



## **Managed Aquifer Recharge Using Treated Wastewater: An Option to Manage a Coastal Aquifer In Oman For Better Domestic Water Supply**

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Arid countries, such as the Sultanate of Oman, are facing challenges of water shortages threatening economic development and social stability. Most of those countries are vulnerable to the potential adverse impacts of climate change, the most significant of which are increased average temperatures, less and more erratic precipitation, sea level rise, and desertification. The combined effect of existing adverse conditions and likely impacts of future climate change will make water management even more difficult than what it is today. Tremendous efforts have been devoted to augment the water resources.

Managed Aquifer Recharge (MAR) is practiced widely to store water during periods of surpluses and withdraw during deficits from an aquifer. In Muscat, there will be a surplus of >100,000 m<sup>3</sup>/day of TWW during winter months in the coming few years. The aquifer along the northern coast of Oman (Al-Khawd Aquifer) is conducive for MAR. Data show that TWW volumes will increase from 7.6 Mm<sup>3</sup> in 2003 to 70.9 Mm<sup>3</sup> in 2035 in Muscat city only.

This study assesses, using MODFLOW 2005 numerical code, the impact of MAR using TWW on better management of the Al-Khawd unconfined coastal aquifer for better urban water supply. Specifically, aiming to maximize withdrawals from the domestic wells with minimize adverse effect of seawater intrusion. The model operates under a number of constrains that minimize the loss to the sea and the injected TWW must not migrates upstream (due to developed mound) and reach the wellfields used for domestic supply. The hypothetical injection wells are located downstream the domestic wellfield zone. The results of different managerial scenarios show that MAR produces a hydraulic barrier that decelerates the seawater intrusion which allows higher abstraction of pristine water from the upstream part of the aquifer. MAR along with redistribution/relocation of public wells allows abstraction of 2 times the current abstraction rate (around 6 Mm<sup>3</sup>/year to 12 Mm<sup>3</sup>/year) without significantly deteriorating the aquifer water quality. The results suggests that the aquifer is capable to withstand further stresses when MAR is practiced allowing better utilization of the Al-Kawd aquifer especially during emergency events.

**Keywords:** Managed Aquifer Recharge, Oman, Climate Change, Treated Effluent, MODFLOW 2005.

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