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Coastal Aquifers Management in Algarve – Portugal

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In the Algarve region there are 17 karstic / porous aquifers systems, 7 located along the coast, in direct contact with the sea. These coastal aquifers, are located in the most densely populated area of Algarve, especially in the summer, and consequently with a higher pressure of water consumption. From the 70's on, with the tourist and agricultural development, there was a groundwater quality degradation (with increased chlorides and nitrates concentrations in some aquifers systems). The human consumption and agriculture are the major consumers of water, and the agricultural represents about 80% of the total consumption. The high extractions of water in coastal aquifer causes an advance of saline wedge towards the mainland. This is accentuated in drought years (which occur frequently in the Algarve).

In order to protect coastal aquifers from saltwater intrusion, a band called Critical Area was created in the early 90's, near the Cotas, of variable width. The opening of new wells is not allowed except those that are intended to replace other existing or that will be used for human consumption, where there is no public water supply. This restriction affects various economic activities (agricultural, industrial and tourism).

Until the year 2000, groundwater was the only source for urban water supply and irrigation. After the construction of several dams, groundwater was replaced by surface water, leading to the shutdown of municipal groundwater wells. This represented a decrease in groundwater extractions of about 40 hm³. During this period there were also significant changes in the extent of irrigated agricultural areas.

The analysis of piezometric levels and some water quality indicators in the last 30 years as well as the review of the water balance of the various coastal aquifer systems, taking into account the reduction in extractions result of changes in land use (the classification of land use on different dates was made by photo interpretation and use of ArcGis [1] software), concluded that there was an increase in the amount of stored water and there was been an improvement of their quality and is limited to saltwater intrusion in restricted areas.

Given the high number of applications for authorization to opening new wells (mainly for agricultural use) in the coastal aquifers areas and their current favorable situation, we considered land use scenarios involving an increase of groundwater extraction, namely irrigated agricultural areas (for new installations), in order to determine the impact on the water balance of the various aquifers systems. The results of the simulations indicate that most of the coastal aquifer systems can support further groundwater extraction, within the area considered critical without compromising sustainability. This increase extractions should be controlled by strict monitoring of the quality and quantity of groundwater and subject to certain conditions.

References:

[1] Software ESRI, ArcGis versão10.1

