

Sustaining irrigation water abstraction at the stressed Murzuq basin aquifer system in southwest Libya through mathematical modelling and optimisation

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Abstract The Murzuq aquifers system in Libya is solely relied upon for irrigation water supply to many large scale schemes such as the Irawan project. However, with no recharge expected because of the aridity in the basin, the aquifers are vulnerable to over-abstraction and significantly depressed piezometric surface. This paper documents the modelling and optimisation studies carried out on the Murzuq to investigate the long-term impacts of the water withdrawals for irrigating Irawan. The predictions of the mathematical model showed that under current agricultural practices, the piezometric surface of the aquifer will stabilise in the year 2030, with a maximum drawdown of 30 m at the centre of the wells-cluster serving the project. On the other hand, the optimisation results confirm that more water than needed is currently being abstracted; adherence to the pumping regime proposed by this study will enhance the long-term sustainability of the Murzuq.

Key words Murzuq basin; Irawan project; Libya; arid; groundwater; irrigation water; mathematical modelling; optimization