**LAGI 2025 Fiji Narrative**

**I. Concept Narrative**

Our proposal for LAGI 2025 Fiji introduces a modular photovoltaic pavilion rooted in local construction knowledge and responsive to the environmental dynamics of Marou Village. The structure provides clean electricity, water harvesting, and shaded communal space, while offering a replicable framework for self-reliant infrastructure across remote island terrains.

Drawing from Fijian traditional local architecture and situated through an initial study of site shadows and slope, the intervention orients itself to support passive water collection, optimal solar exposure, and seasonal land use. The design is raised on stone plinths in alignment with traditional bure foundations, providing airflow beneath the structure, protection during flooding events, and space to integrate the modular cistern and bladder-based water storage system. These systems are embedded into the base platform and partially expressed through surface channels and low retaining walls—visible enough for maintenance access and communal awareness, while minimally intrusive in the landscape.

The pavilion’s frame is constructed from locally harvested bamboo, selected for its carbon-sequestering properties, lightweight transport, and renewability. Joints reference indigenous lashing and binding techniques, adapted for structural stability under cyclone conditions. All material selections emphasize locally sourced or regionally available resources, minimizing transport emissions and supporting regional economic participation.

A key innovation is the foldable photovoltaic roof system, which uses mechanical pivots and tensioned joints to respond to high winds. The PV modules are manually operable, with a passive safety trigger that allows the system to release and fold shut when wind speed thresholds are exceeded. After storms, the system can be reset via simple pulley-and-cord mechanisms. Beneath the panels, a secondary surface on a parallel rail system collects rainwater and funnels it to the integrated storage units. This dual system minimizes reliance on imported parts and supports hands-on local maintenance.

The pavilion supports a spectrum of daily and seasonal activities. Programmatic zones include shaded workspaces for agricultural processing (e.g., cassava peeling or seed drying), semi-private gathering areas, and informal rest points for individuals moving through the site. Paths curve through zones of activity labeled “arrive,” “linger,” “pause,” and “grow,” shaping rhythms of movement and engagement. These designations correspond with seasonal farming cycles and shade patterns mapped in the early phases of design.

Overall, the installation is conceived not as a monument but as a shared socio-technical node—supporting infrastructural independence while reinforcing cultural continuity. Its modularity allows it to scale or replicate across similar terrains and climates, and its construction process is designed to invite local collaboration and future adaptation. By embedding energy and water production within a resilient and socially active architecture, this design serves as a proof-of-concept for grounded climate adaptation across island communities.

**II. Technical Narrative**

The core technical systems of this project are designed for resilience, modularity, and community operability. The installation incorporates a 75 kW solar photovoltaic (PV) array, a manual and passively-actuated folding mechanism, and a dual-source water harvesting and storage system. These systems work in tandem to provide year-round energy and water while minimizing mechanical complexity and maximizing material efficiency.

**Energy System**

The photovoltaic system is composed of standard PV modules mounted on a bamboo-framed structure with a foldable rail and hinge mechanism. Under normal conditions, the panels remain deployed to maximize solar gain. During severe weather events (e.g. cyclones), the system’s passive safety trigger allows the structure to fold inward automatically based on wind force thresholds. This trigger is mechanical and gravity-assisted, with no need for electricity or sensors. Once conditions stabilize, the system can be manually reset via rope-and-pulley operation by local users.

The system is designed to meet or exceed 75 kW nameplate capacity. This energy supports:

* Household lighting and appliance use across 67 homes
* Refrigeration and cold storage for fish and medicine
* Water pumping and treatment systems
* Communal energy uses: education, digital devices, tool use, and low-power cooking
* Future expansion of mini-grid uses (e.g. street lighting, refrigeration nodes)

Energy generation is supplemented by a battery storage system, designed to provide 24-hour access. Lithium iron phosphate (LFP) batteries are the default option due to their safety, cost-effectiveness, and availability, but the system is adaptable to more locally appropriate solutions should new options arise.

**Water Systems**

The design incorporates two distinct water systems:

1. Rainwater Harvesting: Rain is collected via angled, gutter-integrated sub-surfaces beneath the PV modules and channeled to cistern bladders embedded within the stone foundation. These cisterns are modular and accessible, allowing for both visual monitoring and low-tech maintenance. This system provides a consistent supply of clean water during the wet season and supplements existing polyethylene tank storage already used by the village.
2. Passive Flood-Responsive Landscape System: Drawing from erosion and water flow mapping, the site includes shallow swales, rain gardens, and regraded channels that direct stormwater toward infiltration basins and bioretention zones. These features help reduce soil loss, slow water movement, and support seasonal recharge of the groundwater table.

