

**Application of remote sensing and geographic information systems in irrigation water management under water scarcity conditions in Fayoum, Egypt.**

**Journal of Environmental Management. 299 - 113683. (2021)**

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Article status

Shared with others outside the specialization –  
Published in international Journal

Impact Factor: **6.789**

**Abstract**

Egypt suffers from severe water scarcity, which affects the sustainability of agricultural production. Therefore, the sustainable use of available water resources under water scarcity requires the adoption of water allocation policies favoring conservative and efficient use. Water management with free satellite data and geographical information system modeling capabilities can be a valuable approach for optimizing the benefits from the available water resources to meet the requirements for agricultural lands. This study aims to (i) detect and evaluate changes in agricultural areas because of urbanization and reclamation activities using Landsat data in 1999, 2009, and 2019 and (ii) update the irrigation water demand by monitoring the seasonal changes of agricultural area based on normalized difference vegetation index. Water management of Fayoum Governorate in Egypt is characterized by a non-uniform distribution flow over its canals; thus, two pilot areas are selected.

The first site is the Sinnuris canal, the served areas of which represents the urbanization problem. The other site is the Gharaq canal, the served areas of which represents the urbanization and agricultural expansion situations. The results reveal that changes in agricultural areas considerably affect the uniformity of water management. Urbanization activities reduce the agricultural area by ~5.0% and 5.7% in Sinnuris and Gharaq served areas, respectively. However, the newly cultivated lands in Gharaq preserve an increase of 5.8% in the total agricultural area. The considerably changed water allocation strategies in these districts since Sinnuris has an excess of 1.5 m<sup>3</sup>/s of water supply, while the Gharaq area faced an irrigation shortage of 0.26 m<sup>3</sup>/s in 2019. As per the proposed approach, the decision-makers can readjust the water allocation plan to satisfy the water requirements for other demand areas.