

Technology Fact Sheet for Adaptation

Desalinationⁱ

Technology:	Desalination
Technology characteristics	
Introduction	Desalination, desalinization, or desalinisation refers to any of several processes that remove some amount of salt and other minerals from water. Desalination involves removing the salt from water to make it drinkable. There are several ways to do it, and it is not a new idea at all. Sailors have been using solar evaporation to separate salt from sea water for at least several thousand years. Most of the world's 15000 or so desalination plants use distillation as the process, and there are also flash evaporation and electrodialysis methods. All these methods are very expensive, so historically desalination has only been used where other alternatives are also very expensive, such as desert cities. However, an exploding world demand for potable water has led to a lot of research and development in this field and a new, cheaper process has been developed that involves heating sea water and forcing it through membranes to remove the salt from the water. Even so, it is still more expensive than other alternatives, but it is indeed becoming more competitive. Mauritius is characterized by some 75 main coastal villages and about 112 three to give star hotels along the coasts with a total of 12,000 rooms. The potential of using desalinated water is high. In addition the drought season (October–March) coincides with peak season of hospitality industry. Hotels spend some MUR 90/m³ for purchase of water from the CWA through tanker services. The social perception that hotel water supply occurs at the expense of the coastal villages and this may lead to social conflict.
Technology characteristics/highlights	Desalination, which was so costly in the past that few considered it a reliable alternative to treating fresh water, has now become cost-effective and streamlined as a result of energy-efficient filtering technologies such as reverse osmosis. There is also a lot of interest in using local, brackish groundwaters as a source for desalination instead of ocean water. Such waters typically have only one-tenth the salinity of sea water, so desalination can be accomplished more easily and transportation is less of an issue.
Institutional and organizational requirements	Currently, in Mauritius some 7 hotels are already equipped with desalination plants, which they tend to operate specially during the dry periods of the year. In January 2011, the Government informed that it is currently working on a bill to encourage hotels and IRS projects to make provision for desalination plants. It was also pointed out that since 1999 when Mauritius was hit by a severe drought, the Government had insisted that all hotels should adopt a desalination policy. Since 2005, it is compulsory for all new hotels to make provision for desalination as well as for recycling and the reuse of water.
Operation and maintenance	Operating experience with reverse osmosis technology has improved over the past 15 years. Fewer plants have had long-term operational problems. Assuming that a properly designed and constructed unit is installed, the major operational elements associated with the use of RO technology will be the day-to-day monitoring of the system and a systematic program of preventive maintenance. Preventive maintenance includes instrument calibration, pump adjustment, chemical feed inspection and adjustment, leak detection and repair, and structural repair of the system on a planned schedule. The main operational concern related to the use of reverse osmosis units is fouling. Fouling is caused when membrane pores are clogged by salts or obstructed by suspended particulates. It limits the amount of water that can be treated before cleaning is required. Membrane fouling can be corrected by backwashing or cleaning (about every 4 months), and by replacement of the cartridge filter elements (about every 8 weeks). The lifetime of a membrane has been

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	reported to be 2 to 3 years, although, in the literature, higher lifespans have been reported. Operation, maintenance, and monitoring of RO plants require trained engineering staff. Staffing levels are approximately one person for a 200 m³/day plant, increasing to three persons for a 4 000 m³/day plant.
Endorsement by experts	Stress on existing water supplies expected to grow by 56% by 2050, and traditional sources aren't going to be able to meet the growing demand for water worldwide. Desalination is being selected in relatively wet locations in direct commercial competition with traditional water sources. Desalination is growing more rapidly globally than in the regions where it is perceived to be most used. Experts note that desalination is an important option which can be encouraged by Regulatory and Developmental Agencies.
Adequacy for current climate	Mauritius is an isolated island surrounded by the sea and tourism is one of the pillar of the economy. In additional the Government is encouraging hotels to adopt this technology.
Scale/Size of beneficiaries group	Hotels having more than 75 rooms need to provide for desalination facilities if they are located near the coast.
Disadvantages	Environmental impacts of the concentrated brine water.
Capital costs	
Cost to implement adaptation technology	The cost factors of desalting include capital costs and operating and maintenance costs. Costs can vary considerably from one locality to another based on a number of issues in general; the amount of salt to be removed greatly affects the cost of desalting plant operation. The more salts to be removed, the more expensive the desalting process capacity of the facility also impacts costs, with larger plants generally being more economical. A desalination plant operating at a capacity of about 360m³ per day would cost around MUR Rs. 14 million rupees. A plant operating at a capacity of 500 to 600 m³ per day would cost around MUR Rs. 27-30 million.
Additional cost to implement adaptation technology, compared to "business as usual"	Additional yearly cost for operation and maintenance would cost about MUR Rs. 3 million rupees for a 360m ³ per day capacity plant.
Development impacts, direct and indirect benefits	
Direct benefits	Water constantly available for use.
Reduction of vulnerability to climate change, indirect	Rainfall variability in time and pattern will not affect the smooth running of the organization.
Economic benefits, indirect Employment Growth & Investment	Creation of jobs with regards to implementation, operation and maintenance. Can create investments with regarding to the desalination units. Reduce public and private expenditures associated with water infrastructure.
Social benefits, indirect Income Education Health	Availability of water will not affect the clients and hence satisfaction of the service. Low level of capacity building to skilled workers. Increases per capita water availability. Lack of water can have serious health effects and allow for the spread of disease and illness if the reductions continue for even modest lengths of time.
Environmental benefits, indirect	Desalination process involves a byproduct which is not environmentally friendly. The impact can be reduced by diluting it before discarding.
Local context	
Opportunities and Barriers	The barriers are the cost implication, the need for skilled personnel and the impacts on aquifers due to seawater intrusion. The opportunity will be to look for the most economical way of implementing this technology

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	– such as a cluster of hotels.
Market potential	Opportunities for investment is high not only due to climate change but also due to the need for alternative water sources as the demand on the limited amount of freshwater is increasing over time.
Status	The technology is already being practiced by a few hotels located along the coastal zone.
Timeframe	Present in some areas, lacking in other. This will involve an assessment of the requirements of the hotel, setting up the appropriate infrastructure facilities, training skilled workers, importing the desalination unit, installing and commissioning.
Acceptability to local stakeholders	At the level of the stakeholders concerned, there will be a need to convince them as this will require some initial financial investments.

ⁱ This fact sheet has been extracted from TNA Report – Technology Needs Assessment Reports For Climate Change Adaptation – Mauritius. You can access the complete report from the TNA project website <http://tech-action.org/>