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Lanzarote, Water scarcity

As the world's population continues to grow, water demands for both domestic and industrial use, and freshwater resources are rapidly depleted. This crisis not only threatens the availability of drinking water for millions of people worldwide, but also has profound implications for agriculture, public health, the environment, and the economic and political stability of the affected regions.

Lanzarote is one of the easternmost islands in the Canary archipelago, covering approximately 846 km². In 2023, the population of Lanzarote reached 159,021 inhabitants, with an increase of almost 3,000 people compared to the previous year (Canary Islands, 2024). Due to its volcanic terrain, Lanzarote's economy is based on tourism and agriculture, with crops like vines, tomatoes, and potatoes. The original inhabitants of the island of Lanzarote were of Berber roots and were known as mahos or majos. These aborigines arrived on the island around 500 BC and were part of the native population of the Canary Islands. Their ethnic origin dates back to the Berber culture, an ethnic group that lived mainly in North Africa. The mahos or majos had their own culture and adapted to life on the island, forming a unique society in Lanzarote (Lanzarote a unique island, 2024).

In Lanzarote, families usually live in homes that, although modest, are designed to make the most of the space and resources available. Parents balance work with raising their children, and many families are involved in the tourism or agricultural sector. The community is very close-knit and local events, such as fairs and festivals, are important moments for social and cultural gathering.

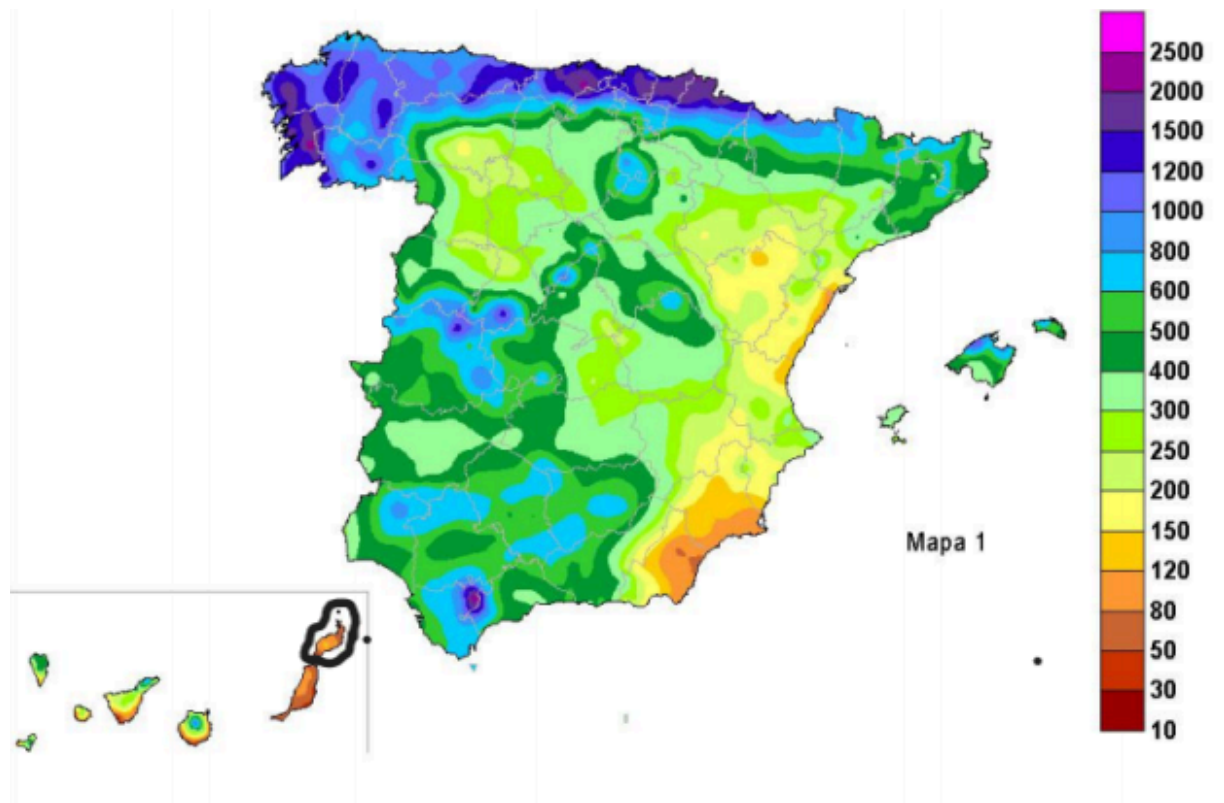
Lanzarote is one of the driest islands in the Canary Islands, with very little rain. In fact, it usually only rains 16 days a year, especially in winter and in the northern area. I will

choose this community, not only because it faces a serious scarcity problem but also because there is great geothermal potential on the island, the availability of research funds, and the possibility of using a renewable source to address water scarcity.

