Mobile Seawater Desalination Systems

Potential for Water Resource Development in Pacific Island Countries

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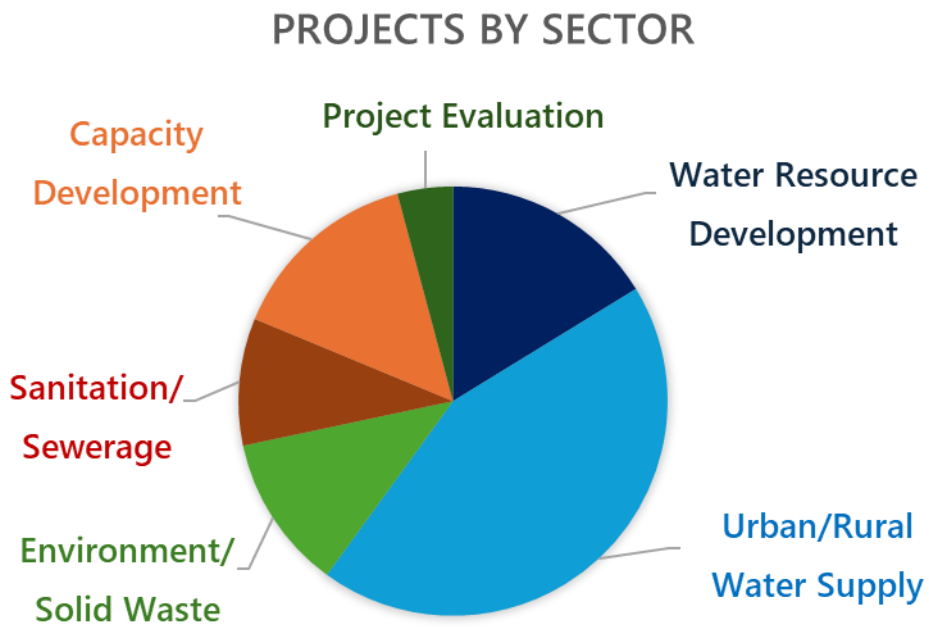
Kiyoko TAKAMZAWA
Senior Consultant
ktakamizawa@jat.co.jp

Japan Techno Co., Ltd.
https://www.jat.co.jp/english/

Company Profile of Japan Techno Co., Ltd.

【Business sectors】
Water resource development, Water supply, Sewerage/sanitation, Environment/waste management, etc

【Regional distribution of overseas projects】
Africa, Middle East, South Asia, Southeast Asia, Pacific, Central America, South America



Water Issues in Pacific Island Countries (PICs)

Geographical Condition	Groundwater Scarcity	Unstable Rainwater	Need for Infrastructure
Small, dispersed islands Limited land area Vulnerable to natural disasters	Depletion of freshwater lens Seawater intrusion Pollution with domestic wastewater	Chronic droughts Limited catchment area Contamination risk	Urbanization and population movement Aging infrastructure Uneven service coverage

Seawater Desalination
as New Water Source and Emergency Backup

1. Leakage reduction and NRW control
2. Distribution management
3. **Disaster preparedness and response**
4. O&M cost reduction
5. **Securing new water sources**
6. Data management

Characteristics of the Water Sector in PICs

【Water Sector in Pacific Island Countries】

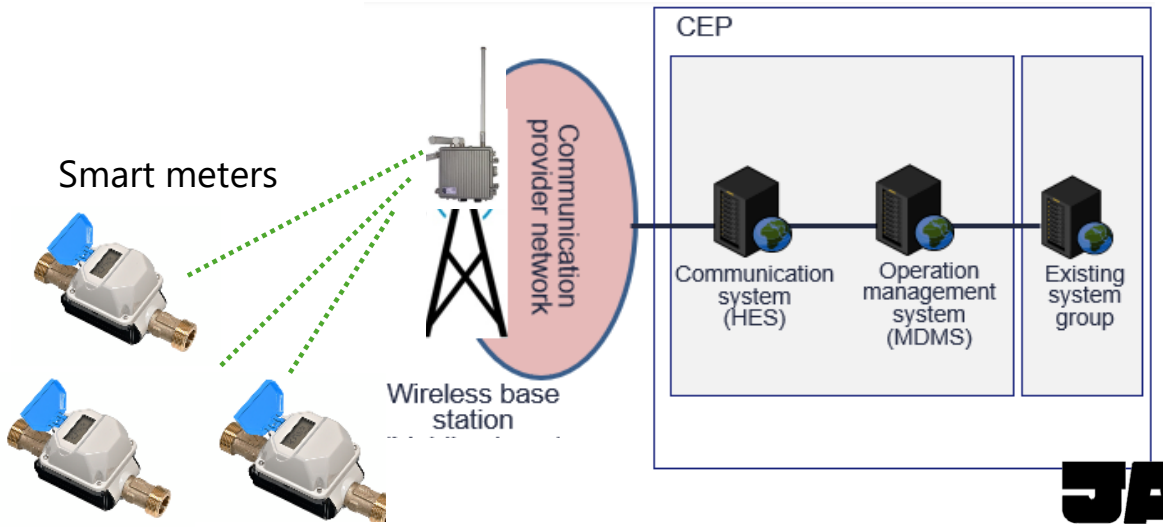
- **Small-scale entities and resource constraints**: With a small user base per entity and **limited budgets for spare parts procurement and O&M**, sustained use of sophisticated equipment is challenging.
- **Unstable financial foundations**: An economy heavily reliant on tourism, coupled with reduced visitor numbers due to disasters and pandemics, directly impacts water utility revenues, leading to insufficient funds for facility renewal.
- **Trends in International Cooperation**: Support is provided by JICA and ADB. For example, in Palau, **"Water Supply Improvement Plan"** is underway, aimed at replacing ageing pipes and reducing non-revenue water (NRW).

