

Leakage reduction in a city

City of Jeddah, Saudi Arabia

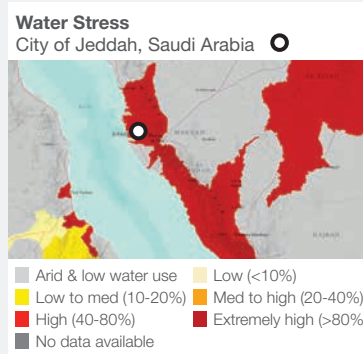
water scarcity impact

Reduced withdrawal	●
Reduced consumption	●
Improved water quality	
Increased productivity	●
Net basin benefit	●

volumetric impact
2 737 000m³/yr

capital cost
confidential

estimated unit cost of water
not available



Water Stress Map:
Gassert, F., M. Landis, M. Luck, P. Reig, and T. Shiao. 2013. "Aqueduct Global Maps 2.0."

Confidence level
● Low ● Medium ● High

Water Scarcity Impact Key
● Main ● Minor

Credits
We wish to acknowledge the input of Jawad Bhatti of i2O water and Diego Lucente and Philippe Charpentier of Suez Environment in the preparation of this case study.

Project Overview

The City of Jeddah is Saudi Arabia's largest city and has a population of 3.5 million. It has an annual rainfall of just 84mm. It is highly water stressed and depends upon desalination for the majority of its water supply. The production cost is estimated to be \$1.86/m³. Current demand is 1 200 000m³/day and this is forecast to increase to 20 000 000m³/day by 2029. The water supply system to the city is intermittent with extreme variations in pressure; on average there are 1 600 pipe repairs per month and levels of unaccounted for water are in the region of 40%, equivalent to \$892 000 worth of desalinated water per day. A ministerial target for unaccounted for water has been set at 10%.

In 2008 a joint venture of Acwa Power and Suez Environment were awarded a seven-year water services management contract under which a number of measures have been implemented to reduce unaccounted for water. This case study reports on successes achieved in the pilot phase of the implementation of pressure management and network management systems in a number of district zones.

Key Elements

- A management contract for the City of Jeddah was established in 2008 including service continuity key performance indicators.
- Network modifications were made to establish fifty one independent supply zones.
- Pilot stage 1: Implementation of Pressure Regulating Valves (PRVs) in sixteen district zones.
- Pilot stage 2: Installation of advanced automatic network pressure management and control systems for two of the sixteen district zones in which PRVs had been installed.

Key Outcomes

The Pilot stage resulted in:

- Water savings of 12% equivalent to a saving of 4 300m³/day.
- The number of leaks was reduced by 50%.
- Average zone pressure reduction of 1.5 bar.
- Rationing reduced enabling supply once a week.
- Expanded continuous service to 20% of customers.

The Pilot stage 2 resulted in:

- A further 10% decrease in leakage achieved, equivalent to 3 200m³/day of water loss savings.
- Additional average pressure decrease of 20%.
- The majority of water supply comes from desalination, thus it is assumed that leakage is a consumptive demand and lost to saline sources. A reduction in leakage therefore results in a reduction in consumptive demand.



City of Jeddah, Saudi Arabia

Intervention Features

- Municipal leakage detection and repair
- Pressure management in municipalities

Project Levers

(1) Establishment of pressure management zones:

In order to enable management of supply across the network 51 independent supply zones were established.

(2) Pilot Stage 1 - Pressure Regulating Valves and flow measurement:

Pressure Regulating Valves (PRVs) and flow meters were installed in 16 district zones. This allowed for a greater degree of network control by sustaining upstream pressure, reducing pressure inside the zones, and matching the flow into the zones with demand.

After the intervention the outcome in district zone HH was measured. The demand of the zone prior to installation of the PRVs was 36 400m³/day. After the PRVs were installed, this demand was reduced to 32 100m³/day, equating to a 12% water saving. The number of leaks was halved and the average pressure reduced by 1.5 bars. Furthermore, the implementation of PRVs to a non-continuous supply improved the supply of water from once in 24 days to once every 8 days, with 20% of customers receiving continuous service.

(3) Pilot Stage 2 - advanced pressure management:

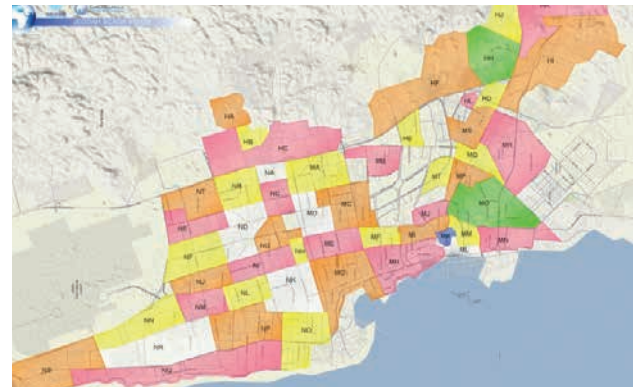
An i2O water advanced pressure management system was installed in two zones, managed from the central network control, with the zones operating under continuous supply.

The outcomes were almost immediate; in one zone water savings were achieved of approximately 3 200m³/day, this was accompanied with a 20% reduction in pressure and an estimated 40% reduction in pipe bursts.

Outcomes and Challenges

The interventions provided additional benefits beyond water savings, these include:

- Reduced operational staff requirements and operational costs through remote monitoring.
- Greater control and the ability to proactively manage supply zones.
- Reduced damage to infrastructure and greater asset life as a result of reduced pressures.
- Increased continuity of supply to customers.



Above: Network of 51 independent supply zones (© Suez Environment)



Above: Commercial centre Jeddah (© Aljadani | Dreamstime.com)