In Lanzarote, there has never been too much water; the inhabitants of this Canary Island have invented all kinds of methods to avoid wasting a single drop. “Without wishing to be pessimistic, in the hydraulic field, we have everything against us. We are an isolated territory, without the possibility of transfers. We inhabit a land with a sparsely rainy climate, located next to a large desert, and the distribution of rain, when it arrives, is very uneven, which makes its distribution difficult. As if that were not enough, we are among those that consume the most water in the country, with an average of 150 liters per person per day, 20 liters more than the national average. Furthermore, among all the crops that exist, we have chosen to harvest the two that consume the most water: avocado and banana. This is without counting the consumption of the millions of tourists who visit us every year and support our economy.”(Universidad Laguna, 2024)

“Each kilo of bananas produced consumes about 500 liters of water. Some productions have lowered it to about 300 liters. A kilo of avocados consumes about 800 liters of water.” (Universidad Laguna, 2024)

Water balance in Lanzarote (2023)



Aemetblog, V. T. L. E. P. (2018, 14 mayo). Balance Hídrico Nacional, 10 de mayo 2018. Aemetblog. <https://aemetblog.es/2018/05/14/balance-hidrico-nacional10-de-mayo-2018/>

My objective is to develop a technology that combines geothermal energy from the volcano with desalination. Nowadays, there are six main processes developed for water desalination (reverse osmosis, freezing, flash evaporation, hydrate formation, electrodialysis, and distillation). All of these processes require energy, and geothermal energy is used to produce electrical energy. It would be worth exploring how to combine these processes with the energy generation offered by geothermal power. In particular, what seems most obvious is to use geothermal energy for the distillation process, since the distillation process consists of heating the water until it evaporates and then condensing it to obtain fresh water. Geothermal energy uses the heat of the ground, and Lanzarote is volcanic and can reach high temperatures at shallow depths. For example, on this same island, we can find restaurants in which geothermal energy

technique is used, harnessing the heat of the kitchen floor, such as the "El Diablo" restaurant.



Aynat, A. (2024, 17 marzo). Guía para Visitar Timanfaya, Lanzarote. Capture The Atlas. <https://capturetheatlas.com/es/timanfaya-lanzarote/>

A cubic meter of water desalinated by reverse osmosis costs about a dollar (Rojas, F., 2015). This desalination process is extremely expensive, and with a hybrid system, up to 50% could be saved. In addition, PhD. Elisabet Palomo Torrejón, among others, has shared that “Renewable desalination in coast areas with water scarcity is a must.”

The cost of living for families in Lanzarote is significantly lower than in mainland Spain and many other parts of Europe. On average, rent prices in Lanzarote are 23% less than in mainland Spain. A three-bedroom home would typically cost 300-400 euros per month. Electricity for a house with a pool and air conditioning costs around 180 euros per month or half that for an apartment. Water expenses should be around 40 euros per month, though they can be higher if you have a large garden or pool. A family of two can expect to spend around 700 euros per month on food, though this can vary depending on shopping habits. (Espacio Lanzarote Real Estate, 2021)

Understanding the cost implications for a typical family in Lanzarote helps inform the pricing structure and ensure that desalinated water is accessible to the local population. Additionally, understanding the typical household expenses and priorities of Lanzarote families can help ensure the desalination project is designed to meet their specific water needs and concerns.

The cost of desalinated water is higher compared to the average family's budget, which is why it's necessary to explore funding options or subsidies to make this project affordable.

I think two great cooperatives could be ACCIONA and ENEL. Both companies focus on sustainable development and on implementing innovative solutions, which align with the goals of my project. ACCIONA is a world leader in the construction of desalination plants using reverse osmosis technology, which is more efficient and has a lower carbon footprint than traditional thermal desalination methods.

