1. Concept Narrative

Our proposal envisions an energy-generating landscape that harmonizes with the existing ecosystems, cultural traditions, and social rhythms of Marou Village in Fiji. Drawing inspiration from both natural systems and indigenous knowledge, the design integrates architecture, landscape, and infrastructure to create a multifunctional, inclusive, and resilient environment.

At the heart of the design is a network of communal structures inspired by the Bromeliad flower, with each petal-shaped canopy performing multiple roles: harvesting solar and wind energy, offering shade, collecting rainwater, and serving as open gathering spaces. These “petal roofs” are constructed using local bamboo for the frame, layered with translucent polymers and composite materials to support solar and wind functions. This floral form reflects Fiji’s vibrant vegetation and symbolizes cultural unity—each petal representing a different community function and climate adaptation strategy.

A series of modular “solar sails” made of tensile photovoltaic fabric stretch across the landscape, generating renewable energy while creating shaded public zones. Oriented with sun paths and prevailing winds, the sails double as social spaces and educational tools, showcasing energy technology as a visible and interactive part of daily life.

The Wildlife Wall, a vertical structure composed of stainless-steel mesh and bamboo columns, serves as a permeable edge between architecture and ecology. Designed with traditional Masi patterns, the wall encourages native bird habitation and enhances the symbiotic relationship between human and non-human species. Its open structure allows for unimpeded pedestrian flow and embeds cultural storytelling into material form.

Greenhouse pavilions and agricultural domes, built using parametric bamboo geometry and sustainable materials like oak, mud, and stone, support local food production and education. Inside, villagers grow staple crops such as cassava, bananas, and guava, reinforcing food sovereignty and biodiversity. Adjacent to these are water collection and channeling systems—modular, umbrella-like canopies that harvest rainwater and direct it into underground storage or natural aquifers. These movable structures help restore damaged waterways and are easily maintained by the community.

The project also includes a "Village Energy Station", a civic anchor combining hydroelectric systems with communal functions. This space embodies energy sovereignty while fostering social cohesion and environmental awareness.

Throughout the proposal, land is treated not as something to be occupied, but to be shared. The design ensures connectivity across pathways and zones, avoiding barriers while promoting inclusion. Each element—whether solar, wind, water, or agricultural—is designed to be modular, flexible, and culturally resonant, allowing the project to evolve with the needs of the site and its people.

The design expresses a regenerative vision for Fiji—where energy, culture, ecology, and community are not separate domains, but woven together like the fibers of a Masi cloth.

2. Technical Narrative

The design integrates a series of low-impact, locally adaptable, and energy-efficient technologies that reflect the unique environmental and cultural context of Marou Village, Fiji. Emphasizing modularity and ecological responsiveness, the technical systems span across water harvesting, solar and wind energy generation, passive environmental control, and sustainable construction strategies.

Water Collection and Management is addressed through a decentralized system of fabric canopies supported by timber columns and aluminum piping. These umbrella-like structures collect rainwater via gravity and channel it into underground storage. They require no electricity and minimal maintenance. Positioned near farms or dams, they help reduce erosion and runoff, restoring damaged hydrological flows. Their modular, movable nature makes them easy to deploy across the site as needed.

Energy Generation is achieved through a combination of solar and wind harvesting technologies. The “petal roofs” incorporate wind-sensitive blades shaped from reinforced composite materials. Each unit is fitted with a gearbox and induction generator to convert wind energy into electricity, with an estimated annual output of 7,000 kWh. The wind blades are sensor-activated, rotating automatically when wind is detected. Complementary to this system, solar petals are equipped with photovoltaic panels that rotate to follow the sun throughout the day, retracting at night. These generate approximately 2,000 kWh annually.

Solar Sails utilize lightweight, tensile solar membranes that track sunlight dynamically. With real-time calibration tested through a custom Unreal Engine simulation, the sails are optimized to produce over 75 kWh per year per module. Inputs include solar radiation and material orientation, while outputs span electrical energy, shading, and performance data for maintenance and optimization. The system is designed to be scalable and durable in marine climates.

