Is solar desalination suitable for small islands?

Solar desalination · https://www.elementalwatermakers.com/knowledge-base/solar-desalination/is-solar-desalination-suitable-for-small-islands/

Yes, solar desalination is highly suitable for small islands. These systems harness abundant sunshine to convert seawater into fresh water, providing islands with energy independence and dramatically reducing water procurement costs. With compact designs requiring minimal space and proven reliability even during storms, solar desalination offers small island communities a sustainable solution to their water challenges while eliminating expensive water imports.



Solar desalination solution installed on an island in The Philippines

What makes solar desalination ideal for small island communities?

Small islands face unique water challenges that make **solar desalination** an ideal solution. These communities typically have abundant sunshine year-round, limited natural freshwater resources, and face prohibitive costs for importing water - often ranging from 10-20 €/m³ for commercial users or communities in remote regions. Solar desalination transforms these challenges into opportunities by using renewable energy to produce fresh water directly from the surrounding ocean.

The technology offers several key advantages that perfectly match island needs. Energy independence stands out as perhaps the most important benefit, as islands no longer need to rely on expensive diesel generators or unstable grid connections to power their water systems. Our solutions use only 3 kWh/m³ of fresh water produced, while standard traditional desalination solutions use 7-10 kWh/m³, making them financially attractive even for smaller communities.

Environmental sustainability also plays a major role in making this technology ideal for islands. Unlike traditional desalination methods that require chemical treatments, modern solar systems operate **chemical-free**, protecting delicate marine ecosystems surrounding islands. The systems produce fresh water that meets WHO drinking water standards without the environmental risks associated with chemical storage and disposal.

How much space does a solar desalination system need on a small island?

Space constraints on small islands often concern property managers, but modern solar desalination systems require surprisingly little room. Typical small systems take around 25-50 square meters of total space, depending on the desired water production capacity. This compact footprint means even the smallest islands can accommodate systems producing anywhere from 5,000 to 100,000 liters of fresh water daily.

The modular design of these systems provides exceptional flexibility for island installations. **Containerized units** maximize efficiency by housing all components in a compact, weather-resistant enclosure that can be positioned virtually anywhere with seawater access. Many resorts and private properties utilize available ground space to preserve valuable areas for other uses, while some systems integrate seamlessly into existing utility areas.

For perspective, a system producing 20,000 liters daily - enough for a small resort or community of 100 people - typically fits within a standard shipping container footprint. This flexibility ensures that even islands with limited flat land can implement effective desalination solutions.



Small desalination solution that comes as an 8 ft containerised, plug & play solution

What are the real costs of solar desalination versus water imports?

The economics of solar desalination become compelling when you compare them to traditional water procurement methods for islands. While initial investment for a solar desalination system ranges from €40,000 to €400,000 depending on capacity, the long-term savings quickly justify this upfront cost. Islands currently paying 10-20 €/m³ for transported water can reduce their water costs significantly with solar desalination, as our solutions can enable clean water for 1-3 €/m³, which includes the

investment and 15 years of operational costs.

Let's break down the real numbers. A medium solar desalination solution that generates 20 m³/day costs around €120,000 for the investment, including the equipment, transport and installation on-site. The operational expenses cost around €3,000 for a medium-scale solar desalination solution. This means that after 15 years, the corresponding water rate is around 1.5 €/m³, providing a significant **return on investment** compared to water imports.

Beyond direct cost savings, solar desalination eliminates several hidden expenses associated with water imports. You no longer need to maintain large storage tanks for irregular deliveries, deal with supply chain disruptions during storms, or manage the logistics of coordinating water shipments. Most island applications see their solar desalination systems become cost-effective within the first few years, after which they enjoy decades of low-cost water production with minimal operational expenses.

How reliable is solar desalination during cloudy days or storms?

Reliability concerns about solar-powered systems during adverse weather are understandable, but modern solar desalination incorporates multiple features to ensure **continuous water production**. Battery storage systems maintain operations during cloudy periods, while hybrid configurations can connect to grid power as backup when needed. Most importantly, water storage tanks provide a buffer supply that ensures consistent water availability even during extended periods of poor weather.

