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Fog water as a non-conventional resource for strengthening water security in coastal settlements of the Atacama Desert

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Rural coastal settlements located in hyperarid areas face increasing levels of water insecurity due to limited freshwater availability, the increasing demand by mining industry, and persistent gaps in water governance. In northern coastal Chile, there is a semi-permanent presence of fog, an unconventional water source with the potential to complement existing resources. However, it has not yet been incorporated into territorial planning and water management. Water is harvested using fog collectors and studies in the area mention average yield varies from 1.5 to 7 L/m^2/day.

This research examines the current conditions of water supply institutional challenges, local perception, and the potential for fog water harvesting as a complementary resource in the town of Chanavaya, which has approximately 80 inhabitants. This coastal settlement is currently supplied exclusively by tanker trucks that deliver water to a Rural Sanitation System and to self-managed households. This mode of supply entails high operating and environmental costs and limits the volume of water available in the town (between 250 and 300 m^3 a month), resulting in water insecurity for residents.

This study proposes a mixed methodological approach. From a social perspective, this research analyses the community's perception of current access to water, its main uses, the problems associated with the existing management model and its costs, knowledge about fog water, acceptance of this unconventional resource, and willingness to pay for it. The research also integrates a normative and institutional document review, interviews with water managers, and household surveys. An estimate of the collectable fog-water potential was also obtained using the numerical model AMARU.

The AMARU model enables the estimation of fog-water potential using meteorological data located at different altitudes, GOES satellite images and a Digital Elevation Model to identify where and how much fog water can be collected. For this research, three climate scenarios were used corresponding to superabundance (1998), mean (2016), and deficit (2019) in fog availability, according to ERA 5 climate reanalysis data. The estimated potential volumes are compared with current water supply, local demand and international standards for access to the resource. These results make it possible to quantify the contribution of this alternative source to reducing gaps in

water access and availability.

Preliminary results indicate that fog harvesting could make a significant contribution to reducing dependence on water tankers, increasing water security and promoting domestic and productive activities. This research contributes to the assessment of fog use in human settlements. It represents a step towards water strategies that are resilient to climate change and created in collaboration with the community.