

## Modelling saline groundwater pumping at the beach for reverse osmosis desalination in Qatar

Husam Baalousha<sup>1,2</sup>, F. Ramasomanana<sup>1</sup>

<sup>1</sup> Qatar Environment and Energy Research Institute (QEERI)

Hamad Bin Khalifa University (HBKU)

Doha, Qatar

<sup>2</sup>College of Science and Engineering, Hamad Bin Khalifa University (HBKU)

Doha, Qatar

### ABSTRACT

Qatar is an arid country, with limited water resources and little rainfall. The country relies on desalination of seawater to meet the increasing water demand for municipal and industrial needs, while the agricultural sector uses the precious fresh groundwater. Groundwater underneath Qatar is mostly saline or brackish with only small lenses of fresh water in the northern part of the country.

Desalination technology currently used in Qatar is based on thermally driven multi-stage flash (MSF) using direct water take from the sea as a feed. MSF consumes higher energy compared to reverse osmosis. The energy consumption of reverse osmosis is less than one third compared to MSF. However, the reverse osmosis requires pre-treatment when the seawater is directly used. To overcome the pre-treatment cost, beach wells can be used as a feed instead of direct seawater. The beach sand works as a filter and thus the input needs minimal pre-treatment. The challenge is the yield of beach wells, which should be enough to feed a large desalination plant. To investigate the yield and the effect of beach wells pumping on the groundwater system, the Sea Water Intrusion package (SWI2) in MODFLOW was used. The most suitable sites for beach wells were investigated, taking into consideration the maximum possible yield.

Model results show the maximum yield of wells at a depth of 100 meters is 16000 m<sup>3</sup> per km<sup>2</sup>. This quantity is good enough for a medium size reverse osmosis plant. Based on hydrogeological settings, the proposed location for the beach wells is near Al-Khor town on the eastern coast of Qatar, and to the north of it.

**Contact Information:** Husam Baalousha, Qatar Environment and Energy Research Institute, Hamad bin Khalifa University, Doha, Qatar. P O Box 34110  
Email:hbaalousha@hbku.edu.qa