	Palau	Japan
Area and Population	Approx. 460 km^2 · Approx. 18,000 people	Approx. 378,000 km^2 · Approx. 125 million people
Water supply coverage	Urban areas nearly 100% (nationwide figure not compiled)	Approximately 98%
User scale per Utility	One utility serves approximately 18,000 people nationwide	Average several tens of thousands (approx. 1,500 utilities)
Major water sources	Surface water/reservoirs (drought risk)	River water, dams, some groundwater
NRW rate	Approximately 48% (urban systems)	Approximately 5–10%

Project Experiences in PICs

【Experience in Palau】

Project title	**Project for the Improvement of Water Supply System in Koror and Airai, Palau** (JV member)
Target area	Water supply region within the Koror-Airai Water Distribution System
Population	Approximately 14,000 people (as of 2013)
Key problems	- High water losses (NRW) due to aging asbestos cement pipes and leaks - Imbalanced water pressure and unreliable supply in some areas
Project components	- Replacement of old asbestos pipes with new PVC pipes (about 13 km of distribution lines) - Installation of smart water meters and flow meters to improve billing and monitoring - Strengthening of water supply management through leak detection equipment and training



Experiences in Other Countries (Asia, Africa etc.)

【Experience in Tunisia】

Project title	**Project for the Construction of an Advanced Sewage Treatment Plant in Gabes, Tunisia**
Target area	Within Gabes Wastewater Treatment Plant in Gannoun City in southern Tunisia
Key problems	- Severe water scarcity and insufficient industrial water due to high-salinity groundwater - Unused secondary treated effluent from existing wastewater treatment plants
Project components	- Construction of a new advanced sewage treatment facility with a treatment capacity of 6,000 m^3/day - Membrane treatment system combining Membrane Bioreactor (MBR) and Reverse Osmosis (RO) - Supporting the O＆M for approx. 10 years to establish an efficient and stable operational framework

Desalination Plant in Maldives

Desalination Plant in Tunisia

Solar Panels in Tunisia

Disaster Response and Mobile Water Treatment

【Truck-mounted water treatment unit】

- **Different treatment processes:** Surface water (sand filter, ceramic filter), saline water (RO filter)

【Lessons learnt】

- **Rapid deployment:** Advance planning of water sources, transport routes, storage tanks, and beneficiary awareness etc. for rapid deployment.
- **Logistics**: Securing personnel and funding to enable operation during disasters
- **Operator training**: Technical support for water operators in formulating “Emergency Water Supply Plan” is essential for efficient operations.

Truck-mounted Treatment Unit (Sand Filter)

Truck-mounted Treatment Unit (RO Filter)

Capacity Building Training

Concept of Mobile Seawater Desalination Unit

【Assumed use cases】

- **Post-disaster**: Directly supply drinking water from the seaside without waiting for the restoration of contaminated rainwater tanks or damaged pipework.
- **Supplementary supply to remote/tourist islands**: Cover shortfalls in production capacity during temporary increases in demand, such as during tourist seasons or events.
- **Drought backup**: Serve as an emergency water source when groundwater become brackish due to reduced rainfall

【Basic specifications】

- **Processing capacity**: Designed as a small-scale decentralized system, envisaged as a flexible solution bridging existing RO plant capacity and new production wells.
- **Power supply**: Aiming for 24-hour operation via a hybrid system combining solar power and generator.

Features of Vessel-mounted Systems

Features	Truck-mounted	Vessel-mounted
Accessibility	For islands with roads	Wide-area coverage including remote islands
Storage & maintenance	Garage/land-based maintenance	Port & dock facilities required
Ease of capacity expansion	Vehicle size restrictions	Expansion depending on vessel tonnage


Source: Japan Water Resources Agency


Source: https://marinewp.com/

【Unique advantages of vessel-based systems】

- Providing sustainable water supply services by visiting multiple islands lacking proper water infrastructure
- The flexibility to supply water to areas where water services have been interrupted due to natural disasters.

