1. **Concept Narrative**

Our design centers on the relationship between the local community, sustainable energy, and water. It aims to foster a deep sense of ownership and pride by inviting community participation while remaining practical, efficient, and easy to assemble. It is important for the local community to foster a personal connection with the designed structure to feel a sense of ownership and actually care for it. Our design strikes the balance between the need for personal touch with the need for standardized production and manufacturing using simple assembly.

The basic structure of the proposal is a modular structural system composed of hollow steel columns and beams, designed for simple, standardized production and easy on-site assembly, while withstanding strong winds and storms. This structural framework supports PV panels at the top and integrates a rainwater collection system. The modules are enveloped with fabrics (masi, tapa) and mats crafted by local residents, adding both functional and aesthetic value.

These fabric elements serve multiple purposes: they act as windbreaks to reduce damage from flying debris during storms, provide visual identity, and showcase community artistry. By enabling individuals to personalize the fabric coverings with their own designs and techniques, the structure becomes a canvas for local expression. This approach not only enhances visual diversity but also reinforces a personal connection to the shared infrastructure they helped design. As a result, each module will have different looks, styles and patterns, making it a diverse creative display based on a simple modular system beneath, where each villager can have a proud display of their own creations.

Rather than making the structure as an isolated solar farm, we believe that allowing people to engage in activities under the structure for different activities will create an everyday connection between local residents and the structure. The structures clustered together will create a shaded space for multiple activities such as playground for kids and detention pond for flood water mitigation, a multifunctional educational space to learn about energy harvesting and showcasing local crafts, a material lab where people can learn about the raw materials used for traditional weaving, agrivoltaic farming space for important local ingredients, and a prototyping workshop space for testing and experimentation. Moreover, a water distribution space and community space will also be created.

1. **Technical Narrative**

**Monocrystalline Silicon PV Panels**

Durability (lasting 25-30 years) and efficiency(more than 20%) plays an important role for our design direction. In a remote island like Fiji, where replacement parts are not readily available and it costs both time, money, energy and CO2 emissions to deliver necessary components, using durable and efficient PV panels is one of the most important design choices that shouldn’t be compromised. Using existing and proven standardized materials also means lower environmental and financial cost upfront related to production and manufacturing, and for that reason, we choose Monocrystalline Silicon PV Panels. The electricity will be stored in Lithium ion batteries and will be distributed from there. In this proposal, the system is expected to generate up to **85kW**.

**Modularity**

The entire system is based on a modular design principle that prioritizes scalability, transportability, and community involvement. Each module is prefabricated using standardized components and designed for easy shipment via boats or small utility vehicles—an essential feature given the logistical constraints of island communities.

Modularity also empowers local participation. Smaller, simpler units can be assembled, maintained, with minimal technical training. This reduces dependence on external labor or specialized technicians, builds local capacity, and fosters a greater sense of ownership and stewardship over the system. The flexibility of the system allows villages to start small and expand incrementally, responding to changing needs and available resources.

**Fresh water storage**

Rainwater harvesting is integrated into the same structural modules that support the PV panels. Sloped panel surfaces channel rainwater into a system of underground piping that delivers it to a central storage tank. Here, the water undergoes filtration before being distributed for community use. This dual-function approach optimizes space and resources, eliminating the need for separate water infrastructure while minimizing environmental disruption. The design includes both centralized and auxiliary storage tanks, enabling the system to store up to **90000 liters** of water, enhancing community resilience during dry seasons.

Each modular unit is a synthesis of engineering and community expression—collecting sunlight, rainwater, and the creativity of local artisans. The result is not just a utility system, but a living infrastructure that generates electricity, stores clean water, and fosters a strong, interconnected community. Through this integration of technology and culture, the project becomes a model of sustainable, community driven development for remote regions.

1. **Prototyping and Pilot Implementation Statement**

Our approach to prototyping and pilot implementation is rooted in participatory design, prioritizing both technical effectiveness and cultural inclusion. Central to both phases is the active involvement of the local community to ensure the system reflects local values, builds skills, and fosters long-term ownership.

**Prototyping Phase**

The prototyping stage serves as both a technical trial and a cultural co-creation process. A full structural module will be developed, comprising three photovoltaic (PV) panels, a rainwater collection system, and four custom-designed fabric and mat panels. Structural elements will be prefabricated off-site using standardized methods and transported to the village to reduce on-site construction complexity.

At the site, our team will work directly with a small group of local residents—initially four individuals—who will each design and craft a fabric or mat panel using traditional techniques and personal expression. These textiles will form the visual and cultural identity of the prototype. The module's final appearance will not be pre-defined; it will emerge organically through the creative input of the participating villagers.

Following fabric/mat production, the same group will participate in assembling the structural frame, including the integration of their crafted panels. This collaborative, hands-on process deepens their understanding of the system, while fostering a strong personal and emotional connection to the infrastructure. In this way, the prototype tests structural viability and the design’s ability to engage and inspire the community.

**Pilot Implementation Phase**

Informed by the prototyping phase, the pilot project will expand the same participatory methodology across the entire community. With a target of over 100 modular units, the pilot presents an opportunity for broad engagement. Every resident interested in contributing to the project—particularly in fabric and mat production—will be welcomed to participate.

