

MAKING THE CASE

# Colombia

## Case Studies on Inclusive Economic Development



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1.0

# Background



## 1.1 Context

The implementation of Boreal Light's solar water desalination and filtration system in La Guajira, Colombia, has shown how innovative technologies combined with community-based approaches can facilitate sustainable and equitable development. La Guajira, located in northern Colombia, is one of the country's most economically and environmentally vulnerable regions.<sup>1</sup> Its arid landscape contributes to persistent water scarcity, which significantly impacts the daily lives of its inhabitants, particularly the Indigenous Wayuu people, who rely heavily on subsistence farming with limited access to sustainable water sources.

The presence of Venezuelan refugees further intensifies competition over the already scarce water resources and limited economic opportunities.<sup>2</sup> Meanwhile, La Guajira bears the brunt of climate change impacts, facing multi-year droughts and rapid depletion of surface water sources. These environmental pressures place additional economic strain on Indigenous communities, who lack the capital and infrastructure to adapt and thrive.<sup>3</sup>

## 1.2 Boreal Light: Technological Solution for Equitable Water Access and Sustainable Livelihoods for Off-Grid Communities

In collaboration with ZOA, an international relief and recovery organization, Boreal Light has successfully implemented an integrated, all-in-one solar water desalination and smart irrigation system to serve the La Guajira community.<sup>4</sup> Equipped with a vertical farming module capable of hosting 1800 plants, Boreal Light's integrated approach is powering La Guajira with both drinking water for survival and climate-smart agriculture for prosperity.<sup>5</sup>

The simplicity of design, sole reliance on solar power, and affordability are key factors to the effectiveness of Boreal Light's system. These factors, combined with Boreal Light's commitment to training locals to service the machines, provide a promising solution to reliable water access and sustainable livelihood opportunities.<sup>6</sup>

**48,000**

*Liters of drinking water*

**750**

*kg of vegetables per harvest*

**120,000**

*people benefitting*

Since the commissioning of the project in 2023, Boreal Light's Winture Planet Cube has revitalized La Guajira's water sector and facilitated the economic prosperity of the community. Producing 48,000 liters of hygienic drinking water and at least 750 kgs of vegetables per harvest, the integrated system benefits 120,000 local people overall while creating 12 local jobs.<sup>7</sup>

The drive for equity in La Guajira goes beyond conventional WASH intervention, aiming to establish long-term resilience against environmental and economic instability. By implementing the integrated system, La Guajira is empowering its most vulnerable populations, offering them greater autonomy over vital resources and a pathway toward inclusive growth.



2.0

# Built For All: Applied



## 2.1 Pillar One: Collective Stewardship of Shared Resources for Future Generations

Treating water of varying quality, from industrial wastewater, saline groundwater to seawater, Boreal Light's community-based project provides sustainable solutions to water scarcity exacerbated by climate change.<sup>8</sup> Through advanced reverse osmosis (RO), the system effectively removes harmful contaminants, producing clean and safe water for consumption, sanitation, and agriculture in the off-grid Indigenous Santa Ana Wayú community.<sup>9</sup>

The program adopts a circular approach to promoting climate resilience, tackling local impacts of climate change by integrating the desalination system with climate-smart agriculture.<sup>10</sup> Treated water from the Winture Planet Cube flows directly to a connected vertical farming module, allowing the Wayú community to produce food locally using minimal water.<sup>11</sup> The saline wastewater generated by the desalination system is used to cultivate spirulina, a nutrient-rich and highly profitable crop that provides a local food source and a potential product for sale.<sup>12</sup> By repurposing and recycling waste and contaminated water for agricultural use, Boreal Light's technology creates a self-sustaining cycle and closed-loop system, driving solutions to both water scarcity and food insecurity for the off-grid community.

