Scalability

The modular nature of the design allows for a scalable approach, starting with a small-scale prototype to test key elements of the system. The structural components—such as wooden beams, rain pipes, and gutters—are specifically designed for ease of assembly and transport. With each module limited to 10 meters in length and 5 meters in width, these elements can be efficiently loaded onto typical small barges, which are 4 meters wide and 14-20 meters long. This modular approach minimizes logistics challenges by allowing for fewer trips, an important consideration for labor-intensive sites.

In the prototype phase, we will focus on testing two or three structural bays of the modules, with particular attention given to the rainwater harvesting system, including the design and functionality of the rain pipes and water storage tanks. A critical objective during this phase is to ensure the system's resilience to extreme weather, particularly category-five cyclones. This will involve rigorous testing of materials, structural connections, and the overall stability of the system under high wind and storm conditions. We also plan to simulate rainwater collection volumes and the performance of filtration systems to evaluate the system's efficiency in real-world conditions.

Given that a significant portion of the structure is wood based, it is essential to engage the local community for feedback on construction techniques and material choices. The wooden components, which form a significant portion of the structure, must be able to withstand humidity, rainfall, and the occasional exposure to saltwater. We will collaborate with local builders to identify the most suitable hardwoods, verify local availability, and explore sustainable sourcing options. This engagement will ensure that the design is contextually and environmentally appropriate, while also fostering community ownership and involvement in the project.

From the outset, the design prioritizes ease of assembly, with materials sourced from local suppliers. This will further streamline the prototyping process and ensure the feasibility of scaling to full implementation.

Operations and Maintenance

Although Sky Letters carries a formally expressive structure, its core components—solar panels, gutters, structural rain pipes, and water tanks—are intentionally chosen for their accessibility, durability, and resemblance to standard mini-grid systems. To ensure long-term operability, a critical early step will be to identify reliable suppliers and consultants capable of delivering robust materials that can also be remanufactured or replaced locally in the future. Solar panels, rainwater gutters, and piping systems should be selected with an expected lifespan of at least 30 years.

We aim to equip the local community with practical training on routine upkeep and storm recovery. This includes knowledge on how to remount or replace solar panels after extreme weather events, check piping joints and gutter alignments, inspect water tanks for leaks, and monitor the condition of the electrical and maintenance rooms. After major weather incidents such as cyclones, each module will require a general inspection, which can be conducted by trained local teams.

Environmental Impact

The environmental impact of Sky Letters is minimized through a combination of material choices, modular design strategies, and sensitivity to site conditions. The primary structural system—composed of hardwood trusses and beams—is sourced locally in Fiji, reducing both transportation emissions and environmental disruption associated with imported construction materials. Steel elements are limited to only essential joints and anchorages that enhance cyclone resilience, while concrete is used sparingly, restricted to foundational points where structural stability demands it. Above-ground polyethylene water tanks are selected in place of concrete alternatives, as they are lightweight, easier to install and replace, and have a lower embodied carbon footprint over time.

The solar energy system is designed with flexibility and repairability in mind. Each panel is independent—if one fails, it can be easily replaced without affecting the function of the entire module. The modular nature of the structure not only supports ease of transportation and assembly, but also allows for future disassembly, reuse, or relocation, thus reducing long-term material waste.