

Characterizing the multi-criteria parameters of an integrated water management model for the Annaba region, Algeria

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Abstract Sustainable water resources management in the Annaba region of Algeria is a complex challenge which requires a new approach if management is to have a sound scientific basis for optimizing and conserving precious and scarce water resources. Increased water demand from population and economic growth, environmental needs, land-use change, urbanization, over-abstraction from aquifers, deterioration of water quality, pollution from local and diffuse sources, water infrastructure hotspots and impacts on public health and ecosystems, are all factors that will continue to create severe water shortage problems. In this research, a new conceptual integrated water-management model has been developed, based on cause-effect relationships. The Driver-Pressure-State-Impact-Response was selected as a well-established framework to allocate the possible variables into five categories: namely socio-economic; pollution pressures; water quality; impacts; and management responses. The effective variables have been characterized and prioritized using multi-criteria analysis with artificial neural networks (ANN), risk assessment techniques and expert opinion and judgment. The selected variables were classified and organized using the multivariate techniques of cluster analysis, factor analysis, principal components and classification analysis. It was concluded that no single measure will be able to solve the water problems in the Annaba region. Rather, a combination of these measures is needed to ensure water availability, suitability, sustainability and security.

Key words ANN; expert opinion and judgment; Annaba region; groundwater; integrated water management model; pollution pressures; public health and ecological impacts; socio-economic driving forces; state of water quality