

**Short and long term coastal aquifer comprehensive vulnerability mapping. The ACVM method a valuable tool for groundwater managing plan.
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Coastal aquifers are subject to contamination from both land-based pollution sources due to human activities and sea salt water intrusion if an hydraulic connection with the sea is present. So coastal aquifers may be vulnerable to the threat of contamination from human land-based activities (vertical vulnerability) and salt water intrusion from the sea (horizontal vulnerability). Furthermore, coastal aquifers are vulnerable to climate change, and in fact a modest increase in sea levels can result in significant negative impact on groundwater quality. Therefore, the goal of this study was to create a method able in describing all aspects of aquifer vulnerability using a single parameter. This new method called ACVM (Aquifer Comprehensive Vulnerability Mapping) was invented, developed and applied in the Ghar El Melh coastal aquifer in Tunisia, in the context of the GEF UNEP-MAP Strategic Partnership for the Mediterranean Sea Large Marine Ecosystem (UNESCO-IHP Sub-component 1.1 on "Management of Coastal Aquifers and Groundwater"). The Ghar El Melh coastal aquifer is a multilayer aquifer in hydraulic connection with the sea, making it susceptible to the phenomenon of salt water intrusion. In this area a short and a long term vulnerability map were carried out applying the ACVM method. The short term vulnerability map considers the land-based activities (vertical vulnerability) and salt water intrusion from the sea (horizontal vulnerability) like external threats that can induce degradation of groundwater quality. While the long term vulnerability map also considers the 'groundwater vulnerability to sea level rise'. These two maps show the combination of the considered components of aquifer vulnerability using only one parameter called comprehensive vulnerability. Consequently they can be a valuable resource for land use management, since it is possible to translate this parameter into management recommendations for the short and long term. The ACVM method establishes a new conceptual approach to evaluating aquifer vulnerability and could be replicated at other coastal aquifers to demonstrate its potential for widespread use.