These systems have proven their reliability in hurricane-prone regions across the Caribbean and Pacific. The containerized designs protect sensitive equipment from storm damage, while robust construction using marine-grade materials ensures longevity in harsh coastal conditions. Remote monitoring capabilities allow operators to track system performance from anywhere, receiving alerts if any issues arise and enabling proactive maintenance.

During typical cloudy conditions, systems continue operating at reduced capacity while drawing on battery reserves. A well-designed installation includes sufficient water storage to cover several days of consumption, providing peace of mind during storm seasons. The combination of energy storage, water storage, and optional grid backup creates a resilient system that maintains water security

regardless of weather conditions.

Which small islands have successfully implemented solar desalination?

Solar desalination has transformed water security for small islands across the Caribbean, Pacific atolls, and remote coastal communities worldwide. These successful implementations share common characteristics: populations under 10,000, limited natural freshwater resources, high energy costs, and economies dependent on tourism. Islands in regions like the Caribbean and Pacific have particularly benefited from this technology due to their abundant sunshine and pressing water needs. Please find several reference projects listed below and many more here:

- Australia
- Bahamas
- New Caledonia
- Madagascar
- Philippines

The most successful island implementations typically serve resorts, small communities, and private properties where traditional water sources prove either scarce or prohibitively expensive. These islands often faced water costs ranging from 10-20 €/m³ before implementing solar desalination, making the economic case particularly strong. Tourism-dependent islands have found solar desalination especially valuable, as it ensures reliable water supply for guests while supporting sustainability goals.

We at Elemental Water Makers have installed systems in 35 countries, helping islands achieve water independence through our plug-and-play solar desalination solutions. Our efficient desalination technology has proven particularly effective for small island applications, where energy efficiency and reliability are paramount. These systems continue operating reliably for over 10 years in harsh coastal conditions, providing islands with long-term water security.

Frequently Asked Questions

What maintenance is required for solar desalination systems on small islands?

Solar desalination systems require minimal maintenance, typically involving monthly inspections, quarterly membrane cleaning, and annual membrane replacement. Most maintenance tasks can be performed by local staff with basic training, eliminating the need for specialized technicians. Remote monitoring systems alert operators to any issues before they become critical, and the chemical-free operation means no hazardous materials handling is required.

How do I determine the right system size for my island's water needs?

Calculate your daily water consumption by multiplying the number of users by 150-200 liters per person for residential use, or 300-500 liters for resort guests. Add 20% buffer capacity for peak demand and future growth. For example, a 50-room resort with 70% occupancy needs approximately 35,000 liters daily, suggesting a 40,000-liter capacity system to ensure adequate supply during full occupancy.

Can solar desalination systems handle varying salinity levels around islands?

Yes, modern solar desalination systems automatically adjust to salinity variations common in island environments, from oceanic levels (35,000 ppm) to brackish lagoon water (5,000-15,000 ppm). The systems include sensors that monitor input water quality and adjust operating parameters accordingly, ensuring consistent fresh water output regardless of source water conditions. This adaptability is particularly valuable for islands with seasonal salinity changes due to rainfall or tidal variations.

What happens to the concentrated brine discharge from the system?

Solar desalination systems produce brine that's typically 1.5-2 times more concentrated than seawater, which is safely dispersed back to the ocean through proper discharge methods. Modern

systems use diffusers to quickly mix brine with surrounding seawater, minimizing environmental impact. Some islands even utilize the mineral-rich brine for salt production or aquaculture applications, turning a byproduct into an additional revenue stream.

How quickly can a solar desalination system be installed on a small island?

The installation time depends on the size of the system. Small systems typically take a few days to install, while larger systems may require several weeks. The modular design allows most components to be pre-assembled off-island, minimizing on-site construction time. The rapid deployment compared to traditional infrastructure projects means islands can achieve water independence within months of project initiation.

What financing options are available for small island communities?

Several financing models make solar desalination accessible for islands, including lease-to-own programs, water-as-a-service contracts, and green energy grants. Many systems qualify for renewable energy incentives and climate adaptation funding. Some suppliers offer performance-based contracts where payments are tied to water production, reducing financial risk for island communities while ensuring system reliability.