



## **Evaluation of golf courses water demand in southern of Portugal for the last three decades**

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Golf is an economic activity with a prominent position in the tourist-sport offer in the region of Algarve. Located in southern of Portugal, this region is the most suitable region for the growth of the golf industry. The climate is characterized by mild winters with slight rainfall and hot and dry summers. The region has an annual average temperature of 14°C and annual precipitation that rarely exceeds 500 mm year<sup>-1</sup>. Since most of the rainfall occurs concentrated in the winter, irrigation is needed during the remaining months of the year to meet the water demand from plants. A proper irrigation management will allow to optimize the use water, thus it constitutes a key issue for the sustainability of this activity in areas subjected to water scarcity. Currently, remote sensing provides the tools to assess the evolution of the greenish quality of the area in the golf courses. In this study, based on Landsat images, vegetation indices were calculated the Normalized Difference Vegetation Index (NDVI), for the spring and summer seasons during the last 30 years. For the same period, according the data collected from weather stations distributed in the region, maps of precipitation, temperature, solar radiation, relative humidity and wind were produced. According the current maintenance practices and irrigation cycles, maps of potential and real evapotranspiration and with basis on the water balance were calculated, and water deficit maps estimated. Upon crossing this information with the NDVI maps, trends were identified in the consumption of water for irrigation due to the growth of the occupied area by golf courses in the region of Algarve. Since drought problems tend to increase due to climate changes, it becomes relevant the need to conduct this study aiming the research of strategies to ensure the beneficial use of water on golf courses and other turfgrass areas.

Keywords: evapotranspiration, golf, irrigation, NDVI, water deficit