**LAGI Fiji - Ray**

“Here in the Pacific we are motivated by the desire to adopt alternatives. It is a matter of survival.”

― Prime Minister Sitiveni Rabuk

**Concept Narrative**

Our proposal exalts the basic yet extraordinary natural elements of the Fijian peninsula: the warmth of the sun, the quenching rain, and the abundant marine life. Rejecting the traditional segregation of infrastructural systems, RAY embraces the limits of Marou Village’s remote island location, integrating solar energy collection and rainwater harvesting and filtration into a single structure.

Given the challenges to construction on Naviti Island, and the severe urgency of the climate crisis, new construction must be rooted in renewable local resources, rely on labor from the villagers, and minimize reliance on fossil fuel technology. The basis of the proposal is a 75 kW array of thin-film solar cells, meeting the energy needs of Morou Village. These solar cells are much lighter than traditional technologies, making them easier and less carbon-intensive to deliver to the island. They are elevated on a pliable tension structure, constructed of materials local to the island, including bamboo rods and woven pandanus mats.

The installation takes the form from the manta rays that swim just off shore in the Fijian waters. Inspired by the gentle waving propulsion of the manta ray’s pectoral fins, the structure flexes under the weight of rainfall to become a water collector, diverting much-needed rainwater through a system of natural filters to a storage basin, for eventual distribution to the village homes.

**Technical Narrative**

The solar array is composed of approximately 80 square meters of thin-film cells, producing 75 kW of power (equivalent to approximately 12,000 kWh/year on Navati Island). We propose the use of Cadmium Telluride (CdTe) panels, a well-proven technology with one of the lowest production global warming potentials amongst solar technologies. The use of thin-film technology greatly reduces the weight and volume of the panels, easing delivery to the island. Emerging technologies such as solar-powered sea-monoplanes will reduce the carbon impact of delivery to the island, with final delivery by rowed skiffs.

The solar energy will require a small installation of Lithium Iron Phosphate batteries to accommodate the electrical demand curve, which could potentially be replaced with pumped hydroelectric storage at a later date when the existing hillside dam and reservoir can be repaired.

The flexible thin-film cells give the structure pliability, allowing it to deform under the weight of rainfall, directing the freshwater into the collection and filtration system. This structure is designed to use local materials, including bamboo stalks, magimagi coconut husk lashing, and woven pandanus mats, reducing the need for imported materials and easing repairs following storms. The use of local materials and traditional craft techniques also allows construction and maintenance of the structure to become a communal activity.

Based on historical data, we anticipate at least 1500mm of rainfall per year, yielding approximately 32,000 gallons of fresh water per year, though this could increase in the future with the installation of additional collection structures. Once collected, the water is directed through a series of natural woven pandanus mats to remove impurities, and stored in a protected retention reservoir for later distribution to homes.

**Prototyping and Pilot Implementation Statement**

The project is designed to utilize primarily local materials and construction techniques (except for the solar cells themselves), which will ease prototyping and piloting. Our intent is to first work with the community to confirm the type and scale of the natural bamboo, coconut, and pandanus resources, and to collaborate with local artisans to refine the structural approach.

One benefit of our proposal is that while the solar and water collection strategies are intended to work in tandem, they can also be individually tested. We envision smaller testing smaller individual components (such as a single support post or small section of woven pandanus mat) before assembling an entire prototype.

Our hope is that the process would be collaborative and iterative. In such an intimate and remote community, it will be essential to recognize and apply local knowledge and experience. Our design establishes an approach, but the full detail of the project can only be determined through collaborative testing and refinement.

**Operations and Maintenance Statement**

By utilizing light, renewable, and local materials, the design is readily repairable. With the severity of storms on the island, the structure is intended to be resilient in its flexibility and use of natural materials which are well-adapted to the local environment. Ongoing maintenance might include repair of the magimagi lashings, replacement of bamboo struts, and regular cleaning of the solar panels.

With the flexibility of the system, we also imagine that at longer intervals the solar cells may require replacement, and could potentially be upgraded to newer, more efficient technologies as they emerge.

**Environmental Impact Assessment**

The installation is elevated from the ground, with minimal structural landing points, to minimize its effects on flora and fauna. As a lightweight structure, we also anticipate that the installation could be periodically moved to allow the area local to the installation time to regenerate and to avoid long-term erosion of a single area.

The use of natural and local materials reduces the chemical risks to the environment, but the solar cells themselves may present some environmental risks. Regular inspections will help identify any damaged panels, which should be removed and/or replaced before they contaminate the environment.