INTEGRATING REMOTE SENSING, GIS AND MATHEMATICAL MODELLING FOR SURFACE WATER QUALITY MANAGEMENT IN AN IRRIGATED WATERSHED

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Major problems affecting the water quality of rivers, streams and lakes vary according to the specific situations. Problems may arise from inadequately treated sewage, poor land use practices, inadequate controls on the discharges of industrial waste waters, uncontrolled poor agricultural practices, excessive use of fertilizers, and a lack of integrated watershed management. The effects of these problems create threatened ecosystems, public health risks, erosion and sedimentation, leading to land and water resources degradation. Many of these negative effects may have arisen from environmentally destructive development, rapidly growing urbanization, increasing population, lack of information sources on the situation regarding water quality and the lack of public awareness and education on the protection of water resources. Irrigated agricultural watersheds are an example of watersheds facing such problems and suffering from pollution and water quality problems.

The assessment of surface water quality on a watershed scale, involves the examination of all activities in the watershed for their possible effects on the existing water bodies. Irrigated watersheds are of complex physical nature in that they include interacting irrigation and drainage networks which may be connected to lakes or lagoons. Studying surface water quality problems in such watersheds for better management practices calls for a reassessment and integration of information technology tools designed to support the management process. Water quality models are considered key elements in understanding water quality problems and are main components in management and decision support systems. Models are now becoming very advanced in describing the dynamics of the aquatic environment and can produce a considerable amount of data, which can be difficult to appreciate. The problem that often arises is the most efficient way of presenting those data in their geographical context. On the other hand, the geographical processing of environmental information is equally developed and many advanced Geographical Information Systems (GIS) are now available. Remote sensing techniques have also shown through different studies good potential for mapping and monitoring a number of water quality parameters.

Therefore the integration between mathematical modelling, GIS and remote sensing applications could provide a powerful tool for management and decision making process

related to surface water quality problems. This paper aims to contribute to the field of surface water quality management through integrating physically based water quality mathematical models with the spatial capabilities of GIS and the spatial and temporal capabilities of remote sensing to develop an integrated water quality management information system that is applicable to irrigated watersheds. Edko drainage catchment and lake system in the western Egyptian Nile Delta is chosen as a pilot watershed for application of the proposed system.

Keywords: Surface water quality management; GIS; Remote Sensing; Mathematical modelling; Information systems; Irrigated agricultural watersheds.