Seawater desalination

Challenge: Too little water **Adaptation response:** Alternative water sources

Description

Desalination of seawater is a process in which salt and other constituents are removed to produce pure water. The two most common forms of desalination are thermal treatment and membrane processes. Thermal treatment uses heat to evaporate the water, leaving behind the dissolved salts, or waste stream, and separating it from pure water. Membrane processes use reverse osmosis and high pressure to force saltwater through very fine, porous filters that retain the salts, leaving pure water on one side of the membrane and the waste stream on the other side.

Since a great majority of earth's water is found in the seas and oceans, desalination creates an opportunity for coastal communities to access virtually unlimited freshwater sources. In addition, desalination techniques can be used to purify brackish water in areas with seawater intrusion. In light of climate change adaptation, this is also a crucial resource for areas where existing freshwater resources can no longer support local populations or be rehabilitated to meet the freshwater demands.

Implementation

Seawater desalination is most effective when implemented in water sectors with strong water policies, well-defined water resource availabilities and demand, and strong technical expertise. In regards to budget and local demand for freshwater resources, there are several options for desalination plants, water purification approaches, and potential energy sources for desalination (e.g. alternative energy such as wind). The characteristics of the saltwater, such as salinity, temperature, general level of contamination, etc greatly influences the choice of technology. For example, membrane processes are more suited for brackish water, which typically has lower salt concentrations. Pre-treatment (e.g. micro filtering of algae from sea water) may be needed before starting the desalination processes, as along with advanced deposition processes for the waste stream (including cooling where necessary). Monitoring and environmental impact assessment should also be instituted, depending on plant size and waste disposal methods.

Environmental Benefits

- Reduces pressure on scarce surface or groundwater sources, preventing source degradation and promoting source diversification.

Socioeconomic Benefits

- Provides an alternative or supplementary source of freshwater water for potentially water stressed or arid areas.
- Provides safe drinking water due to the high quality of output water. It can also provide water for other sectors such as industries that need very pure water sources like pharmaceuticals.

Opportunities and Barriers

<u>Opportunities:</u>

- Technological advances are continuously reducing the economic and environmental impacts of desalination

- It provides climate change adaptation benefits in water scarce areas through water source diversification and reduced pressure on freshwater sources
- It has the potential to provide a near unlimited supply of water if sustainable energy utilization methods and safe discharge are deployed

<u>Barriers:</u>

- Disposal of the waste stream produced from desalination can have negative effects on the environment due to its high concentration of salts and traces of chemicals, though this is improving with recent technological advances
- Desalination techniques are relatively expensive and require a lot of energy, though there are increasing possibilities for using renewable energy, such as solar or wind-driven desalination coupling
- Developing countries, which often have the greatest freshwater needs, may not be able to use desalination, as the best opportunities for its implementation are in well-managed water sectors with clear water policies
- Optimal utilization requires training, regular maintenance and access to spare parts, which could be a limiting factor in remote and smaller communities

Implementation considerations*

Technological maturity:	3-4
Initial investment:	3-5
Operational costs:	3-5
Implementation timeframe:	2-3

* This adaptation technology brief includes a general assessment of four dimensions relating to implementation of the technology. It represents an indicative assessment scale of 1-5 as follows:
Technological maturity: 1 - in early stages of research and development, to 5 – fully mature and widely used
Initial investment: 1 – very low cost, to 5 – very high cost investment needed to implement technology
Operational costs: 1 – very low/no cost, to 5 – very high costs of operation and maintenance
Implementation timeframe: 1 – very quick to implement and reach desired capacity, to 5 – significant time investments needed to establish and/or reach full capacity
This assessment is to be used as an indication only and is to be seen as relative to the other technologies included in this guide. More specific costs and timelines are to be identified as relevant for the specific technology and geography.

Sources and further information

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