Together, these systems support water security across dry and wet seasons while minimizing reliance on imported filtration technologies. Should additional purification be needed, a low-power reverse osmosis system can be integrated as a fallback.

**Inputs and Outputs**

* Inputs: Solar radiation, rainwater, wind force (as a trigger)
* Outputs: Electricity (AC/DC), potable and non-potable water, shaded space, agricultural co-benefits

Every element is selected to support manual assembly, minimal import reliance, and durability in salt-air, high-humidity, and storm-prone environments. The integrated systems prioritize low operational overhead and high community control, forming a robust infrastructure suited to remote island implementation.

**III. Prototyping and Pilot Implementation Statement**

Our team proposes a phased and community-led approach to prototyping and full-scale implementation. The process is grounded in iterative testing, modular assembly, and deep collaboration with the residents of Marou Village and relevant regional partners.

**Prototyping Phase**

The initial prototype will focus on a scaled module of the bamboo structural system, the foldable PV mechanism, and one unit of the integrated water storage platform. This module will be fabricated off-site using locally sourced bamboo (from neighboring islands, pending supply chain confirmation), volcanic stone, and standard PV hardware. Prototyping will take place in Fiji, in collaboration with regional partners and skilled craftspeople, allowing for material adaptation, joint testing, and safety validation in alignment with cyclone resilience criteria.

We will test:

* Manual and passive actuation of the PV folding system in response to simulated wind conditions, kinetics and efficiency of joints/rail construction for folding mechanisms
* Weight-bearing performance of the bamboo frame and stone platform
* Water runoff capture efficiency and gutter flow rate
* Ease of access for water storage maintenance, ease of access to stored water, filtration efficiency and grade change needed for effective water movement through system

Feedback loops will be built into each phase, including review sessions with Marou residents and local technical advisors. Where feasible, adjustments to detailing and assembly methods will be made based on direct user input.

**Full-Scale Pilot Implementation**

The full-scale pilot will be implemented as a modular cluster of 3–5 interconnected pavilion units within the designated LAGI energy site. The foundation work will be done in partnership with local masons using stone sourced from the island or surrounding areas. Bamboo will be processed on-site if possible, using training workshops to involve young community members in joint preparation, treatment, and framing. Assembly will use low-tech joinery systems that can be maintained or replaced locally over time.

Collaboration with the community will be structured in three key ways:

1. Design-to-Build Workshops: Hands-on training for residents in bamboo joinery, panel folding mechanics, and cistern maintenance.
2. Programming Consultations: Participatory planning for how each spatial zone (“pause,” “linger,” “work,” etc.) is used, programmed, and maintained seasonally.
3. Knowledge Transfer: Local documentation of the system’s design logic, construction process, and maintenance protocols in both visual and oral formats to ensure long-term cultural retention and technical continuity.

We will work alongside the Fiji Rural Electrification Fund (FREF), ASU’s LEAPS program, and the Fiji Arts Council to align the pilot with broader infrastructural and cultural initiatives. Our team commits to remaining involved during the pilot build phase as technical support and design liaisons, ensuring clear handover to the Marou community.

This pilot will not only serve Marou Village but will act as a scalable model for other off-grid island communities facing similar climate and resource challenges.

**IV. Operations and Maintenance Statement**

The long-term success of this installation relies on low-maintenance systems, intuitive operation, and embedded local ownership. All components have been selected and designed with these goals in mind: to minimize external dependencies, withstand local environmental pressures, and foster confidence and agency within the Marou Village community.

Operations

Daily operation of the system requires minimal input:

* The photovoltaic array functions autonomously under normal conditions.
* During cyclone warnings or high-wind events, the foldable PV modules are designed to automatically retract via a mechanical wind-release trigger. After the storm, residents manually reset the system by pulling a cord to redeploy the panels.
* The rainwater collection gutters are cleaned seasonally, and the collected water is gravity-fed into storage tanks for direct community use.

