Date of poster presentation: 13 April 2022

DEVELOPMENT OF A MODEL FOR THE IMPLEMENTATION OF THE CIRCULAR ECONOMY IN DESERTIC COASTAL REGIONS

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Food production in desertic regions is a challenge due to the restricted access to fresh water. A major challenge for the development of desertic coastal regions (CR) is thus to minimize the cost of water desalinization and maximize its utilization for agriculture, industrial, commercial and residential use.

The goal of this study is to define a logical way to create a model of circular economy that can fit in arid CR and can be extrapolated to other places in the world.

This study compares two different desertic CR on the American continent which have similar geographical characteristics. In both of these deserts there are cities in which the access and management of fresh water represents an issue for their continuously growth and conceding water rights to the mining industry. The city of Antofagasta with 432,000 inhabitants (2021) is located in the Atacama Desert (ADt) and its main source of water is a desalinization plant. The city of Hermosillo with 936,000 inhabitants (2020) located in the Sonora Desert (SD), utilizes aquifers filled with water appropriated or transferred from other users as its main source of water due to a prolonged drought.

On the south of the continent, the ADt in Chile, which is the driest place on Earth, as there is not rainfall for decades and, therefore the possibility of food growing is almost impossible. In the north, the SD in Mexico is characterized by its extreme aridity and temperatures up to 50ºC in summer.

Since both deserts have access to the coast, we propose integrating the following methods for a sustainable circular economy:

- Water desalinization (WD): 91.24 ML/day are produced in Antofagasta, Chile. It can be used for microalgae and seaweed production. The waste water of these cultures can be used directly for WD. Therefore, it is possible to have two uses for the same water, contributing to circularity.

- Solar energy: to provide energy for WD.

- Hydroponic system for food production: utilized in hydroponic systems to produce fresh food in non-arable land.

- Water dosing with hydrogels for agriculture: is a recent innovation in Mexico and it can save up to 50% in water consumption in irrigation systems.
- Microalgae culture as a biomass: non-arable areas can be utilized for microalgae cultures in raceways or tanks with water supply from the sea.
- Seaweed farming and processing for food supply and biochemicals.
- Recovery of nutrients from waste water treatment streams and anaerobic digestion.

Keywords: Circular economy, desertic coastal regions, water desalinization, algae