This inclusive approach transforms the pilot from a purely technical project into a community-driven art and infrastructure initiative. Each fabric/mat panel will tell a different story, reflect a unique identity, and contribute to a collective sense of ownership. The act of creating and assembling these units becomes a shared cultural event, promoting unity, creativity, and pride.

This will be a scalable, adaptive, and culturally meaningful infrastructure system—built not only for the community but with the community. It reflects their creativity, meets their needs, and empowers them to lead its future development.

1. **Operations and Maintenance Statement**

The long-term success of this project is rooted in community ownership, cultural continuity, and low-maintenance, durable technology. The system is intentionally designed to minimize reliance on external expertise, empowering local residents to manage, maintain, and evolve it over time.

**Community-Centered Maintenance and Control**
The fabric/mat panels are designed to be replaced and refreshed periodically by the local community. Patterns, colors, and techniques may evolve with time, reflecting seasonal festivals, generational changes, or individual creative expression. This dynamic fabric/mat renewal process supports continuous community engagement and reinforces a personal connection to the system. Because residents contribute to the creation of specific modules, they develop a sense of pride and responsibility. This ownership naturally extends to maintenance, with responsibility often passing from one generation to the next, fostering a culture of care without the need for external enforcement.

**Low-Maintenance Technology with Community Oversight**
Technologically, the system uses robust and low-maintenance components. Monocrystalline silicon PV panels, with a lifespan of 25–30 years, ensure long-term performance. Lithium-ion batteries provide reliable energy storage with minimal upkeep. Routine tasks—such as cleaning panels, checking battery levels, or ensuring water flow—can be managed locally with simple training and tools. To support this, the project includes training workshops and illustrated manuals to guide community members in basic troubleshooting, system monitoring, and safe part replacement.

**Preserving Cultural Heritage Through Infrastructure**
The integration of traditional weaving into the structure strengthens the community’s emotional investment into the system, and it also becomes a means of preserving and evolving cultural heritage. As new techniques emerge, fabrics and mats may improve in performance and durability, making maintenance a culturally meaningful act of creativity and continuity. This fusion of tradition and technology makes maintenance no longer just a technical task—it becomes an act of cultural continuity, creativity, and collective care.

Operations and maintenance are not separated obligations but are instead embedded within the social and cultural fabric of the village. By combining durable, low-maintenance technologies with meaningful community participation and cultural expression, the project ensures long-term viability, resilience, and a strong sense of shared responsibility.

1. **Environmental Impact Assessment**

The proposed modular energy and water system is designed with a deep sensitivity to its ecological context. While the installation brings significant benefits in renewable energy and water access, it may also create environmental impacts that must be carefully managed through thoughtful design and adaptive deployment.

**Potential Effects on Natural Ecosystems**

1. Disturbance to Soil and Vegetation
 The construction of infrastructure can lead to soil compaction, disruption of root systems, and displacement of native vegetation. However, the design minimizes these risks by using a single foundation per module and reducing the need for widespread anchoring. This limited footprint preserves much of the surrounding ground cover and allows natural vegetation to grow between structures, helping maintain soil health and biodiversity.
2. Collision Risk for Birds
Large reflective surfaces such as solar panels can pose a hazard to birds. All panels are inclined inwards at a 19-degree angle for maximum solar radiation, eliminating direct horizontal collision paths. Additionally, the fabric and mat envelope surrounding each module serves as a soft barrier, reducing impact severity in the rare event of a bird collision. The textured and patterned surfaces of the panels may also help birds visually identify and avoid the structure.
3. Habitat Fragmentation and Visual Impact
 Deploying multiple infrastructure systems (energy, water, shading, etc.) separately can fragment landscapes and disrupt habitats. By integrating photovoltaic and rainwater collection systems into a single modular unit, the need for multiple structures is eliminated, significantly reducing land disturbance and preserving more continuous habitat zones.

**Mitigation Measures and Adaptive Strategies**

1. Incremental and Phased Deployment
A key mitigation strategy is phased installation. By deploying the system in stages, local ecological responses can be monitored over time, allowing for adjustments in design, layout, or placement based on observed impacts before full-scale implementation. This adaptive approach ensures that unforeseen environmental issues can be addressed early and effectively.
2. Optimized Footprint and Scalability
Since the system can be scaled to meet specific energy and water needs, it can avoid overdevelopment and unnecessary land use. This ensures tailored responses to different environmental conditions across various sites.
3. Continual Monitoring and Community Feedback
Ongoing monitoring of environmental conditions—such as vegetation health, storm water runoff patterns, local ecology—will be paired with community observations and feedback. This data will inform future upgrades and ensure that the system remains responsive to existing site conditions.
4. Long-Term Durability and Upgradeability
The use of durable monocrystalline PV panels and long-life lithium-ion batteries reduces the frequency of replacement and the need for repeated construction activity, which in turn lowers cumulative ecological impact. Modular upgrades and maintenance can be performed without dismantling the entire structure, further minimizing disruption.

The design embodies a low-impact philosophy through modularity, adaptability, and a strong commitment to ongoing environmental control, minimizing risks while maximizing resilience.