Electricity from the system feeds into a mini-grid managed locally, in coordination with technical partners such as FREF and ASU. Energy will be prioritized for essential services—lighting, refrigeration, water pumping, and communication—and may be distributed via a village-based energy committee, depending on Marou’s governance preferences.

Water systems, including modular bladders and cisterns, are equipped with basic filtration screens and overflow controls. These components are intentionally accessible and visible, inviting regular interaction and community monitoring. Overflow channels from these units help irrigate nearby gardens, increasing site productivity and supporting agroecological practices.

**Maintenance**

Maintenance is designed to be manual, visible, and teachable. No complex tools, proprietary parts, or software interfaces are required for essential tasks. Maintenance responsibilities will be shared by a small group of trained residents through a rotating stewardship model.

Key tasks include:

* seasonal inspection and cleaning of PV modules
* Checking and resetting the folding system after storms
* Monitoring battery health (with digital indicators)
* Clearing water filters and rain collection gutters
* Inspecting bamboo structure for wear, rot, or insect damage

The bamboo framing system is designed for easy repair and modular replacement. Community members trained during the construction workshops will have the knowledge and tools to replace structural members over time. We will also provide a detailed maintenance manual with step-by-step illustrations and bilingual (Fijian and English) explanations, co-developed with residents for clarity and accessibility.

Where necessary, external support from technical partners (FREF, ASU, or others) can be accessed for advanced tasks such as inverter replacement or battery maintenance. However, the goal is for 95% of upkeep to be performed locally.

As the system becomes familiar to residents, it can also serve as a training ground for younger generations—both as a learning opportunity and as an infrastructural anchor for broader climate adaptation practices. The installation is not only a technical object but a civic and cultural asset, maintained through shared use and care.

**V. Environmental Impact Assessment**

The proposed installation is designed to minimize ecological disturbance, enhance local resilience, and offer net-positive environmental impact across its full lifecycle. Material selection, siting strategy, and system design all reflect a deep sensitivity to the natural systems of Naviti Island and the specific vulnerabilities of Marou Village.

**Construction Phase**
All primary construction materials—bamboo, stone, and thatch—are either sourced locally or from nearby islands to reduce embodied carbon and transport emissions. Bamboo, in particular, is a rapidly renewable material with strong carbon sequestration properties. Harvesting will follow regional best practices to ensure forest health and future regrowth. Bamboo offcuts can be repurposed as garden fencing, compost structures, or future construction elements.

The stone foundations, while durable and weather-resistant, will require limited site excavation. These platforms are designed to raise the installation above seasonal flood levels, allowing water to pass through the site without obstruction and avoiding the need for artificial fill or extensive grading. Foundation work will be conducted with hand tools wherever possible to limit noise, emissions, and erosion.

Logistics for materials will account for shallow tide conditions and seasonal accessibility. The modular nature of the design means that components can be transported via skiffs or small barges, eliminating the need for invasive staging areas or heavy equipment on-site.

**Operational Impact**
Once installed, the pavilion has zero greenhouse gas emissions and does not rely on fossil fuels. The photovoltaic system provides a capacity of 75 kW of renewable electricity, displacing costly and polluting diesel fuel use. The rainwater harvesting system reduces demand on compromised groundwater sources and helps recharge local soils through managed overflow.

Stormwater landscape elements—such as swales, rain gardens, and infiltration basins—are integrated into the topography with native plants to stabilize soils, mitigate erosion, and reduce flood severity. These features require no external energy inputs and restore rather than disrupt the watershed.

All battery systems are housed in weatherproof enclosures to prevent leakage or contamination. End-of-life recycling plans for batteries and PV modules will follow FREF and Fiji DOE protocols.

**Ecological Sensitivity**
No living materials from outside the island will be introduced. All plantings are native or locally adapted species, and the structure is sited to avoid existing root systems and riparian paths. The open base of the platform allows for unobstructed movement of small animals, insects, and water, maintaining habitat continuity.

Lighting, if added, will use low-lumen, downward-facing LEDs to reduce light pollution and minimize impact on nocturnal wildlife.

The long-term presence of the pavilion is intended to regenerate site health, serve as a climate refuge, and reinforce the interconnectedness of built and natural systems.

In sum, the environmental footprint of this project is not only minimal—it is a catalyst for landscape repair, climate adaptation, and ecological stewardship.