**LAGI 2025 Fiji**

# Tanoa: The Bowl of Life

## Introduction

In Fijian culture, the *tanoa* is a sacred wooden vessel used in traditional kava ceremonies that bring people together in dialogue, celebration, and communal decision-making. Carved from a single piece of wood with a shallow, circular form, the tanoa represents the heart of Fijian hospitality and collective wisdom. Just as the traditional tanoa gathers people and distributes a shared resource that nourishes community bonds, our design "Tanoa: The Bowl of Life" creates a gathering place that collects, transforms, and distributes the natural resources of sun and rain to serve the needs of Marou Village. This reimagining of the tanoa as sustainable infrastructure honors Fijian cultural heritage while addressing pressing contemporary challenges of energy independence and water security.

## 1. Concept Narrative

Tanoa: The Bowl of Life is a freestanding, multifunctional community structure inspired by the form and meaning of the traditional Fijian *tanoa* — the ceremonial kava bowl that symbolizes unity, dialogue, and shared resource. While deeply respectful of the cultural significance of the original object, this project reimagines the *tanoa* as a vessel that gathers not just people, but also nature's abundance: **sunlight, rainwater, and collective purpose**.

Its wide, circular design (**27.0 meters** in diameter and **9.6 meters** high) captures both energy and water, while creating a shaded, communal space beneath. The structure provides **528 m$^2$** of usable shaded area (beneath the main bowl structure) and is built from locally available materials, primarily treated structural bamboo, merging cultural symbolism with resilient infrastructure. The structure is positioned to align with existing village pathways, creating natural circulation patterns beneath.

The underside of the structure provides a wide, shaded plaza for **village gatherings, storytelling, school sessions, celebrations, or ceremonies**. Its open layout encourages participation across generations and functions seamlessly with village rhythms — including early morning and evening use, when peaks in energy and social activity occur. The structure becomes a cultural heart and practical backbone, reinforcing both tradition and adaptation.

Cultural motifs, carvings, and interior details will be designed **in close consultation with the community of Marou**. During the prototyping phase, we will convene a series of design workshops with village elders, artists, and youth to incorporate traditional patterns, stories, and symbolic elements into the structure. This collaborative process will ensure the final piece respects and celebrates Fijian cultural heritage while meeting practical needs.

At once iconic and pragmatic, Tanoa: The Bowl of Life represents a hopeful intersection of tradition, sustainability, and community-led future-making.

## 2. Technical Narrative

**Energy:** The interior slope of the shallow bowl is lined with **528 $m^2$ of photovoltaic (PV) panels**, installed along a gentle radial curve optimized for solar gain and rain capture. The selected PV modules will be compliant with **IEC/UL standards** and carry a minimum **25-year performance warranty**. This solar system provides a **75-100 kW mini-grid**, achieving the **minimum 75 kW capacity** required by the design brief. This capacity significantly exceeds the peak energy demand of Marou Village (estimated at 17 kW) and comfortably covers all daily use. According to regional modeling, the system generates approximately **374 kWh of electricity per day**, against an average daily consumption of **244 kWh**, leaving a **surplus of 130 kWh**.

The system incorporates **250 kWh of lithium iron phosphate (LFP) batteries** housed in a sealed, elevated technical enclosure beneath the central portion of the structure. This capacity exceeds the 98 kWh overnight demand, providing approximately 2.5 days of autonomy during cloudy periods. The batteries are arranged in modular 10 kWh units for easy maintenance and future expansion.

The 130 kWh daily surplus will power: (1) a 5 kW ice-making system producing 250 kg of ice daily for fish preservation, (2) a community charging station for devices and small batteries, (3) path lighting for nighttime safety, and (4) pumps to distribute harvested water throughout the village. This addresses specific needs identified during community consultation.

**Water:** Rainwater is collected across the full **586 $m^2$ projected circular roof area** and guided via a central funnel system into an integrated **cistern** located within the structure's base, providing protection and thermal stability. Based on Marou's average annual rainfall of **1,250 mm**, the structure is expected to harvest approximately **732,500 liters of rainwater per year**. While the guideline suggests aiming for ~900,000 L storage, this harvested volume, combined with a planned **storage capacity of approximately 750,000 liters** within the internal cistern, significantly enhances water security, extending resilience by an estimated 2 months during the critical dry season (May-October).

Before distribution, water from the cistern undergoes a **four-stage filtration process** designed for effectiveness and local maintainability: (1) first-flush diverter removing initial roof contaminants, (2) mesh pre-filter, (3) slow sand filtration, and (4) activated carbon polishing. To enhance community understanding and allow for easy inspection, the **sand and carbon filter tanks will be constructed from clear, durable materials like food-grade polycarbonate or glass**. Filtered, potable water meeting WHO standards will then be held in a smaller, separate **clear inspection tank** before being pumped for village use.

**Structure & Materials:** The structure employs a radial truss system using locally sourced structural bamboo (e.g., treated *Bambusa vulgaris* or *Dendrocalamus asper*) known for its strength and sustainability. Engineered joints utilize stainless steel connectors and natural fiber binding techniques. The 12 main supports are anchored 2 meters into the ground using reinforced concrete footings, designed to withstand **280 km/h cyclone winds**. The bowl's aerodynamic profile minimizes wind resistance, while the perforated center allows pressure equalization during storms.

