

Chapter 3.12

Using Geographic Information System to Infollow the Fertilizers Pollution Migration

Gehan A.H. Sallam

National Water Research Center, Egypt

Tahani Youssef

Helwan University, Egypt

Mohamed El-Sayed Embaby

National Water Research Center, Egypt

Fatma Shaltot

Helwan University, Egypt

ABSTRACT

In recent years, many countries have faced great challenges due to their limited water resources. According to these challenges, they have undertaken large scale projects to reuse agricultural drainage water in irrigation purpose. The Governments in these countries can enhance water management and sustainable development by adopting policies that enable them to meet water demands and supply management. Therefore, there is a need for unconventional methods to provide better tools for the assessment and management of water quality problems to adopt management policies and set the limits for sustainable drainage water reuse.

The implementation of Geographic Information System (GIS) in this field offers an ideal tool for measurements with limited number of sampled points. Statistical analysis that can be provided within GIS is rapidly becoming an impressive tool for statistical analysis of continuous data. The main objective of this chapter is to discuss using GIS to in-follow the pollution caused by fertilizers migration to the water and the soil by applying statistical analysis within the GIS using geostatistical analyst. Geostatistical analyst is an extension of Arc Map™ that bridges the gap between geostatistics and GIS and provides a powerful collection of tools for the management and visualization of spatial data by applying Spatial Statistics.

DOI: 10.4018/978-1-60960-472-1.ch312

INTRODUCTION

Water is one of the most important inputs of economic development. Water management has been identified as one of the elements of sustainable development. Size, type, and location of the economic activities depend on the nature, quantity, quality, and location of the available water resources. In arid and semi arid regions limited water supply constraints economic activity. National governments can enhance economic growth and development by adopting policies that enable water demands management in addition to water supply management to overcome water scarcity.

Hydroinformatics is a branch of Informatics which concentrates on the application of information and communications technologies (ICTs) in addressing the increasingly serious problems of the equitable and efficient use of water for many different purposes. Growing out of the earlier discipline of computational hydraulics, the numerical simulation of water flows and related processes remains a mainstay of hydroinformatics, which encourages a focus not only on the technology but on its application in a social context. On the technical side, in addition to computational hydraulics, hydroinformatics has a strong interest in the use of techniques originating in the so-called artificial intelligence community, such as artificial neural networks or recently support vector machines and genetic programming. These might be used with large collections of observed data for the purpose of data mining for knowledge discovery, or with data generated from an existing, physically based model in order to generate a computationally efficient emulator of that model for some purpose.

Hydroinformatics recognises the inherently social nature of the problems of water management and of decision making processes, and strives to understand the social processes by which technologies are brought into use. Since the problems of water management are most severe in the majority world, while the resources to obtain and develop technological solutions are concentrated in the

hands of the minority, the need to examine these social processes are particularly acute.

Hydroinformatics draws on and integrates hydraulics, hydrology, environmental engineering and many other disciplines. It sees application at all points in the water cycle from atmosphere to ocean and in artificial interventions in that cycle such as urban drainage and water supply systems. It provides support for decision making at all levels from governance and policy through management to operations.

Arid and semi arid regions are facing great challenges due to their limited water resources compared to the expanded water demands. The demand for water in agriculture, industry, and municipal purposes has been increasing due to population growth and increase of income. The agricultural sector is the largest consumer of water. The increasing demands for food production require more attention to be given for reclamation and cultivation of more agricultural areas. Consequently, the irrigation water consumption increased. This increase was made available by increasing in drainage water reuse and groundwater abstraction. Therefore, governments have undertaken large scale projects to reuse agricultural drainage water in irrigation. The agricultural drainage water is one of the most feasible resources of reuse because it is relatively of good quality and has nearly no environmental impacts in comparison to other resources such as sewage water.

Taking into consideration the environmental aspects of drainage water reuse, diffuse pollution of water resources from agricultural sources (agrochemicals) is a major environmental issue. Agrochemicals are usually introduced to increase the crop productivity or to resist herbs and insects. Highly productive lands receive large applications of fertilizers, pesticides, and organic amendments. Part of these additions could be reached by irrigation water into the drainage water as water flows over land surface and passes through the plant root zone. Therefore, they are regarded as potential source of environmental pollution. In addition

21 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/using-geographic-information-system-infollow/51718

Related Content

Challenges of Waste Management in a Developing Context: Lessons From Lebanon

Mutasem El-Fadel and Amani Maalouf (2020). *Sustainable Waste Management Challenges in Developing Countries* (pp. 166-185).

www.irma-international.org/chapter/challenges-of-waste-management-in-a-developing-context/240076

A Strategy for Estimating Nutrient Concentrations Using Remote Sensing Datasets and Hydrological Modeling

Vladimir J. Alarcon and William H. McAnally (2012). *International Journal of Agricultural and Environmental Information Systems* (pp. 1-13).

www.irma-international.org/article/strategy-estimating-nutrient-concentrations-using/62062

Numerical Simulation of Seismic Interaction of Pile Foundation and Structure

Pavan Kumar Emani, Janaki Rama Raju Patchamatla, Shashank Kothari, Ritesh Kumar and Vedula Srinivasa Phanikanth (2019). *Recent Challenges and Advances in Geotechnical Earthquake Engineering* (pp. 141-167).

www.irma-international.org/chapter/numerical-simulation-of-seismic-interaction-of-pile-foundation-and-structure/210248

Supporting Decision for Environment-Friendly Practices in the Agri-Food Sector: When Argumentation and System Dynamics Simulation Complete Each Other

Rallou Thomopoulos, Bernard Moulin and Laurent Bedoussac (2018). *International Journal of Agricultural and Environmental Information Systems* (pp. 1-21).

www.irma-international.org/article/supporting-decision-for-environment-friendly-practices-in-the-agri-food-sector/207752

Internet of Things-Enabled Crop Growth Monitoring System for Smart Agriculture

Hongyu Hu, Zheng Chen and Peng Wen Wu (2021). *International Journal of Agricultural and Environmental Information Systems* (pp. 30-48).

www.irma-international.org/article/internet-of-things-enabled-crop-growth-monitoring-system-for-smart-agriculture/275241