sites found in the first stage, the third stage is the design of the dam cross section.. To achieve this framework, a GIS-based MCDM tool for dam site selection is developed as a toolbar in ArcGIS9.3 environment. This tool would simplify and facilitate the decision of dam site selection. The developed tool provides several scenarios of dam site based on the parameters considered during the analysis. The developed tool provides the use of (integration AHP-OWA) method, which is used to the first time in dam site selection. The developed tool is applied to Kabeer Sheemaly River, Syria as a case study to determine the potential earth dam sites. The study showed that the linguistic quantifier “At least one” is suggested to be used when the decision maker has high experience in dam site selection, while the linguistic quantifier “All” is suggested to be used in other cases.

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