ACCIONA is also recognized for its leadership in the construction of desalination plants using reverse osmosis technology, which supports its ability to implement water desalination projects efficiently and sustainably. Although ACCIONA is not directly mentioned in the sources as a specialist in geothermal energy, its experience in sustainable technologies and its participation in renewable energy projects could be beneficial for the integration of geothermal energy in the desalination process. ACCIONA has demonstrated its commitment to sustainability through its renewable energy projects and its focus on reducing its carbon footprint, which aligns with the implementation of clean and efficient technologies in desalination projects.

ENEL is a multinational energy company headquartered in Italy, with a strong presence in the renewable energy sector.

It is one of the largest utility companies in the world, with operations in over 30 countries and a focus on sustainable energy solutions. ENEL is a leader in the development and deployment of renewable energy technologies, including solar, wind, and geothermal power. The company has a strong track record of researching and operating renewable energy projects, with a total installed capacity of over 49 GW globally.

This expertise in renewable energy could be valuable for powering a water desalination plant, as renewable sources can provide a sustainable and environmentally friendly energy source. While ENEL's primary focus is on the energy sector, the company has also been involved in water infrastructure projects, particularly in developing countries. For example, ENEL has participated in the construction and operation of water treatment and distribution systems in countries like Brazil and Peru.

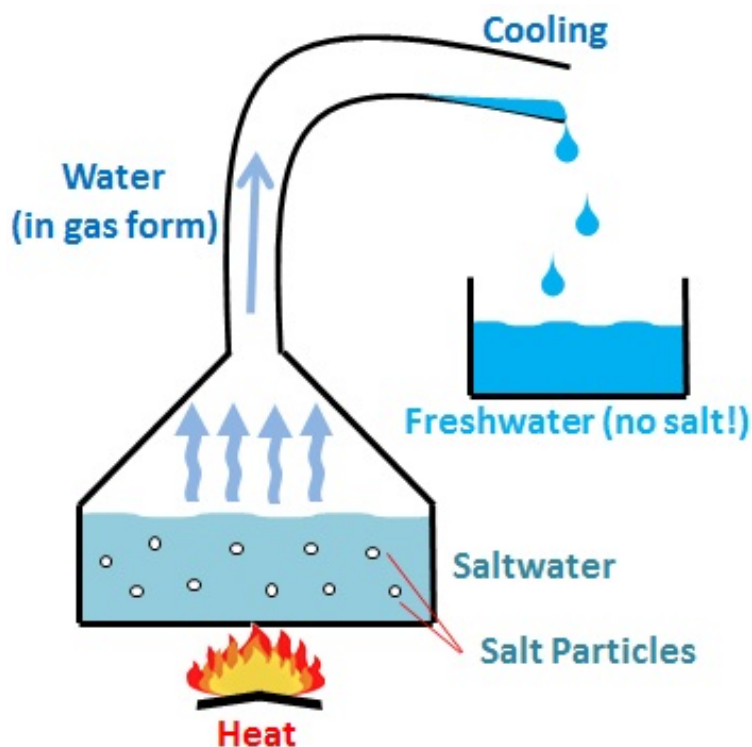
My project would involve developing a system that integrates the desalination process with the energy generation process through geothermal power in a plant. It would use electricity to generate water vapor that would then be transformed into distilled water, in a place where the soil temperature is very high at shallow depths.

The system will likely consist of a well dug deep beneath the coast that will collect seawater, with vaporducts that withstand high temperatures, made of fireproof and corrosion-resistant material. It will include a tank and brine recycling system, a water sterilization element (for example, a chlorine dispenser), a series of membranes to ensure water filtration and a mechanism to collect water condensation.

In all of this, my project should not differ from a standard evaporative desalination plant. The key difference lies in how I obtain the energy to reach the temperature needed for water evaporation and in the possibility of using the same process to both generate energy and desalinate the water. I aim to use the high temperature of the subsoil as an energy source for water evaporation, thus minimizing the need for additional energy sources.

