



International Water Resources Association

La Guajira: Severe Water Shortage, Policy Assessment, & Climate Change v. Normal Climate Variability

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There are ~250,000 Wayuu people in the La Guajira territory of Colombia.
It is in the NE part of the country, bordering the Caribbean Sea

(Wikipedia 2024 image by permission)





Colombia Location Map (Wikipedia 2025, image by permission)





Bottom Line up Front

- The issue of a severe potable water shortage in La Guajira, Columbia, South America is at the center of a humanitarian crisis amongst the Wayuu indigenous ancestral community.
- In La Guajira, there is a combination of corruption, exploitation & mismanagement, in the face of already precarious circumstances due to more extreme weather events likely related to a combination of the effects of climate change & El Nino
- Low cost desalination tools may be a way to assist the suffering Wayuu indigenous people



The Situation

- The climate is arid, dry and with high temperatures.
- Rainfall is rare & usually occurs in September – November; typically, there are only 1 -2 rain events/year

The Situation

- The population is dispersed with a common water source only reached by a Wayúu resident by walking 15 to 30 minutes, more if the closest water source malfunctions.

In La Guajira, most people, according to UNDP data, have access to only 0.7 liters of water per day. A healthy adult needs about 3.7 liters of fluids daily.

During the recent prolonged drought, the child mortality rate surged to 24 per 1,000 due to malnutrition & disease.

For Colombia as a whole it's about 11.

A severely degraded Jaguey shared by Wayuu people and animals. La Guajira, Colombia. Photo by D.H. Rasolt.



A dried up “Jaguey” caused by a prolonged drought. La Guajira, Colombia. Photo by V.Circe.



A Wayuu child who walked several kilometers to reach the water of a Jaguey. La Guajira, Colombia. Photo by V.Circe.





Policy Considerations

La Guajira has been mostly abandoned by the Colombian government since independence in 1810, and the population has been a victim of widespread exploitation and corruption.

The crisis is further exacerbated by incompetent resource management, the dominant economic interests of multinational corporations, and the difficulty of adapting [traditional beliefs](#) to present circumstances.

Policy Considerations

- This combination of corruption, exploitation and mismanagement, in the face of already precarious circumstances due to more extreme weather events related to climate change, is common in the developing world, and critical for the global community to be aware of and try to prevent in the coming decades.
- The crisis in La Guajira and with the Indigenous Wayuu helps to illustrate what can happen when these [conflicting interests](#) are thrown upon a vulnerable environment and peoples. (Henryk Rasolt Resilience, 2/3/2021)



Corruption & Inaction: An Example From 2024

- President Petro took his entire cabinet to La Guajira for a week in 2024.
- The agenda was to meet with residents for a national response to various needs, including potable water. He declared a national emergency for the area, which was quickly declared unconstitutional. He also ordered 20 enormous water trucks to be delivered to the area, which resulted in dismissal of the head of Colombia's equivalent of FEMA over corruption charges.
- The reason? The FEMA head took a 30% 'commission' on each truck.



El Nino Occurs Periodically in La Guajira

- El Niño is a climate pattern that describes the unusual warming of surface waters in the eastern tropical Pacific Ocean. El Niño is the “warm phase” of a larger phenomenon called the El Niño-Southern Oscillation (ENSO).
- One of the main repercussions of El Niño in Colombia is the decrease in rainfall, which leads to prolonged droughts in regions such as La Guajira, Santander, and some areas of the Coffee Region. These droughts affect the availability of water for human and agricultural consumption.



The Changing Climate

- **Hypothesis: Periodic El Nino climate events are exacerbated by climate change.**

Climate Change Models Predict Further Drops in Rainfall

- Previous precipitation scarcity correlates with El Nino climate events. Between 2012 and 2016 Alta Guajira had a drought where average monthly precipitation bottomed at only 5 mm in 2015.
- Climate challenges in La Guajira are exacerbated by low elevation, proximity to the equator, and its position with consistent trade winds. Daily ambient temperatures are always in the 90s.
- According to climate models, La Guajira is expected to experience significant temperature increases with estimates at 7 degrees Fahrenheit by the end of the century.
- This also translates to 30 – 40% decreases in annual rainfall by the end of the century.

Complexities of Precipitation Data, Drought, Climate Change

- **Periods of drought have increased in La Guajira over the last 10 years**

Per Arregoces et al. 2024:

- *“Over the 42 years from 1981 to 2023, the mean annual precipitation at La Guajira increased by 3.76 mm/year...”*
- **How can this happen as regional temperatures increase due to climate change?**
- **Hypothesis: Although measured rainfall has slightly increased (likely due to increased evaporation from increasing temperatures largely from climate change), there are fewer storms & they are more monsoonal, causing more runoff and less capture in surface water bodies or recharge of aquifers.**



Evidence for Human Influence on Climate Change

- While a single drought event cannot be definitively attributed to climate change as it is a localized weather event, the increased frequency, severity and duration of droughts in different regions around the world can, and have, been tied to rising temperatures and changing precipitation patterns due to global climate change (D.H. Rasolt 2021).
- See Nature 2019: **Twentieth-century hydroclimate changes consistent with human influence**
- [Kate Marvel](#), [Benjamin I. Cook](#), [Céline J. W. Bonfils](#), [Paul J. Durack](#), [Jason E. Smerdon](#) & [A. Park Williams](#)
- [Nature](#) volume 569, pages 59–65 (2019)



El Cerrejon Coal Mine Further Stresses H2O Supply

- Located in Media Guajira is Latin America's largest coal mine, Cerrejon — itself a major actor in the ongoing climate change saga.
- Cerrejon uses large volumes of water from the Rancheria River, along with vital groundwater.
- It is estimated that Cerrejon uses approximately 2,700,000 liters of water per day to run the extensive operations of the mine.

El Cerrejon



Contaminants From the El Cerrejon Mine

- **Heavy Metals:**

Arsenic, cadmium, lead, and mercury are commonly associated with coal mining and have been found in the surrounding water sources.

- **Sulphates and Acidity:**

The mining process, especially the exposure of sulfur-rich coal seams, can lead to the release of **sulfates** and **acid mine drainage (AMD)**. AMD lowers the pH of water bodies and can lead to harmful impacts on aquatic life and the broader ecosystem.

- **Chemicals from Mining Operations:**

- Mining activities often use various chemicals for the extraction and processing of coal. These can include **cyanide** and **ammonia** compounds



Promoting Distribution of Small Drinking H₂O Devices

- QuenchSea is a portable, low-cost, manually powered device that uses a reverse osmosis filter to turn seawater into drinkable freshwater, offering a solution for water scarcity and emergency situations.
- **Human-powered:** It requires no external energy source, relying on manual pumping.
- **Filtration:** It includes reverse osmosis pre-filtration and ultrafiltration membrane (filter) to remove suspended solids, pathogens, parasites, and microplastics.
- **Low Cost:** It aims to be an affordable solution for accessing clean water.
- **Capacity:** It can produce up to 3-6 liters (~1 gallon) of freshwater per hour.
- **Duration:** A membrane should produce 500 liters (130 gallons) before changeout
- **Membrane cost:** \$60 USD

An Example of a Low-Cost Desalination Tool.



Conclusions

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Questions?

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