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Proposal to determine the carbon and ecological footprint of seawater reverse osmosis desalination plants.

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INTRODUCTION

This study focuses on seawater reverse osmosis (SWRO) desalination plants in the Canary Islands (Spain) where there are more than 320 private and public units of varying size. The objective is to provide proposals to optimize the operation of these plants, improving energy consumption, water quality, costs and emissions, and making the desalination process more efficient and sustainable. An analysis is undertaken in this study of the carbon footprint ratios (per m3 and type of inhabitant or per m3 and type of productive activity) for each of the islands as a contribution to the decision-making process on the inclusion of renewable energy in the energy mix. The conditions for the production of freshwater in each of the islands vary due to differences in the available power technologies and the energy costs. The ecological footprint is also studied for each island. This work shows the results of an analysis of energy efficiency and the environmental footprints.

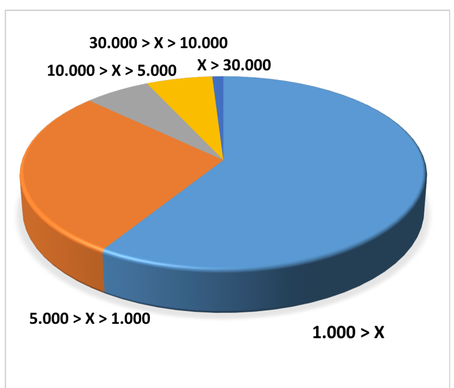
METHODOLOGY

The methodology employed in this study is divided into 3 subsections: energy consumption, CO2 emission factor (carbon footprint) and ecological footprint. In each section, a formula is presented for each parameter, which will subsequently be used in the Results section.

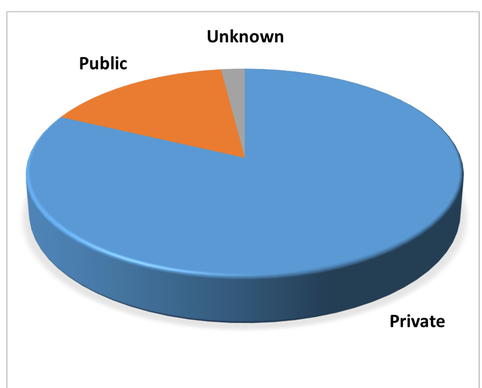
CONCLUSIONS

For an annual desalinated water production in the Canary Islands of 660,000 m3/day, and considering an energy consumption of about 3.04 kWh/m3, the calculated carbon footprint per year is 439,402 tCO2 and the ecological footprint 219,701 ha/year. Given a total population in the islands of 2,207,225 inhabitants, the ecological footprint is 0.1 ha/person/year and the carbon footprint 0.2 tCO2/person/year.

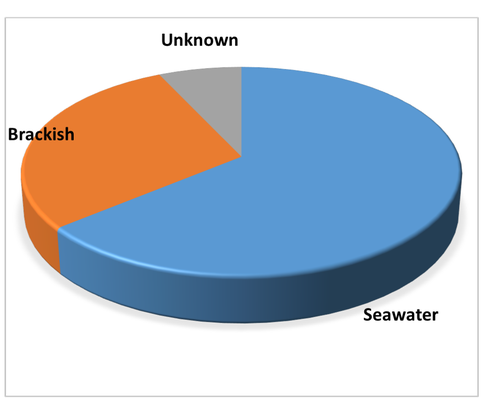
Permeate Flow (m3/day)



Type of use



Water origin



Desalination method used