The solar array attached to the Winture Planet Cube enables the system to operate independently of external fuel sources, allowing a continuous treatment process powered by clean, renewable energy. This eliminates the need for firewood to boil and disinfect water, which is traditionally practiced by off-grid communities to treat contaminated water, and reduces carbon emissions by 800 tons annually.<sup>13</sup> As part of Boreal Light's social capacity-building efforts, members of the community are trained and engaged in managing and operating the off-grid systems, hence promoting a sense of community ownership of both scarce resources and climate-smart infrastructures.<sup>14</sup>

### Lessons and Opportunities for Improvement

The modular design of the water treatment systems and vertical farming modules makes it easy to transport, install, and expand based on community needs. This flexibility makes it suitable for deployment in diverse off-grid contexts, highlighting a scalable model for promoting inclusion.<sup>15</sup> Despite close collaboration and partnerships with actors in the private, development, and humanitarian sectors, engagement with public sector stakeholders remains limited.<sup>16</sup>

Deepening partnerships with public sector stakeholders and building synergies with government-led programs in recipient countries are, therefore, crucial to scaling and enhancing the long-term sustainability of Boreal Light's intervention.

## 2.2 Pillar Two: Equitable access to resources and opportunities

### Strengths

Promoting equity, fairness, and resilience is at the core of Boreal Light's intervention. By providing an efficient alternative to traditional water sources and treatment methods, Boreal Light's intervention creates pathways for individuals to build wealth and improve economic outcomes. Easily accessible water alleviates the burdens of water fetching, traditionally performed by women and girls who suffer double disadvantages in the economic system.<sup>17</sup> Owing to the solar-powered design, the cost of water production is driven down to \$0.55 per 1,000 liters compared to bottled drinking water, which typically sells for \$4 per 20 liters, improving water affordability<sup>18</sup>. The off-grid solution has effectively lowered the cost of access to drinking water by 90% for communities whose water expenses constitute a substantial proportion of their income.<sup>19</sup> Likewise, agricultural production supported by the vertical farming module provides alternative sources of income, enhancing equitable access to livelihood opportunities.

### Opportunities for Improvement

Currently, WASH experts from ZOA, Boreal Light's local implementing partner, are responsible for overseeing the daily operations of the integrated system.<sup>20</sup> However, due to the short-term contract of the WASH experts and Boreal Light's commitment to promoting local ownership of its technology, transfer of technical oversight capacity to community members for the long-term operation emerged as an imperative.<sup>21</sup> Scaling and expanding Boreal Light's training program, the WaterKiosk Academy in La Guajira, which has seen success in East Africa, presents a promising solution to empower local agents in operational oversight.<sup>22</sup> This also presents a valuable opportunity to enhance economic and gender inclusion for the most vulnerable indigenous Wayú people and Venezuelan refugees, while ensuring the long-term sustainability of Boreal Light intervention.

## 2.3 Pillar Three: A Level Playing Field for Work and Competition

### Strengths

The combination of remote monitoring and on-site technical training, provided by the Boreal Light local support team, enables community employees to perform daily operations and maintenance of the advanced system independently.<sup>23</sup> This approach facilitates the building of local expertise, effective knowledge transfer, and skill development within the community, boosting employment prospects while reducing barriers to entering the labour market for the marginalized community.<sup>24</sup>

Moreover, the purification technology significantly reduces the incidence of waterborne diseases, which, in turn, improves local economic productivity.<sup>25</sup> Meanwhile, the project actively promotes entrepreneurial activities by enabling community members to sell and distribute purified water to nearby areas using locally produced containers and packaging materials, contributing to innovative small business models.<sup>26</sup>

Additionally, the low-cost irrigation water provided to a community reliant on subsistence farming supports sustainable livelihood opportunities for its members. The vertical farming module further enhances agricultural productivity while significantly lowering production costs, positioning locally grown produce as a competitive market option. This comparative advantage promotes a more level playing field, supporting the community's long-term economic resilience and self-sufficiency.

### Opportunities for Improvement

Although the vertical farming module and smart irrigation system have significantly boosted agricultural production, the community continues to rely on an informal barter system to trade locally grown produce.<sup>27</sup> Leveraging the enhanced productivity and market competitiveness of vertical farming, additional efforts to commercialize agricultural production beyond local consumption, such as establishing direct connections between local farmers and buyers, would improve market access and foster local entrepreneurship. This shift would not only expand economic opportunities but also transition the community towards a more formalized market, fostering economic resilience and inclusion.

3.0

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**Photo 1:** *Boreal Light*, accessed November 16, 2025.  
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