

17 June

**WORLD DAY TO COMBAT
DESERTIFICATION AND DROUGHT**



COMBATING DESERTIFICATION: THE IMPACT OF RENEWABLE ENERGY POWERED DESALINATION IN NORTHERN BRAZIL



World Day to Combat Desertification and Drought is observed on 17 June each year to promote public awareness of international efforts to combat desertification. The day offers a chance to recognize that land degradation neutrality (LDN) is achievable through problem-solving, strong community involvement, and cooperation at all levels. Of the world's 8 billion inhabitants, over one billion young people under 25 live in developing countries, particularly regions directly dependent on land and natural resources for sustenance. ([source](#)).

The motto of this international day is "healthy land = healthy people."

The theme for 2024 is 'Food. Feed. Fibre, ' which reminds us that over-consumption can lead to desertification ([source](#)).

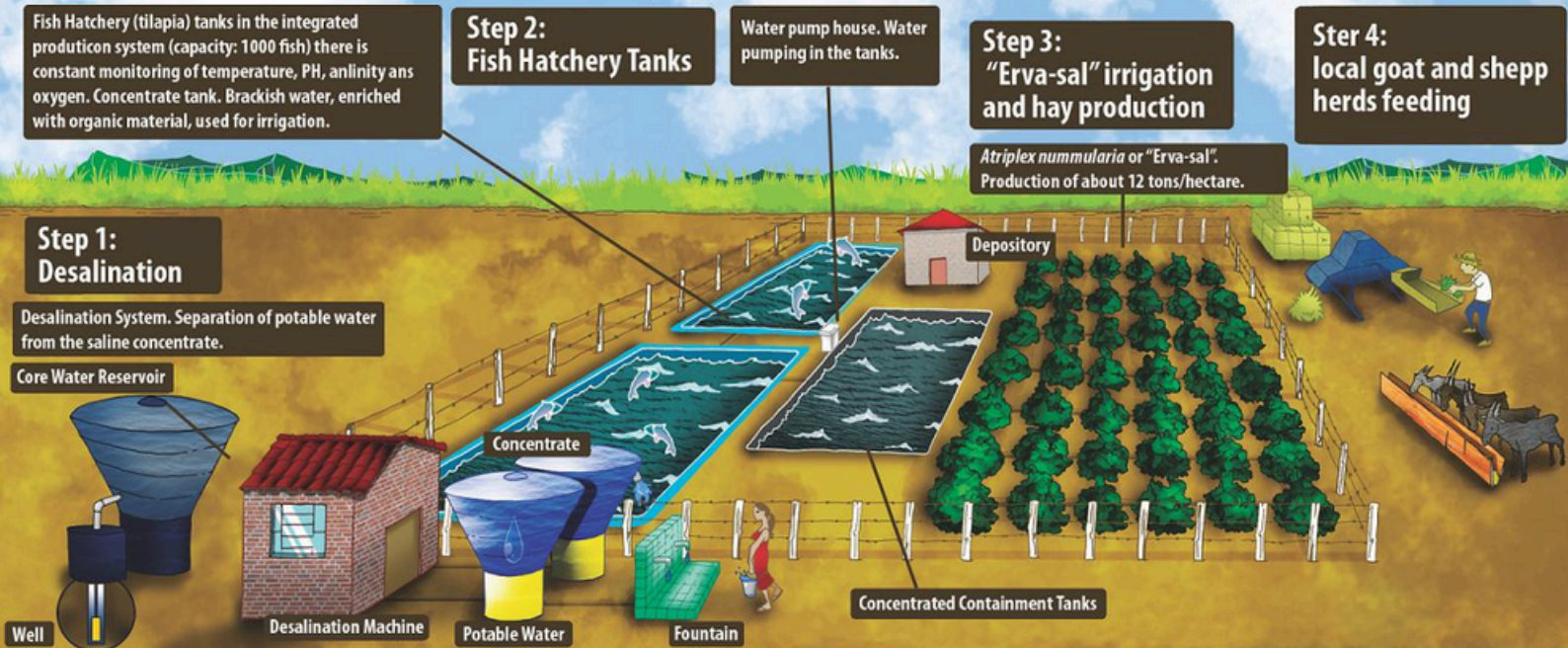
Desertification in Brazil: A Looming Threat

Desertification is among the most serious environmental problems; it has social, economic, and environmental effects. Identifying areas susceptible to desertification (ASD) can support planning for rational water use because these areas have limited water and are affected by climate variability ([source](#)).