Using the Reverse Osmosis system has several advantages, its ability to remove contaminants such as salt, bacteria, and viruses from water makes it suitable for a variety of applications. The food and beverage industry increases the consumer demand for safe and high-quality products, since this system removes contaminants, including bacteria, viruses, dissolved solids, and impurities, ensuring that the water used in food meets stringent standards. Reverse osmosis water filters also help reduce operational costs by providing an efficient and reliable water purification solution.

Another advantage is that the system removes impurities and reduces the need for chemical treatment. This leads to energy savings and reduced maintenance requirements. Finally, focusing on water purification helps prevent equipment corrosion and scaling by removing harmful minerals and impurities that can cause damage over time, it aids in maintaining consistent product quality by eliminating unwanted substances that might affect the composition of the chemicals being produced and it helps increase efficiency and reduce operational costs by producing purifying water on-site eliminating the need to rely solely on external water resources (Brother Filtration, 2024). Reverse osmosis, despite being a system completely friendly to the environment, sets new standards in efficiency and cost-effectiveness. By integrating reverse osmosis systems we can significantly streamline operations and ensure consistent, high-quality water output.



Desalinización resolvería la crisis mundial del agua | Blog. (2023, 12 diciembre). BossTech.
<https://bosstech.pe/desalinizacion-crisis-mundial-agua/>

Although Lanzarote has been using reverse osmosis for desalination, adding the island's geothermal potential into this process is a novel approach. Historically, Lanzarote has not combined its volcanic climate with desalination technologies. The use of geothermal energy to enhance the efficiency of desalination is a promising area of research but is still relatively new. Studies on geothermal energy's potential in desalination (Colmenar, Santos, et al., 2020) suggest that using geothermal heat could significantly improve the sustainability and cost-effectiveness of desalination efforts.

Many regions around the world face even more severe water crises than Lanzarote, the island's unique situation makes it an excellent case for innovation. Lanzarote's severe water scarcity combined with its geothermal potential provides a valuable opportunity to test and improve new technologies. By integrating geothermal energy with desalination processes on the island and demonstrating their effectiveness, we can create a model that other areas with similar challenges might follow and contribute to solving water scarcity worldwide.

Fresh water is essential to our lives in more ways than we often recognize. Not only is it vital for drinking and maintaining health, but it is also crucial for growing food and preserving our ecosystems. In places like Lanzarote, where water is scarce, everyday life can be a constant challenge. The idea of using geothermal energy to desalinate seawater offers a glimmer of hope for these communities. Imagine how people's lives would change if they had access to a reliable source of clean, safe water. It would not only improve their health and well-being but it would also strengthen their communities and give them a greater sense of security. As we face the challenges of water scarcity around the world, it is essential to remember that every drop counts and that we all have a role to play in protecting this invaluable resource. By working together and supporting innovative solutions, we can ensure that freshwater remains a lifeline for generations to come.

The use of water is a basic human need and each of us should have access to it. Unfortunately, it doesn't always work that way. On a personal level, I have never experienced a lack of water, but I have witnessed it. Last year I traveled to Nairobi to participate in a volunteer program at a public children's school. Every day I visited the school, there was never enough water for everyone. Children, approximately five at each table, had to share a single glass of water among themselves because there was no more available. There was never enough water to wash the dishes the children used, which made the situation unhygienic and they put their health at risk due to the reuse of dirty dishes. This problem extends beyond schools and affects the entire country.

It is deeply troubling that, in today's world of advanced technology and progress, clean drinking water is still a luxury for some and not a basic right for everyone. This glaring injustice highlights a painful truth, while many of us have easy access to water, countless others face a daily struggle to obtain even a few clean drops.

The gap between those who can easily access water and those who must endure harsh conditions to find it reveals a serious moral failing. It shows that our global priorities are not aligned with the needs of all people. Clean water has become a privilege determined by economic status rather than a universal right.

This inequality has severe consequences. Without access to clean water, people face health problems, poverty, and daily hardship. The most vulnerable suffer the most, and the disparity between those with access and those without only grows. The fact that we have the technology and resources to solve this problem, yet still allow such disparities to persist, is a serious failure on our part.

Access to clean water is a basic human right, and we must make sure everyone has it. The issue is not just about scarcity but about fairness and respect for every person's dignity. We need to act with urgency and compassion to address this issue. True progress will be measured by how we care for those who are most in need, and it's time for us to turn our awareness into meaningful action.

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