【Marine-specific constraints】

- Measures are required to address difficulties in berthing due to waves and membrane blockage caused by the ingestion of suspended marine particles.

Configuration of Vessel-Mounted Systems

【Equipment layout on the vessel】

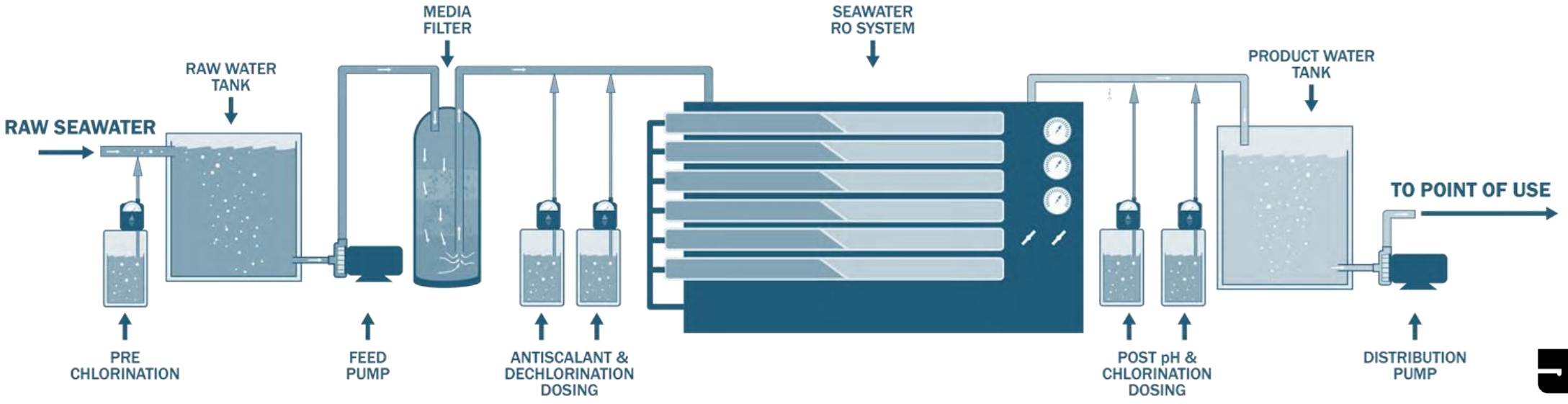
- **Raw water intake section**: Seawater intake from the hull bottom or sides.
- **Pre-treatment and RO unit**: A pre-filter to remove seawater turbidity and an RO membrane to remove salt.
- **Storage tank**: Temporarily stores generated freshwater to facilitate transfer to land.
- **Autonomous Power Supply**: Combination of solar panels and diesel generators for resilience against power outages.

【Operational flow】

Port entry → Water intake and treatment → Water supply and transfer to land → Proceed to next island (patrol)

【Safety & Environmental considerations】

Chemical management, brine discharge handling, etc.



Procurement and Operational Challenges

【Vessel procurement & business model】

- **Existing** vessel conversion vs **Newbuild**
- **Public ownership** vs **Private charter**
- Peacetime utilisation (tourism support, construction water supply, etc.) and standby costs during emergencies.

【Operational sustainability】

- **Capacity Building**: Provide ongoing training to local staff on RO membrane cleaning and electrical system maintenance.
- **Securing Spare Parts**: Establish a supply chain (in collaboration with private sector) ensuring parts reach even isolated environments in island countries.
- **Risks and Responses**: Address deficiencies in management capacity and difficulties in fee collection through transparency enabled by Japanese IT technologies

	Major Procurement Scheme	Characteristics (Funding/Operating entity)
ODA	Bilateral ODA/ Multilateral Financing	Funded by donor contributions, operated by public entities
PPP	Concession/ Availability Payment	Private investment & operation, with government paying long-term usage fees
Private	Off-taker Agreement / CSR Donation	Private water production and corporate demand, or free provision

Summary and Discussion

【Summary】

1. The water resources of Pacific island nations are highly vulnerable to climate change and disasters, making vessel-mounted equipment effective as “**mobile infrastructure**”.
2. This system complements existing rainwater and groundwater infrastructure, providing redundancy to secure survival lines during emergencies.
3. The key to success lies not merely in equipment provision, but in delivering a **package combining Japanese operation and maintenance expertise with local capacity building**.

【Questions for participants】

Q1. *In what scenarios might mobile desalination prove useful?*

Q2. *What operational or regulatory concerns are particularly noteworthy?*

Please share your specific and practical needs for a resilient future for Pacific Island nations.

Thank you for your attention!