Every year, the world loses 100 million hectares of fertile land, an area larger than the state of Mato Grosso in Brazil. Over half of the world's rangelands are degraded, jeopardizing food security and reducing the soil carbon stock, second only to the oceans. If current trends continue, we must restore 1.5 billion hectares of land by 2030 to achieve the Land Degradation Neutrality goal. Degraded lands fail to infiltrate and retain water adequately, leading to increased runoff and accelerated erosion. Global warming and poor land management exacerbate this issue, causing droughts more frequently and intensely. In 2023 alone, one in four people worldwide was affected by drought, with such events increasing by 29% since 2000, highlighting a planetary-scale emergency ([source](#)).

The Água Doce Program (PAD)

The Água Doce Program (PAD) represents a transformative effort by the Brazilian Federal Government to address water scarcity in the semi-arid regions, particularly in remote villages facing desertification and off-grid challenges. These areas, spanning multiple states and historically marginalized communities, rely on groundwater sources that are heavily saline, ranging from mildly brackish to seawater-like concentrations. Due to geological constraints, traditional deep wells provide limited water, primarily suitable for basic domestic needs.



In response to these challenges, PAD employs low-energy desalination systems utilizing reverse osmosis technology, powered by renewable energy sources like photovoltaic solar panels coupled with batteries. This shift ensures sustainable, low-energy, and low-carbon water production and addresses the critical issue of contaminated water sources. By integrating renewable energy into the desalination process, PAD enhances energy independence for off-grid communities in northern Brazil, reducing operational costs and mitigating environmental impact.

The program's impact is profound and far-reaching. Since its inception, PAD has established more than 811 operational desalination plants, serving approximately 320,000 people, and plans to expand to 1,000 plants. The success of PAD hinges on community involvement and social mobilization, where local communities actively participate in the management and operation of the desalination systems through shared management agreements.

These agreements outline responsibilities for community members, alongside municipal, state, and federal government representatives, ensuring sustainable water management practices. While the Federal Government provides initial capital investment and covers periodic maintenance costs, the community shares daily operational expenses, fostering ownership and sustainability. This collaborative approach ensures reliable access to clean drinking water and empowers local communities economically and socially.

PAD exemplifies a holistic approach to water management, leveraging renewable energy and community participation to provide sustainable solutions for water-scarce regions in Brazil. By addressing the specific challenges of saline groundwater and off-grid conditions, the program improves public health and well-being. It builds resilience against climate change impacts on water and land, setting a model for inclusive and sustainable development in remote and marginalized areas ([source](#)).

The Circular Approach Adopted by the Água Doce Program (PAD)

These desalination initiatives in Brazil embody a circular approach by conscientiously managing its environmental impact and resource recovery and utilization. Effluent from the desalination process, typically seen as waste, is repurposed for beneficial uses such as animal feed, tilapia fish farming, and biosaline agriculture irrigation, transforming waste into valuable resources. For effluent that cannot be repurposed, containment in evaporation tanks prevents soil degradation, ensuring responsible waste management practices. Beyond environmental stewardship, the program significantly impacts local communities by providing quality water to address water scarcity in the semi-arid region, improving health, agriculture, and economic opportunities. Community-based operators are trained, empowering local residents to sustainably manage and maintain desalination systems, fostering resilience and skills development. Designed for efficiency, the systems employ low recovery rates to minimize pretreatment needs and membrane fouling risks, optimizing resource use and promoting longevity. This holistic approach tackles immediate water challenges and sets a sustainable precedent for water management in vulnerable regions, emphasizing resilience, efficiency, and community empowerment.

