DESALINATION PROSPECTIVE IN THE ARAB REGION

POLICY BRIEF

المجلس العربي للمياه
Arab Water Council

United Nations Educational, Scientific and Cultural Organization
منظمة الأمم المتحدة للتربيـة والعلم والثقـافـة

Cairo Office
مكتب القاهرة

Key Messages

- Desalination stands as the most promising sector to supply high quality water resource. The GCC-countries currently have the highest concentration of desalination capacity worldwide. Many other Arab countries also have plans to develop and expand their desalination capacities for meeting the escalating municipal water demands.

- Expansion of desalination has been associated with enormous financial, economic and environmental costs. In particular, the currently adopted technology is energy-intensive and consumes a sizable portion of the energy resources production in the region.

- Implementing energy efficiency programs and diversifying energy resources in desalination would enhance the sustainability of desalination and would help mitigate its associated environmental negative impacts.

- Despite the increasing reliance in the region on desalination, its technology remains imported with limited added value to the countries' local economy. It is important to build local and regional knowledge hubs in desalination technologies.

- There is a dire need to develop national plans for using renewable energy in desalination and provide incentive for the development and adoption of energy saving technologies.

- Governments should provide incentives to attract private sector and provide legal and regularity framework to strengthen government's regulatory role and improve sector governance.

Context

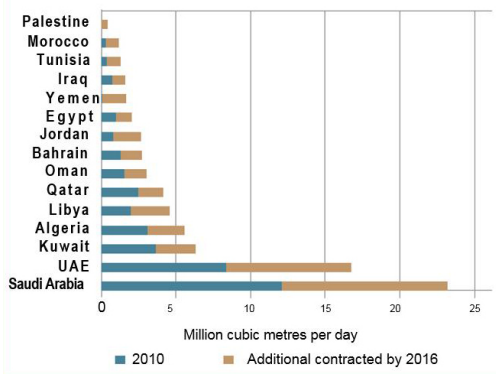
The role of desalination as a major source of domestic water supply will continue to increase in the Arab region due to population growth, urbanization, industrialization, and depletion of non-renewable groundwater resources. This policy brief outlines challenges, potentials and impacts in relation to desalination in the Arab region. The brief provides recommendations to meet the increasing demand for desalinated water; and to build necessary capacity and institutional structure. Economic and environmental issues are also addressed in relation to energy demands; and rejected water and brine impacts on marine life.

This effort is part of the mandate of the Arab Water Council and UNESCO to establish an Arab Regional Initiative in support of the non-conventional water resources (NCWR) development. The initiative will help mobilize the financial, legal and technical support required to adopt proper policies and build up appropriate structures and human capacities for the sustainable development of NCWR in the region, including desalination.

Trends in Desalination

Desalination of seawater has become a reliable method for water supply all over the world and has been practiced successfully for many decades and the technical and economic feasibility is well established. The worldwide desalination capacity has increased dramatically from around 35 million cubic meters daily in 2005 to about 80 million cubic meters daily in 2015, with the largest desalination plant of one million cubic meters per day at Ras AL-Khair project in Saudi Arabia.

Box 1. Accumulated Desalination Water in Selected Arab Countries in 2010 and 2016



With more than half the world's desalination capacity, the Arab region, particularly the GCC countries, lead the world in desalination. Although desalinated water contributes only a very small share of Arab countries' total water supply (1.8 %), it contributes nearly all the water supply for 70 % of cities in the Gulf countries. This share is expected to rise as groundwater resources continue to deteriorate.

Desalination plants in Arab countries have a cumulative capacity of about 36 million cubic meters a day in 2011. The highest desalination capacity is in the Gulf countries (81 %), Algeria (8.3 %), and Libya (4 %). Some countries, such as Jordan and Tunisia, desalinate brackish water at a low cost and promote it for domestic use. Arab countries total desalination capacity is expected to go up to 86 million cubic meter a day by 2025 with estimated investment of $38 billion, about 70% of it in the Gulf countries (UNDP 2013)

Potential and Challenges

Growth of desalination is expected to remain high for the next decade to meet escalating domestic water demand. Most of the anticipated increase in capacity will be concentrated in the region's high-income, energy-exporting countries, such as the Gulf countries, where it will be used to supply water to cities and industry.

Desalination is capital intensive and energy-intensive process, so energy efficiency should be a key criterion in commissioning new plants and upgrading old ones. Saudi Arabia, with 35 % of the Arab region's desalination capacity, uses 25 % of its oil and gas production to generate electricity and produce water. If water demand continues to grow at the current rate, this share will top 50 % by 2030.

