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Integrated water resources management (IWRM) using GIS

A Thesis Submitted for the Partial Fulfillment of the
Master Degree
Civil Engineering - Irrigation & Hydraulics [2010]

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STATEMENT

This thesis is submitted to the Irrigation and Hydraulics Department, Faculty of Engineering, Ain Shams University in the partial fulfillment of the requirements for the Degree of Master in Civil Engineering.

The work in this thesis was carried out in the Irrigation and Hydraulics Department, Faculty of Engineering, Ain Shams University from 2004 to 2010.

No part of this thesis has been submitted for a degree or a qualification at any other university or institution.

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Abstract

The view that wetlands are wastelands, resulting from ignorance or misunderstanding of the value of the goods and services available, has led to their conversion to intensive agricultural, industrial or residential uses. Wetlands may also be lost by pollution, waste disposal, mining or groundwater. Therefore there is a need to conserve and manage wetlands to retain their importance and their economic values.

The aim of this study is to develop an environmental assessment and conservation of wetland using GIS, and understanding the impact of human interventions on wetlands loss, pollution and degradation.

Assessment of wetland requires assessment of the activities take place both within a wetland and in the surrounding catchments. One of the most important assessment factors is the allocation of sufficient water of an adequate quality to maintain the desired wetland functions.

This thesis takes Burullus lagoon as a case study. Burullus is the second largest lake and most productive wetland in the Egyptian Nile Delta and considered among the most important wetlands in the Mediterranean region, also classified from Ramsar as one of wetlands of international Importance. Burullus lagoon is facing problems due to increasing pollution pressure on it.

The spatial distribution of water quality parameters were largely mapped by geostatistical methods, comparing the values with the water quality guidelines help to determine the severe parameter and their pollution impacts on wetlands ecosystem. The use of the GIS provides a successful method to visualize the reality. It helps to better understand the system relations and therefore improve the decision making process.

The analysis manifested that the eastern and southern parts of the lake has high values than the western part for most of the quality parameters (TS,EC, TDS, Total Hardness, Ca, Mg, Cl, Na, So4, COD, and Cu) , this is due to agricultural runoff, leaching of soil contamination as most of agriculture lands located on the east side of the lagoon and due to point source water pollution discharge from industrial as the industrial zone located at the south.

It can be concluded that lake suffers from degradation in water quality as it highly affected by the drainage water, this is also gives a justification for the trend change between 2002 and 2008. This degradation in water quality could cause most types of wetland pollution (eutriphication, acidity, salinization, sedimentation…ect). This situation is completely not suitable for a conserved area like Burullus lake.

As a result for this fact, control action need to be taken to insure that the drainage are compliance with the guideline values in order to keep the lake safe, and to preserve the socioeconomic and ecological benefits of the lake water that could bring in particular to the inhabitants of the catchment and the potential positive impacts on the country in general.

Keywords:
Wetland, GIS, geostatistical analysis, water pollution.

Acknowledgements

I would like to thank my supervisors **Dr. Iman Elazizy**, Professor of Hydraulics, Ain Shams University, for her continuous guidance, expert advice and valuable suggestions that greatly enriched this work.

I am deeply grateful to **Dr. Hoda Soussa,** Associate Professor of Hydraulics, Ain Shams University, for all her support in my entire study, sincere advice and encouragement.

Special thanks to IHE for their help, Dr. Sherif M. El-Sayed, Eng. Amal Azab, who facilitate collecting the data, providing me with the needed field equipment and facilitate the variables lab analysis in the IHE laboratory, Eng. Al- Sayed Ibrahim who provides me with intensive data about Burullus lagoon (Area description and 2002 lagoon water quality data), and all people who joined me in my field trip and helped me in collecting the data.

Finally my sincerest gratitude goes to my parents for their prayer and continuous support.

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