As of 2017, ten agreements, one for each state in the Brazilian semi-arid region, have been in place, with an investment of approximately R\$260 million (around US\$50 million) to provide quality water to 1,200 communities. Since the program's inception, 3,378 communities in 270 of the most critical municipalities have been assessed, and around 2,400 community-based operators have been trained.

The installed desalination systems can produce about 3.2 million liters daily drinking water. With a typical deep well flow rate of approximately 1,000 liters per hour in the semi-arid region, a system can safely produce 4,000 liters of desalinated water daily, sufficient to supply 400 people with 10 liters of drinking water daily. Recovery rates are kept low to minimize the use of pretreatment and the risk of membrane fouling ([source](#)).



Decarbonization: Ensuring Reliable and Affordable Electricity Supply

Ensuring affordable and reliable electricity supply is pivotal for the sustainability and efficiency of off-grid desalination plants. To tackle this challenge, the PAD initiative has integrated solar energy into its operations. The pioneering pilot project in João Câmara, Rio Grande do Norte, utilizing photovoltaic panels, has paved the way for subsequent installations across other sites. Looking ahead, the 2020-2025 work plan outlines an ambitious program to expand solar energy integration, aiming to install 1,500 photovoltaic solar systems to power PAD desalination plants.

This strategic shift towards solar energy enhances energy independence and reliability and aligns with global efforts towards decarbonization. By harnessing abundant solar resources in Brazil's semi-arid regions, PAD reduces operational costs and minimizes the environmental footprint of water production. This initiative not only ensures a sustainable water supply but also contributes to local economic development through the promotion of renewable energy technologies. Ultimately, integrating solar power into desalination plants underlines PAD's commitment to innovative, sustainable solutions that address water scarcity and climate resilience challenges ([source](#)).





The International Desalination and Reuse Association (IDRA)

As a UN-recognized organization, our role as the International Desalination and Reuse Association (IDRA) is to share knowledge of technical solutions to address the ever-growing demand for clean water for all.

The IDRA and its global members have been promoting water reuse and desalination solutions for over fifty years to address water scarcity challenges in both industrial and municipal sectors. In June 2022, IDRA launched the Be Water Positive + Initiative, aiming to disseminate knowledge and highlight efforts in water stewardship. The initiative urges industries and utilities to adopt best practices for environmental stewardship and energy efficiency in desalination and water reuse projects, emphasizing suitable technologies based on plant locations. IDRA facilitates discussions on environmental issues related to desalination and water reuse, advocating for water recycling to reduce water footprints, increase decarbonization of operations, integrate renewable energy sources, and minimize chemical usage.

It is, therefore, why the IDRA commends the Água Doce Program (PAD) for its outstanding efforts in combating desertification and fostering a community based on shared goals, and why we chose to highlight today such a case study. Desertification poses serious social, economic, and environmental challenges, and identifying areas susceptible to desertification is crucial for planning rational water use. In this context, PAD's initiative to provide quality drinking water through desalination systems in Brazil's semi-arid region is exemplary. The program's success is anchored in strong social mobilization, community participation, and shared management agreements. When combined with decarbonization, desalination presents a highly effective approach to meeting the increasing global demand for clean water. This synergy addresses the twin challenges of water scarcity and climate change. By using renewable energy sources, such as solar power, to drive desalination processes, we can significantly reduce the carbon footprint typically associated with desalination plants. This not only makes the production of freshwater more sustainable but also helps mitigate the impacts of global warming. Implementing such green technologies ensures a continuous supply of potable water while promoting environmental stewardship. As climate change increases, populations grow, and freshwater resources become increasingly strained, the integration of desalination and decarbonization stands out as a crucial strategy for securing a resilient and sustainable water future. The PAD's innovative use of solar energy to power desalination systems and environmentally appropriate effluent disposal underscores its commitment to sustainable development. By addressing the region's water scarcity issues and improving resilience against climate variability, PAD enhances the quality of life for its residents and sets a benchmark for similar initiatives worldwide.



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