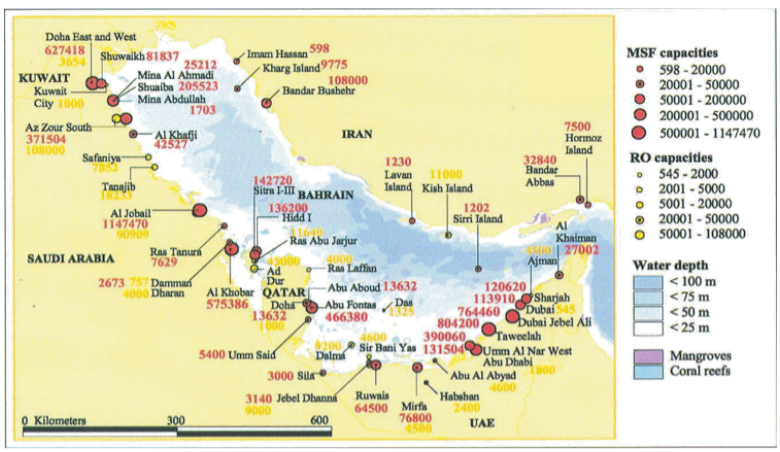
Costs per delivered cubic meter of desalinated water are as high as $1.50. Desalinated water is subsidized, however, and sold for as little as 4 cents per cubic meter in some Arab countries. With improvements in desalination technologies, production costs are dropping (see box 1). New technologies, such as reverse osmosis, electro dialysis and hybrids, are more energy efficient and better suited to different types of water. This downward trend in the cost of desalinated water indicates that desalination technology is becoming more viable for poorer countries.

Box 1. Desalination cost is dropping

Improved technologies, such as reverse osmosis, electrodialysis and hybrids, are more energy efficient and better suited to different types of water. These advances drove down global prices for multistage flash over 1999–2004, from an average of $1.0 per cubic meter to $0.50–$0.80. For reverse osmosis, the average cost of desalinated water is estimated at $0.99 per cubic meter for seawater and $0.20–$0.70 for brackish water.

Despite the many benefits the technology has to offer, concerns rise over potential negative impacts on the environment. New technologies have reduced some of these, but others remain such as the concentrates and chemical discharges to the marine environment, the emissions of air pollutants and the energy demand of the processes. The regional impacts of the water discharged from thermal desalination plants has not been studied in depth, raising concerns about the marine life and damage to the fragile marine ecosystem surrounding the Arab countries.

Despite having most of the world's desalination capacity, Arab countries devote little resources to research and development (R&D) and produce few products related to these technologies, which are all imported. In addition, the desalination industry contributes very limited added value in fabricating equipment, refurbishing plants, localizing op2erations and maintenance, manufacturing key spare parts and providing job opportunities for local labor.



Multi-stage flash (MSF) and reverse osmosis desalination in the Gulf, 2008
Source: UND 2013

The Way Forward

The large anticipated expansion in desalination plants requires a review of policies and practices, including ways to increase capacity, knowledge and value added to the local economy. In the Arab region, local capacity and knowledge focus on operations and maintenance, ignoring plant design, manufacturing and construction, even in countries that depend heavily on desalination to meet domestic water demand.

By designing incentives for local businesses, governments can attract local investments in manufacturing key desalination plant components and cultivating local innovations to attain economic sustainability. Government enterprises should value energy at world market prices and provide incentives for in-house R&D departments to promote innovations in technology and operation.

The energy requirements for desalination can be met through renewable sources, such as, solar power. Until recently, only small desalination plants in remote areas with no access to electricity from the grid used renewable energy. With its vast solar energy potential, developing solar-powered desalination technologies should be a top priority in Arab countries. R&D investments to identify optimal technical solutions and products for desalination and cogeneration powered by renewable energies can lower desalination costs and make it more sustainable.

The private sector could play a major role in building new desalination plants, increasing their efficiency and reducing their costs. Governments should provide incentives to attract the private sector and provide the legal and regularity framework to strengthen the governance and ensure sustainability of the sector.

Policy Recommendations

1. Enhanced Policies and Institutional Framework

a. Develop national plans for the use of renewable energy in desalination and provide incentive for the development and adoption of energy saving technologies.

b. Governments should provide incentives to attract private sector and provide legal and regularity framework to strengthen government's regulatory role and improve sector governance.

c. Develop a comprehensive environmental legislation related to desalination and provide incentives to reduce the carbon footprint as well as environmental impacts on the ecosystem

2. Capacity Building and Networking for Knowledge Sharing

a. Build regional capacity to design, manufacture, and construct desalination plants. This will help build local and regional knowledge in desalination technologies and provide value added to the economy. Incentive for hiring local and regional labor force will also enhance accumulated experiences.

b. Set-up extensive educational specializations and expand and support online self-training programs that offer technical and vocational training in desalination.

c. Develop of an "Arab portal desalination network" to exchange best experiences and technology development among institutions and experts working in desalination in the Arab region

For Further Reading

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