ASSESSMENT OF SEAWATER INTRUSION AND GROUNDWATER QUALITY IN THE ANTHROPIZED RECLAMATION AREA OF ARBOREA (W SARDINIA)

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Groundwater represents an important very sensitive natural resource exploited for human consumption, agricultural and industrial activities. In Mediterranean area, one of the common environmental hazard for groundwater, that may affect coastal aquifers, especially in agricultural areas, is represented by the phenomenon of seawater intrusion. The intensive use of groundwater resources for the agricultural practices and for irrigation may generate the deterioration of groundwater quality, in the areas particularly vulnerable to seawater intrusion. Such phenomenon is one of the major problems in Sardinian coastal aquifers (Italy). In particular, it has been detected in the reclamation area of Arborea plain (west Sardinia) where intensive agriculture and dairy farming are the mainstays of the local economy.
In this research SINTACS and GALDIT vulnerability indexes and the numerical model for simulating groundwater flow have been applied for evaluating respectively the intrinsic vulnerability to pollution, seawater intrusion and groundwater flow for a typical Mediterranean phreatic alluvial aquifer such as Arborea plain aquifer. All these three methods have been applied under variable hydrogeological conditions in different research periods (2007 and 2015). All parameters used for this vulnerability assessment were prepared, classified, weighted and integrated in a GIS environment.
Results show that the vulnerability to contamination of groundwater obtained by solving the SINTACS equation has a range from very high vulnerability to low. The vulnerability map indicates that the zones which are most vulnerable to groundwater pollution are located in the coast North-West of the plain (where on the sandy land there is very low protection for the groundwater). In these areas the geology is formed by alternating layers of clay and limestone. The area with the lowest value of vulnerability is located in the South West coastal shores and small claimed areas where the clay matrix forms a protection against the groundwater pollution. The other part of the area, where the soil is characterized by alternating layers of gravel and sand is highly vulnerable to pollution. As concerns the application of GALDIT vulnerability index the results obtained show that in the studied area the range of the vulnerability to seawater intrusion is from very high to moderate, there are no areas that are not affected by this phenomenon. The numerical simulation results shows that the trend of the flow lines have direction East-West and especially in the coastal area confirm the results obtained with the two parametric methods. In fact, the piezometric head in this area results zero or above the sea level even if the aquifer depth is remarkable. In conclusion the application of SINTACS and GALDIT vulnerability indexes and flux numerical models may offer a valuable contribution to the team of existing tools in the field of seawater intrusion and groundwater quality modelling by allowing to punctually monitor the progressive degradation of groundwater resources in

coastal areas and then to identify action plans aimed at informing and training farmers end users of the groundwater resources in much better management.