Greenhouse Pavilions employ parametric bamboo frameworks with variable gap sizes to modulate sunlight. This passive solar design maximizes photosynthesis for native plants like cassava, guava, and bananas without relying on active energy systems. Gaps in the roofing structure are strategically positioned to diffuse or admit sunlight depending on solar angles. While the greenhouses do not generate energy themselves, they integrate with the site-wide water systems for irrigation, reducing the need for external infrastructure.

Construction Sequencing was carefully mapped to reflect real-world feasibility using regionally available materials and skills. The sequencing process translates conceptual ideas into actionable phases—ranging from site preparation and foundation setting to modular assembly of bamboo structures and tensile surfaces. This framework is tailored to local capacity, enabling community participation and adaptive deployment.

The proposal's integration is orchestrated under a holistic strategy—a cohesive layout that combines multiple multifunctional technologies to create an energy-generating landscape. The aim is not only to generate power but to shape a space where environmental systems, architectural form, and cultural identity merge into a regenerative whole.

3. Prototyping and Pilot Implementation Statement

The design will undergo a detailed prototyping and pilot implementation process to ensure it meets the needs of the Marou community and functions well within the site's conditions. The process will begin with small-scale prototypes, followed by full-scale installations, and will emphasize community involvement and feedback.

For the Wildlife Wall, a small-scale prototype will be constructed to test the function of stainless-steel mesh and bamboo columns in creating a permeable boundary that integrates with the landscape. The focus will be on evaluating its support for local bird species and its functionality as a circulation route. Feedback from the local residents, who will also assist with maintenance, will help refine the design. Once validated, a full-scale version will be built to ensure it integrates seamlessly with the site and community.

The Water Channels and Systems will begin with a prototype of the umbrella water catcher made from local materials. This prototype will be tested for its ability to collect rainwater, handle varying weather conditions, and maintain functionality over time. Pilot units will be installed in areas such as near dams or locations with poor drainage, with local farmers playing a key role in monitoring and providing feedback. The aim is to refine the design to meet local needs and ensure long-term sustainability.

For the Communal Zones, scale models and simulations using Unreal Engine will simulate how the petal roofs will perform under different weather conditions. This process will help identify how the design can effectively generate energy and provide shaded spaces. Full-scale prototypes will be built on-site, where local community members will be actively involved in construction. Feedback will be used to adjust the design, ensuring it works well in the local climate and addresses community needs.

Solar Sails will undergo prototyping through scaled models, with real-time simulations in Unreal Engine to test performance. The full-scale pilot will focus on modular prefabrication, reducing on-site construction time. Community workshops will ensure the design is culturally relevant, and feedback will help adjust the aesthetic and functional aspects of the structure, ensuring it meets both energy generation and social needs.

The Greenhouse Pavilions will be built using locally sourced bamboo, optimized for sunlight capture. The design will be tested for its sustainability and functionality in supporting local agriculture. Local community members will learn bamboo construction techniques, providing them with valuable skills. During the pilot phase, the greenhouse will be tested for its ability to grow crops such as cassava and bananas, with modifications made based on local feedback.

The overall prototyping process will involve close collaboration with the Marou community, ensuring that all designs are adapted to local needs and conditions. Feedback will be gathered throughout the testing phases, making the project a participatory effort that aligns with both environmental and cultural requirements.

4. Operations and Maintenance Statement

The proposed design emphasizes sustainability and ease of maintenance, with each component incorporating simple, locally manageable systems to ensure long-term operational effectiveness.

For the wildlife wall, the design is inherently low-maintenance. The mesh structure allows for the gradual establishment of native plant species and serves as a habitat for local birds. The 600mm hollow spaces within the walls provide shelter and nesting opportunities for birds, facilitating an ongoing ecological relationship. The walls themselves will evolve as natural habitats, requiring minimal intervention over time.

The umbrella water collector operates on passive principles, using gravity for water collection with no need for electricity. Its maintenance consists of basic cleaning of the fabric canopy and inspection of the central pipe for any blockages, to be carried out a few times each year. Local farmers and community members will be trained in these maintenance procedures, ensuring they are capable of keeping the system functioning. By involving the community in its upkeep, we promote the system's longevity and its role in water collection and land maintenance.

