Technology Fact Sheet for Adaptation

Desalination of brackish water by reverse osmosis [i]

Technology Name: Desalination of brackish water by reverse osmosis

1. **Sector** – Water
2. **Technology characteristics**

2.1 Introduction

During a water scarcity, desalination can be used to produce fresh water from brackish water or sea water. In this technology, high pressure is applied to brackish water/sea water forcing water molecules to pass through a membrane while retaining salts and other larger molecules. This technology contributes to adaptation in following ways(1).

- Diversification of water supply by providing alternative or supplementary sources of water when current water resources is inadequate in quantity or quality
- Resilience to water quality degradation

2.2 Technology characteristics/Highlights

- High cost
- Advanced technology

2.3 Institutional/ organisational requirements

- It is necessary to determine freshwater resource potential, demand and consumption and then can decide on whether it is required to implement the desalination technology

3 Operations and maintenance

3.1 Endorsement by experts

3.1.1 Operations

- Pressure is used to drive water molecules across a membrane in a direction opposite to that they would naturally move due to osmotic pressure.
- Because osmotic pressure must be overcome, the energy needed to drive water molecules across the membrane is directly related to salt concentration.
- Therefore it is better to use brackish water having lower salt concentration, rather than using sea water.

3.1.2 Maintenance

- Technical capabilities are required
- Membranes have to be replaced

3.2 Adequacy for current climate

Negative consequences of the adaption option:

- Energy requirement is high and therefore GHG emissions will be high.
- Concentrated waste streams can cause negative impacts on ecosystems.

3.3 Size of beneficiaries groups

Areas where other safe water sources are not available

4 Costs

4.1 Cost to implement adaptation options

Combined units for desalination and disinfection are commercially available and it is reported that they can produce water for about $4 per 1m^3 from salt contaminated ground water[(2)].

Additional costs to implement adaptation option, compared to "business as usual"

- Cost for membranes and energy
- Additional cost is required when sea water is used instead brackish water

5 Development impacts , indirect benefits

Economic benefits

- **Employment** – Low
- **Investment -** High

Social benefits:

- **Income –** Low**;** This is an expensive technology
- **Education –** It is necessary to develop low-cost desalination methods.

Health

- High positive impact; Decrease in waterborne diseases

5.1 Environmental benefits

- High negative impact on surface water or ground water due to effect of concentrated waste streams
- Impact on flood forming – no impact
- Release of GHG – High; Reason - energy consumption for this process is very high

6 Local context

6.1 (i) Opportunities

- When fresh water resources are inadequate to meet the demand
- When abundant sources of brackish water are available
- When consumers do not like to reuse treated waste water

(ii) Barriers

- This is a high cost method.
- It is necessary to replace membranes
- Disposal of concentrated waste cause negative impact on the environment
- Green house gas emissions.

6.2 Status

Cost for providing treated pipe born water and water produce by reverse osmosis of brackish/sea water are Rs. 33/= and Rs.87/= respectively. (Capital cost for a desalination plant is very high and it is is not counted here). Due to high cost, at present the desalination plant in Hambantota is not in use. Certain desalination plants donated to Sri Lanka just after Tsunami are still in use.

6.3 Acceptability to local stake holders

Cost is high and as a result the demand for this technology is low.

7 References

(1) Technologies for climate change adaptation-The water sector; Mark Elliot, Andrew Armstrong, Josep Lobuglio and Jamie Bartram, UNEP, (ISBN 978-87-550-3902-5); 2011

(2) https://energypedia.info/index.php/Decentralized_drinking_water_supply

http://www.alibaba.com/product-gs/493951559/2m3_full_automatic_seawater_desalination_plant.html

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