

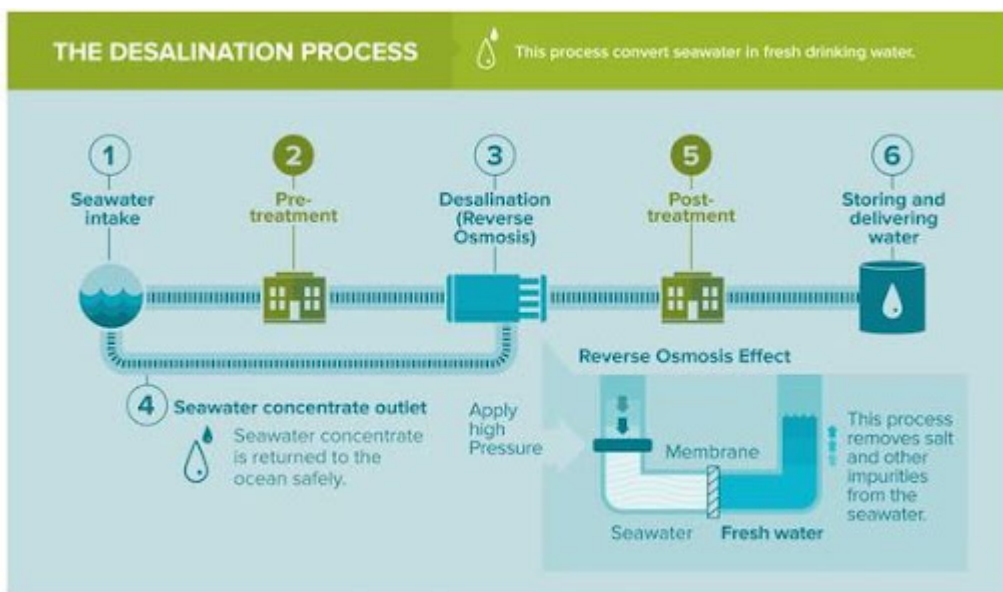
Ocean desalination as a solution to water crisis

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In news- Amid an 'imminent' global water crisis, the desalination of our oceans into drinking water has emerged as the ultimate means to drought-proof regions suffering water poverty.

About ocean desalination technology-

- The centuries-old concept uses **thermal distillation or a reverse osmosis membrane to separate salt from the sea.**
- The technique is now being utilized globally, with well over 20,000 desalination plants currently operating in over 170 countries – the 10 largest in Saudi Arabia, the United Arab Emirates (UAE) and Israel.



- **Around 47% of the world's desalinated water is produced in the Middle East and North Africa alone,** Manzoor Qadir, deputy director of the United Nations University Institute for Water, Environment and Health, told DW.
- These arid regions have few other options since they generate less than 500 cubic meters of water per capita

through rainfall or river runoff – which is half the upper limit of water scarcity as defined by the UN. The United States, by contrast, produces 1,207 cubic meters of freshwater per person.

- Water poverty is set to worsen as populations increase along with temperatures, with Sub-Saharan Africa predicted to become a hotspot of water scarcity by 2050.
- It is a great option in terms of enhancing water resources & costs have “decreased tremendously” from around \$5 (\$4.69) per cubic meter (1,000 liters) in the 2000s to 50 cents today.
- For countries like Cyprus, there’s no other option if they want to maintain this living standard. **The hottest and driest nation in the EU, Cyprus relies on desalination for 80% of its drinking water.**

Impacts of desalination on the marine and climate-

- Before becoming a magic bullet for water scarcity, desalination presents some serious environmental trade-offs in its current guise.
- Firstly, separating salt from water is **highly energy intensive**.
- A 2021 study on the environmental consequences of removing salt from seawater in Cyprus co-authored by Kuepper showed that the **four desalination plants in the country generate around 2% of its total greenhouse gas emissions**. The plants also **accounted for 5% of the total electricity consumption in Cyprus**, representing one of the largest shares by sector of electricity consumption, according to the study.
- Furthermore, the report notes that **desalinated water produced generated around 103 million cubic meters of toxic**, high-salinity brine effluent that impacted the Mediterranean seagrass ecosystem in the region of the discharge pipes.
- Increased salinity, combined with climate-driven

temperature rise, **can cause a decrease in the dissolved oxygen content, resulting in conditions called hypoxia.**

- This **hypersaline water can sink to the ocean bed and kill marine microorganisms** that are vital to the entire food chain.
- In addition, **chemical compounds such as copper and chloride are also observable in the desalination pre-treatment process and can be toxic to organisms** in the receiving water, according to the report.

How can desalination be made sustainable?

- The solution to the relatively high CO2 emissions is to deploy renewables to power desalination plants.
- A Berlin-based company, Boreal Light, has developed off-grid solar and wind energy desalination plants that ensure greater energy independence and immunity from price fluctuations.
- Meanwhile, though brine discharge can be better diffused through outfall pipes that are not in the vicinity of vulnerable marine life, a better solution would be to keep the remnant solids on the land.
- The 2019 study on the state of desalination showed how sodium, magnesium, calcium, potassium, bromine, boron, strontium, lithium, rubidium and uranium could be harvested from the filtered material and reused in industry and agriculture. Recovery of these resources remains economically uncompetitive, however.
- This needs to change as reuse is an important sustainability solution, he added, especially in countries producing large volumes of brine with relatively low efficiencies, such as Saudi Arabia, UAE, Kuwait and Qatar.
- Scientists at the US research body, the Massachusetts Institute of Technology (MIT), have suggested ways to repurpose brine by using the salt to produce caustic soda, or sodium hydroxide.

- When used to pre-treat seawater entering the desalination plant, sodium hydroxide helps prevent the fouling of the reverse osmosis membranes used to filter the ocean water.