The communal zones, including petal roofs, are designed to endure through careful material selection, with corrosion-resistant components to ensure long-term durability. The roofs are equipped with drainage systems that efficiently channel water, which is then filtered to irrigate the surrounding land. Mechanisms are integrated into the structure to allow rotation of the petals, facilitating drying and cleansing. These self-operating features minimize the need for manual intervention, ensuring that the communal spaces remain functional with minimal maintenance.

The solar sails are designed to be low-maintenance, with modular components for easy repair or replacement. The system integrates visual indicators and app-based monitoring, enabling community members to perform basic diagnostics and seasonal assessments. To support local engagement, training programs will be offered, focusing on upkeep procedures aligned with seasonal weather patterns. This approach encourages long-term community ownership, both in maintaining the system and in harnessing the energy it generates.

The greenhouse pavilions feature bamboo and wood construction, materials that are relatively easy to maintain. Bamboo can be reshaped or replaced as needed, though care will be required for the curved wood elements of the roof, which may require skilled labor. The stone and lime floor is durable and easy to install, though stone elements may present challenges in long-term maintenance. Bamboo's natural resilience will help it endure in the outdoor environment, though it may require periodic treatment with natural oils, such as linseed oil, to protect against UV damage and moisture. The local community will be trained to maintain the bamboo structures, though more experienced workers will be needed for the roof's more complex elements.

Through these approaches, the local community will play a key role in the ongoing operation and maintenance of the project, ensuring that each system remains functional and integrated with the local environment over time.

5. Environmental Impact Assessment

The EIA for the proposed project focuses on mitigating any potential negative effects on the local ecosystems while enhancing biodiversity and ensuring sustainability.

The wildlife wall design aims to integrate the built environment with the existing ecosystems, enhancing biodiversity by creating habitats for local species, especially birds. This structure minimizes disruption by using materials that blend seamlessly with the surroundings and offer protection for native flora and fauna. The walls are designed to evolve into natural habitats over time, encouraging nesting and providing shelter for birds. The design minimizes any harm to the environment and fosters a deeper connection between the architecture and the natural surroundings.

The water channels and systems are designed to collect rainwater, reduce runoff, and improve soil health. These systems use sustainable materials that do not disrupt local ecosystems and are integrated into the landscape in a way that blends naturally with the environment. However, to minimize risks such as water overflow or potential habitat disruption, careful positioning of the systems will be carried out. Local community education and regular maintenance will further mitigate these risks, ensuring that the systems continue to function optimally without causing harm. The use of eco-friendly materials is integral to maintaining a harmonious relationship with the environment.

In the communal zones, the primary environmental concern is the potential accumulation of debris, such as leaves and branches, which could obstruct the functionality of the petal roof systems. To address this, a mesh guard will be implemented to prevent blockages and allow for easy cleaning. The design also considers the adaptability of the structures to local environmental conditions, ensuring that they function efficiently without harming the surrounding ecosystem.

The solar sails are designed with a minimal environmental footprint, using recyclable materials and avoiding invasive construction methods. The structure is lightweight, with non-toxic materials that adapt well to sensitive ecosystems. Buffer zones will be incorporated to protect native flora and fauna, and any water interactions will be managed to prevent contamination, ensuring that the surrounding environment remains intact.

Finally, the greenhouse pavilions utilize bamboo, a highly sustainable material, which has a lower environmental impact compared to timber. Bamboo’s rapid growth and minimal need for machinery make it an eco-friendly choice. However, the use of mud and lime for the flooring could potentially contribute to soil erosion and pollution, though these materials will be used in limited quantities to minimize their impact. The overall aesthetic and functionality of the greenhouse are designed to enhance the environmental value of the site, supporting local agriculture without significantly altering the landscape.

In conclusion, the project prioritizes sustainable practices that minimize disruption to the environment while fostering biodiversity and ecological health. By using eco-friendly materials, promoting local involvement, and addressing potential challenges proactively, the design aims to create a positive and lasting impact on the natural ecosystem.