1. **Concept Narrative**

**Design Concept**

Our design highlights hidden connections through cultural symbolism and sustainability. Inspired by the iris of an eye and the conch shell’s spiral, it represents vision, continuity, and resilience. The eye symbolizes interconnectedness—between people, nature, and communities—while the conch’s spiral reflects the ongoing cycles of cultural and environmental adaptation.

A key feature is the integration of local construction knowledge, reinforcing the Itaukei way of life. As skilled artisan builders (mataisau) decline, this project serves as an opportunity to revitalize and share traditional techniques, ensuring they remain a living part of the community.

**Materials and Shared Land Use**

The design primarily utilizes locally sourced materials: bamboo for structural elements, coconut fiber and shells for water filtration, and seashells for wind chimes. These choices minimize environmental impact while enhancing cultural relevance and accessibility.

The site is envisioned as a multifunctional community space, fostering social interaction, education, and recreation. It provides shaded gathering areas, cooling mist stations, flexible seating, and storytelling zones, encouraging cultural preservation and community engagement.

**Physical Design Components**

1. Solar and Water Funnels: These structures generate energy, collect rainwater, and provide shaded communal spaces. Centrally located, they form a recognizable landmark visible from the shoreline.
2. Story Gallery: A semi-enclosed shaded space designed for crafting, teaching, and storytelling. Featuring solar-powered LED-lit acrylic drawing boards, it fosters creativity, education, and cultural exchange.
3. Enchanted Mist Pergola: Designed for cooling relief, it utilizes harvested rainwater to create mist during hot months. In cooler seasons, seashell wind chimes provide an auditory experience, while filtered light enhances ambiance.
4. Spiral Axis Road: Solar-powered street lights are installed on both sides of the road, effectively guiding residents to the community center area at night. We also recommend extending these lights into Marou Village to enhance nighttime activity flexibility for villagers.

**UN Sustainable Development Goals**

Our design directly contributes to several UN Sustainable Development Goals (SDGs), addressing key challenges and promoting resilience within the community:

SDG 3: Good Health and Well-being – Provides shaded and misted spaces, reducing heat stress and enhancing overall well-being.

SDG 6: Clean Water and Sanitation – Implements rainwater harvesting and filtration, ensuring access to safe drinking water year-round.

SDG 7: Affordable and Clean Energy – Reduces reliance on diesel by integrating solar power, offering a sustainable energy alternative.

SDG 10: Reduced Inequalities – Improves access to clean water and stable energy, addressing disparities between Marou and more developed regions.

SDG 11: Sustainable Communities – Enhances self-reliance by reducing dependence on imported energy and infrastructure.

SDG 12: Responsible Consumption and Production – Uses locally sourced, renewable materials, minimizing waste and ecological impact.

SDG 13: Climate Action – Lowers carbon emissions by shifting from fossil fuels to renewable energy solutions.

SDG 15: Life on Land – Limits land use impact by maintaining a compact footprint, responsibly sourcing materials, and integrating native vegetation.

Through a holistic approach, this intervention strengthens community sustainability while respecting cultural traditions and environmental constraints.

1. **Technical Narrative**

**Solar Energy System**

Our design incorporates thin-film cadmium telluride (CdTe) photovoltaic panels, selected for their high efficiency (20%) and flexibility, which allows seamless integration with curved surfaces. CdTe panels are commercially available from multiple suppliers, making them a viable and cost-effective alternative to traditional silicon-based solar cells.

The installation consists of five solar funnels, each equipped with six CdTe panels, covering a total surface area of 375 m² (12.5 m² per panel). This system generates approximately 75 kW of power, producing an estimated 118.26 MWh annually. By leveraging renewable solar energy, the community can significantly reduce its reliance on diesel-generated electricity, thereby lowering greenhouse gas emissions and promoting energy independence.

Furthermore, the solar panels are designed to withstand environmental challenges, including high humidity and salt exposure, ensuring long-term durability with minimal maintenance. A quick-release mechanism allows for rapid panel removal in the event of severe weather, preventing damage and extending system lifespan.

**Clean Water Solution**

Beyond energy generation, the solar funnels serve as an integrated rainwater collection and purification system. During the wet season, rainwater is directed through a multi-stage filtration process and stored in an underground cistern, ensuring year-round water availability. This system captures approximately 834,858 liters of water annually, exceeding the five-year average rainfall in Marou (934,205.4 liters from 2019-2023).

The underground cistern has a capacity of 942,477.8 liters, allowing for surplus storage to account for extreme weather events linked to climate change. The purification process utilizes activated carbon derived from coconut husks, chitosan extracted from marine waste, and locally sourced sand and gravel. A nonwoven polypropylene membrane serves as a pre-filtration layer, ensuring high-quality potable water while minimizing dependency on imported materials.

