



Decision-making and stakeholders' constructive participation in environmental projects[☆]



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ABSTRACT

Integrated water resources management means making decisions and taking actions while focusing on how managing water. This study identifies the stakeholders participating in decision-making process of Jumilla-Villena aquifer (SE Spain), their objectives, and alternative actions that stakeholders should consider in the public participation project. If the system achieves the good quantitative groundwater status in the context of the EU Water Framework Directive (WFD), future scenarios regarding pumping strategies may arise. These future scenarios will lead to different environmental impacts and socio-economic development of the region, and hence, to a different acceptance degree between stakeholders. This study establishes the foundations to perform a public participation project and contributes to define the best management policies for the groundwater system.

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1. Introduction

Integrated water resources management involves technical, scientific, political, legislative, and organizational aspects of water system. Water resources management suffers from continual and growing pressures (Perez-Pineda & Quintanilla-Armijo, 2013). These pressures on water resources derive from reasons such as human activity, population growth, living standards increase, land-use and climate changes, growing competition for water, and pollution from industrial, municipal, and agricultural sources. The WCED (1987) define sustainability according to these reasons.

Aquifer over-exploitation may lead to water level drawdown (i.e., abstraction cost increase), progressive water quality deterioration (e.g., soil salinization), ecological damage (e.g., rivers and springs flow decrease), and subsidence and landslide processes (Bacchus, 2000). The EU Water Framework Directive (WFD) requires member states to “protect, enhance and restore all bodies of groundwater” to reach a good (quantitative and chemical) groundwater status by 2015 (EC, 2000). The Groundwater Directive (GWD) encourages the identification and disposal of any significant pollutant concentration (EC, 2006).

The WFD also recognizes economics' role in reaching the environmental and ecological objectives. Won-Suk, Dong-Eun, and Jae-ho

(2014) indicate the necessary balance between environmental damage costs (which are not readily assessable) and water benefits of the water for region's sustainable socio-economic development. Different policy instruments for groundwater management can cope with present and future situations (water pricing, quotas, water abstraction taxes, pollution taxes, subsidies, tradable permits, or groundwater banking). The final goal is to combine existing regulations, institutional capability, social acceptability, stakeholder involvement, and political will.

However, because of the complexity of interactions between economic, agronomic and hydrologic systems, the stochastic nature of some factors (e.g. climate, soil, topographic conditions, etc.), and to the lack of knowledge, the consequences of management practices recommended by the authorities are difficult to predict accurately. Despite these facts, numerical simulation models—which may explicitly take into account the biophysics of the aquifer, and integrate its socio-economic characterization—can help in both the decision-making process and the uncertainty assessment.

The Jumilla-Villena aquifer (SE Spain), officially over-exploited, provides the scenario for this study. A calibrated groundwater flow model (which considers physical processes in the aquifer) generates different scenarios regarding future pumping strategies. These scenarios will show different environmental impacts and region's socio-economic development, and hence, a different degree of acceptance by stakeholders. This study identifies the stakeholders, the objectives according to the WFD, and the alternative actions to take into consideration in a public participation project. This study establishes the foundations to perform a public participation project and contributes to define the best management policies for the groundwater system. Furthermore, a

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