**System inputs:** Solar radiation, rainwater **System outputs:** AC/DC electricity, potable water, ice for cooling, community gathering space

## 3. Prototyping and Pilot Implementation Statement

Prototyping will take place **on-site in Marou Village** using a participatory design-build approach. Drawing on existing knowledge in bamboo architecture from regions like Indonesia and Thailand, and integrating local craftsmanship, the project will be implemented in collaboration with community members from the outset. Prototyping phases will allow for **live testing of water catchment (including flow into the cistern), filtration performance (visualized through the clear tanks), solar performance, and spatial flow**, adapted based on user feedback.

A workshop-based knowledge transfer program will train 10-15 village members in construction techniques, creating a skilled local workforce. Four community members will receive specialized training in PV system monitoring, basic electronics repair, and water system maintenance (including filter media replacement), forming a maintenance team with defined roles and succession planning. Quarterly refresher workshops maintain skill levels.

During the prototyping phase, we will convene a series of design workshops with village elders, artists, and youth to incorporate traditional patterns, stories, and symbolic elements into the structure. This collaborative process will ensure the final piece respects and celebrates Fijian cultural heritage while meeting practical needs.

The central water collection system connects to the village's stormwater channels, helping mitigate erosion during heavy rains while also testing water flow management. The prototyping phase will include several small-scale test structures to evaluate material performance (including bamboo treatment effectiveness) in local conditions before final construction.

A local team will be assembled and trained during construction, ensuring that the final version is **both community-owned and community-understood**.

## 4. Operations and Maintenance Statement

The Bowl of Life is designed to be **community-operated and easily maintained**. The photovoltaic array is mounted at an angle and height that allows for safe and regular cleaning from designated access points. The water storage and filtration systems require only periodic upkeep. The **clear filter tanks allow for easy visual inspection** of the filter media (sand, carbon) and water clarity, simplifying monitoring. The four-stage filtration system is designed to be maintained by local operators with minimal training, with sand media replacement occurring on a scheduled quarterly basis.

Treated bamboo and reinforced joints make for a long-lasting structure that can be repaired using locally available materials and skills. The radial bamboo truss system with engineered joints using stainless steel connectors and natural fiber binding techniques can be inspected and repaired by trained community members.

During the prototyping phase, a group of **local stewards** will be trained to manage inspections, coordinate repairs (structure, PV, water systems), and oversee educational use. This model builds long-term resilience and reduces dependence on outside maintenance or funding. The energy system monitoring will be simplified with visual indicators of system health and maintenance needs, allowing non-technical operators to identify when expert assistance is required.

Community members will receive training in basic troubleshooting of the electrical components, while more complex technical issues can be addressed through a remote support partnership with technical schools in Fiji, creating educational opportunities for students while providing needed expertise to the village.

## 5. Environmental Impact Assessment

The Bowl of Life minimizes environmental impact while strengthening local ecological systems. It requires minimal deep foundations and uses **renewable, locally sourced bamboo**, reducing transportation emissions and supporting local resources. The structure employs a radial bamboo truss system with engineered joints using stainless steel connectors and natural fiber binding techniques. The 12 main supports are anchored 2 meters into the ground using reinforced concrete footings, designed to withstand 280 km/h winds.

The energy system displaces carbon-emitting sources, while the rainwater system reduces reliance on potentially strained groundwater resources. The central water collection system connects to the village's stormwater channels, helping mitigate erosion during heavy rains. The structure's orientation is optimized to face north for maximum solar exposure in the Southern Hemisphere.

Construction and prototyping will be monitored for potential effects on local flora, soil drainage, and micro-ecosystems, with mitigations such as runoff buffering or natural plant reintegration where needed. During construction, temporary silt fencing will be used to prevent soil erosion, and disturbed areas will be revegetated with native species.

Because the design collects resources from the sky rather than extracting from the land, its footprint is **light, regenerative, and symbolic of a new way forward** — one that listens to the earth and its people at the same time.

## 6. Cost Efficiency

This project is designed to meet the critical cost constraint of **≤ $15 USD per Watt installed (CAPEX)** outlined in the LAGI 2025 guidelines. Cost efficiency is achieved through:

**Material Selection:** Prioritizing locally sourced, treated bamboo significantly reduces material and transportation costs compared to conventional materials.

**Community Participation:** Utilizing a trained local workforce for construction and maintenance under the participatory design-build model lowers labor costs and fosters ownership.

**Standardized Components:** Employing readily available, standards-compliant PV panels and modular LFP battery systems leverages economies of scale.

**Integrated Design:** Combining energy generation, water harvesting, and community space into a single structure optimizes resource use.

A detailed cost breakdown demonstrating adherence to the ≤ $15/Watt target will be provided as a supplementary document, outlining projected expenses for materials, specialized components (PV, batteries, controllers, pumps), transportation, training, and contingency.

## 7. Replicability and Scalability

The "Tanoa: The Bowl of Life" concept possesses inherent qualities that support replicability and scalability in similar contexts:

**Modular Systems:** The energy storage (modular batteries) and potentially the water filtration components can be easily scaled based on specific community needs.

**Adaptable Form:** While culturally specific to the *tanoa*, the underlying principle of a bowl-shaped structure for combined solar collection, water harvesting, and shelter is adaptable. The diameter and height can be adjusted.

**Bamboo Construction:** The use of engineered bamboo construction techniques, once mastered through the initial project and training, can be replicated using local resources in many tropical regions. Standardized joinery designs can facilitate this.

**Participatory Model:** The process of community co-design, training, and stewardship is a replicable social framework for implementing sustainable infrastructure projects elsewhere.

This design offers a template that balances cultural resonance with universal needs for energy, water, and community space, making it suitable for adaptation in other rural or island communities facing similar challenges.