By integrating solar energy with a sustainable water management system, our design enhances community resilience, addressing both energy independence and water security in an ecologically responsible manner.

1. **Prototyping and Pilot Implementation Statement**

Our team recognizes the importance of community involvement in successfully implementing the project. While we have studied the environmental challenges of the site, we acknowledge our limited understanding of the residents’ daily lives and traditional construction techniques. To bridge this gap, we will engage in a participatory design process that incorporates local knowledge and expertise.

Understanding Local Needs: Through direct engagement, we will learn how the community currently meets its water and energy needs, identifying challenges beyond intermittent energy access and insufficient water collection.

Documenting Traditional Construction Techniques: We will observe and document local construction methods, including small-scale logging, material sourcing, and post-disaster rebuilding efforts, ensuring the design aligns with sustainable local practices.

Collaborative Design Development: Community workshops will provide opportunities for residents to contribute to the design, ensuring it reflects their needs and cultural identity. This participatory approach fosters local ownership and long-term sustainability.

Simplified Maintenance and Repair: By co-developing straightforward repair and maintenance strategies using locally available materials, we aim to create a design that is easy to manage without relying on external resources.

The prototyping phase will involve testing scaled models, refining structural details, and ensuring feasibility before full-scale implementation. The pilot phase will be conducted in collaboration with local stakeholders, incorporating community feedback to refine the intervention and ensure long-term functionality and resilience.

1. **Operations and Maintenance Statement**

**Designed for Community Building**

The design is intended to withstand smaller storms, but specifically uses local crafting materials like bamboo and native hardwood to be repaired or rebuilt when damaged by severe winds or precipitation. It relies on traditional building techniques and community participation to be created and maintained.

**Solar Panel Attachment and Removal Method**

The solar panels cannot be rebuilt and due to their operational need to be on top of the structure, they are at higher risk for damage during severe weather. For this purpose, the attachment of the panels is designed to be tightly secure but is tied down with a quick-release and simple chain sinnet in order to be taken off before a harsh storm. It will take a single person to release one panel, but a few more to help guide the panel down safely in a controlled fall using two ropes—the original rope that bound the panel to the installation and a second rope that doubles as a decorative shell wind chime when not needed for its true function. The second rope is kept taut and guides the panel as the first rope is used to pull the panel into a controlled fall. Lifting the panel off the installation with a ladder is another option if there is time before the severe weather.

If the entire community works together, we estimate that take down of the solar panels would not take long (around 15-20 minutes, especially with practice of the techniques), and can then be stored in the Community Centre or Yasawa School so they are protected.

**Additional Elements and Considerations**

Other elements that cannot be easily rebuilt include the structures made of concrete and metal, such as the ground paving, the cistern, and the water dispenser. However, we have chosen to make these interventions prioritize longevity and as they are lower to the ground, we hope they will not experience severe impacts but we have minimized our use of non-repairable materials so that limited supplies would need to be delivered in the event of structural failure.

1. **Environmental Impact Assessment**

Our installation relies heavily on natural materials that are produced by the locals through small-scale logging and is the same materials that they rely on to build and maintain their own homes. It is meant to be sustainable through its ability to be rebuilt or repaired by the community.

We minimized the costly transportation of goods and avoided introducing materials that can decay and contaminate the local environment such as plastics or harsh chemical treatments. We aim to use only what we need and the largest environmental cost of materials will be the initial set up, as repair is intended to use less materials. However, as vegetation is fast-growing in this area, we don’t believe there will be more than a moderate small-site impact for too long.

We use concrete and rebar in limited application, and though we considered coral concrete for its aesthetic and value to a design we believe will be beloved, we decided against using a limited resource in this way. The concrete is restricted to the ground plane and the below-grade cistern as structural integrity and longevity are integral to the function and durability of the design.

Our water funnel treatment features a system of layers based on using activated carbon from discarded coconut husks as feedstock. Nonwoven polypropylene will need to be imported as the first stage of the filter. Chitosan is used as the next stage after the activated carbon, and though it needs to be refined from raw crustacean chitin (that would otherwise be marine waste), the chemicals needed to demineralize, deproteinize, and deacetylase chitin can be done outside of a lab environment (dilute hydrochloric acid and sodium hydroxide) but they will need to be imported and disposed of correctly. The final two layers feature coarse sand and gravel, and we anticipate that these resources will be locally sourced and perhaps quarried, but we will not be using an abundance of these materials.