

## A model study of desalination and hypersalinity of the Arabian Gulf

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### ABSTRACT

Desalinated seawater is indispensably required at all costs in the hot and arid climate of the Arabian Gulf countries of Kuwait, Saudi Arabia, Bahrain, Qatar and the United Arab Emirates to sustain and allow the continuing long-term socio-economic development. Building more seawater desalination plants and increasing water production rates appear to be the answer to satisfy the projected future water demands. On the other hand, the Arabian Gulf itself is a shallow semi-enclosed marginal sea and environmentally very fragile. Its water is naturally characterized by higher salinity due to an extremely high evaporation rate as a consequence of solar heating, and therefore any further loss of water by desalination plants operated along its coast would make the Arabian Gulf hypersaline. However, many scientists believe and state that the environmental impact of seawater desalination on the Arabian Gulf as a whole is negligible because natural evaporation is magnitudes higher. Using a simple mathematical model for a semi-enclosed sea of simple geometry, the role of natural evaporation and seawater desalination in the Arabian Gulf is formulated.

*Keywords:* Arabian Gulf; Evaporation; Hypersaline; Mathematical model; Seawater desalination; Semi-enclosed sea

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