

Representation of uncertainties in spatial modelling of decision processes in integrated water resources management

ANA CRISTINA S. SILVA, CARLOS O. GALVAO, IANA A. A. RUFINO, JANIRO C. REGO & J. PATROCINIO TOMAZ ALBUQUERQUE

Dept of Civil Engineering, Federal University of Campina Grande, CP 505, Campina Grande, PB, 58.100-971, Brazil
galvao@dec.ufcg.edu.br

Abstract This work presents a spatial modelling of a decision-making process in water management, which considers the associated uncertainties. The case under study is a coastal area in a rapid process of urbanization in Northeast Brazil. Groundwater is exploited for municipal supply and for controlling aquifer levels, so that flooding is minimized. The decision variables are the location and discharge of extraction wells, subject to flow restrictions related to contamination sources from surface and saline intrusion from the ocean. Subjective data and associated uncertainties were handled using Fuzzy Logic: public opinion on preferred areas in which to minimize flood risk, and expert opinion on contamination of groundwater. A groundwater flow numerical model simulated the impact of management alternatives on the aquifer, and Monte Carlo simulation was applied to the characterization of its parameter uncertainty. The approach was successfully implemented in a geographical information system.

Key words uncertainty; decision making; flooding; groundwater; Monte Carlo; Fuzzy Logic; GIS; Brazil