Feasibility of Establishing Desalination Plants at the Dry Zones of Sri Lanka

Source: http://www.sundaytimes.lk/140803/news/families-animals-suffer-in-a-parched-land-109503.html

Water scarcity has already been recognised as a major 21st century global environmental problem [1]. Water scarcity arises when the demand for fresh water in a given domain exceeds the supply. Several nations are quickly depleting their freshwater supplies, and many large river basins in both developing and developed nations are experiencing severe water scarcity. According to Sri Lanka, the country is divided into two principal divisions based on annual precipitation of 1,875 mm: Dry Zones (DZ), which account for around 70% of the country, and wet zones, which account for the remaining 30% [2]. Sri Lanka's DZ districts such as Ampara, Anuradhapura, Batticaloa, Kurunegala, Hambantota, Jaffna, Kilinochchi, Kurunegala, Mullaitivu, Polonnaruwa, Puttalam, Trincomalee, Mannar and Vavuniya are experiencing extreme seasonal or year-round water scarcity [3]. Water shortage is a common concern for residents of DZs during the dry season as a result of inadequate tank storage capabilities, maintenance and operation issues, and DZ population growth [4].

The primary reasons for water scarcity are climate changes, industrialization, contamination of limited freshwater supplies, deforestation, water pollution, and destruction of wetlands [5]. Due to a lack of safe freshwater, people in DZs are experiencing irrigation inefficiency, groundwater depletion and diseases such as dental fluoride, skin allergies, chronic kidney diseases, chronic renal failure, and skeleton fluorosis. Water conservation, infrastructure rehabilitation, and distribution systems like rainwater harvesting systems, desalination technologies, sewage treatment, and irrigation efficiency can be implemented to reduce water stress.

Source: https://www.conserve-energy-future.com/causes-effects-solutions-of-water-scarcity.php

Desalination is one of the sustainable solutions which eliminates salt from drinking water and removes potentially hazardous metals, chemicals, and microorganisms, and eliminates microorganisms by physically excluding them via chemical reactions. The Sea Water Reverse Osmosis (SWRO) desalination plant utilizes seawater to produce pure water. The development of SWRO plants is viable in coastal side DZs like Hambantota, Puttalam, Trincomalee, and Jaffna. Brackish Water Reverse Osmosis (BWRO) desalination plants are filtrating water from the tanks and rivers through the Reverse Osmosis membrane. BWRO plants can be established in DZs like Vavuniya, Batticaloa, Kurunegala and Mullaitivu. Further DZs like Ampara, Mannar, Polonnaruwa, and Anuradhapura are ideal for implementing irrigation efficiency to reduce water scarcity. Regardless, the SWRO desalination plant is best suited for Sri Lanka's DZ as it is an island around by water.

Source: https://www.suez.com/en/news/press-releases/first-seawater-desalination-plant-in-jaffna-sri-lanka

The Delft Island is Sri Lanka's first successfully built seawater-to-freshwater facility. However, desalination is portrayed as a novel concept in the Sri Lankan context due to the large-scale Jaffna desalination plant project. To develop, run, and maintain small-scale desalination facilities in the Sri Lankan context, NWSDB (National Water Supply and Drainage Board) is technically and theoretically feasible. But in order to get out of the catastrophic situation, Sri Lanka currently requires the operation of large-scale desalination facilities. Further, there are small-scale desalination facilities that are owned by private businesses for commercial use. It's clearly demonstrated that Sri Lankan experts are technically capable of operating and maintaining desalination plants. Energy Recovering Devices (ERDs), which can be used to improve the SWRO plant's efficiency while reducing overall energy consumption, are another technical advantage for Sri Lanka's current scenario.

Mature fish, larvae, and other marine life can suffer injuries or even die when they get trapped in or drawn into open water surface intake pipes. Surface water intake for desalination poses a major hazard to marine life, but this can be prevented by properly designing seawater intakes. Desalination practically increases the reliance on fossil fuels, which will increase Green House Gas emissions and worsen climate change. Reorienting toward renewable energy sources will lessen the reliance on fossil fuels. High levels of salt and other minerals included in brine discharge endanger the coastal ecosystem. Every novel approach may have a detrimental effect on the environment, which requires immediate actions for mitigation. To prevent these negative effects on the environment, environmental impact assessments must be performed.

Source: https://island.lk/water-for-people/

There are no separate rules and regulations related to desalination. However, NWSDB followed several local and international regulations and standards like Central Environmental Authority (CEA) and health regulations, ISO, and SLS standards for establishing desalination plants in Sri Lanka. Therefore, it is legally permissible to build desalination facilities in Sri Lanka. Every government aims to operate its desalination facility at a break-even point, not for profit. The government's main objective is to provide pure water for the people and increase their domestic life cycle. Therefore, the government must focus on social benefits than financial benefits. Desalination is becoming a significant drinkable water supply, with over 18,000 plants in 150 countries. The existing market capacity of desalination is around 67 % in the world.

> Desalination is becoming a more popular method of supplying fresh water in many parts of the world where it is scarce. The technological advancements that deliver high-quality drinking water are critical for regional prosperity and economic success.

Both developing and developed nations are experiencing severe water scarcity due to climate changes, industrialization, population growth, contamination of limited freshwater supplies, deforestation, water pollution, and destruction of wetlands. The most significant and widespread natural threat in Sri Lanka is water scarcity. Ampara, Anuradhapura, Batticaloa, Kurunagala, Hambantota, Jaffna, Killinochchi, Kurunegala, Mullaitivu, Polonnaruwa, Puttalam, Trincomalee, Mannar, and Vavuniya are the districts in Sri Lanka's DZ that experience significant seasonal or year-round water scarcity. So, there is a rising need for the desalination plants in the DZ of Sri Lanka due to irrigation inefficiency, ground water depletion, rising diseases such as dental fluoride, skin allergies, chronic kidney diseases, chronic renal failure, and skeleton fluorosis. The SWRO desalination plant's demand is increasingly day by day than other desalination plants. As a pioneer, French firm SUEZ, which constructs the Jaffna desalination plant, designs novel ways to produce drinking water sustainably while minimizing operational costs and environmental effects. Experts proposed DZs in Trincomalee, Puttalam, Hambantota, and Jaffna as potential locations for the construction of SWRO desalination plants. According to the research findings, desalination plants can undoubtedly be a workable solution to Sri Lanka's water stress.

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