LAGI2025



LAGI 2025 Fiji Narrative

Concept Narrative

With the knowledge of rainwater collection, renewable energy and the traditions of the community the UmbraWell will be a multifunctional infrastructure that is both sustainable and culturally grounded. It is designed to serve both homes and agriculture by harnessing the sun and rain while also bringing in the traditions of this community. UmbraWell is a canopy system that foregrounds the morphological flexibility of thin-film non-silicon photovoltaic technology. This design will be made up of locally sourced materials while also using a traditional craft in Fiji. This will include bamboo, coconut palm fronds and pandanus leaves. The bamboo will be used for the downspout as it is light weight, strong and durable. The coconut palm fronds will be used for the structure and ribs as they are lightweight, strong and flexible. Lastly the pandanus leaves shall be harvested, prepped and thatched together to create the catchment area as well as line the inside of the downspout. Pandanus leaves already contribute to architecture in Fiji as they are tightly woven leaves that provide a solid shelter. Bringing each of these materials into my design will allow the community to be part of the design as there will need to be maintenance throughout the years. The maintenance of the pandanus leaves is typically a communal activity that is also accompanied by storytelling or teaching the younger generations of traditions while rethatching the structures. The community is already so involved with the makings of Marou Village, and I wanted them to also be part of this design. The chosen site will be transformed into a welcoming, multifunctioning space that will serve for bother recreational purposes and landscape for all to enjoy. There will be a new path weaving through the site creating a park-like environment with plenty of fields for activities and farming. In the evening, the UmbraWell will provide solar lighting that will softly illuminate the park, farming, and pathways. This will ensure that the park is safe and accessible anytime throughout the day and will ensure a different experience from sunrise to nightfall. Recognizing the already existing farmland on the site, my design will allow for an extension of the farming to support the island and the education agriculture for Marou Village.



Whether the visitors or the community use this space for farming, a nice walk or rest under the canopies or even for the children to run around and play will be an inviting enjoyable space that will bring the visitors and the community closer to the land, culture and one another. The UmbraWell will only be one aspect of this space but an important one as it will provide shade, collect water, and provide solar power to the community. Though the UmbraWell is designed to be resilient it also acknowledges the region's vulnerability to extreme weather conditions. The structure and canopy can be quickly folded and collapsed to be stored in the downspout of the design with an easy lever system. This will allow protection for the Photovoltaic technologies and the pandanus leaves to be preserved. Being able to incorporate a low-tech, community centered maintenance into UmbraWell creates a resilient design where technology will compliment Marou Village rather than replace the traditional practices.

1. Technical Narrative

The most important feature of the UmbraWell system is its canopy, it will be made up using locally sourced and harvested materials such as coconut palm fronds and pandanus leaves. These natural materials are both well regarded for their natural strength, flexibility, and ample supply in the region. This canopy is not only culturally and environmentally appropriate but also serves as the foundation for integrating two essential technologies designed to meet the needs of the local environment. The first core technology that is integrated into the canopy is a rainwater harvesting system. Designed to resemble an inverted umbrella, the canopy design flips the traditional aspect of an umbrella. Though it will still be able to shield users from rainfall, it is engineered to capture and direct rainwater. Water collected by the canopy design is funneled through a downspout, where it then passes through a series of filtration systems to ensure it is safe and clean. Once filtered, the water is stored in an underground tank. The water being harvested will serve multiple purposes: it supports on-site farming efforts, provides for the daily needs of residents—such as drinking, cooking, hygiene, and cleaning—and acts as an educational tool for teaching community members how to operate and maintain the system. The



decision to focus on rainwater harvesting as a primary system was driven by the limited availability of clean water during Fiji's dry seasons. A community-based decision would be to capture, filter, and store rainwater throughout the year, The UmbraWell system helps reduce the shortage of water in the community, so they don't have to rely on external water supplies. The second key technology integrated into the UmbraWell is the use of thin-film non-silicon photovoltaic cells. These solar technologies are to generate renewable electricity, powering solar park lights on the design, local residences, and small businesses. The choice of thin-film nonsilicon photovoltaics was deliberate: their lightweight, flexible, and durable properties make them ideal for seamless integration into the canopy's form, structure, and storage. By expanding solar capacity within the Marou Village, the project will reduce the community's travel to the main island for reliable electricity to work. This will open up opportunities for the residents of Marou Village to live and work locally. Currently, many locals must travel to the main island for employment as the more rural islands don't have the access the main island can provide. The UmbraWell aims to reverse this trend by supporting sustainable livelihoods within the village itself. Together, the rainwater harvesting system and the solar energy solution form the UmbraWell design. The UmbraWell is designed not only as a sustainable solution to environmental challenges but is also a community-driven design as it will create a space for all to enjoy and allow for those who visit a chance to get to know the island. It will enhance the locals' everyday life and contribute to the education and economic opportunities of the village.

• What are the system inputs?

The system inputs include sunlight and rainwater. The photovoltaic thin film non-silicon is fueled by sunlight which will allow it to function and provide for the village's electrical needs. The rainwater is to be collected and stored for use throughout the year.

• What are the system outputs?

The system will then produce electricity and clean water. The thin film non-silicon will provide electricity for businesses and the residence in Marou Village. These are all essential for everyday



life and to provide for the community. The clean water that was harvested from the canopy system will provide to the growing businesses, the residence, and the farmlands. These are all essential for everyday life and to provide for the community.

2. Prototyping and Pilot Implementation Statement

My team will take an approach to the prototyping process, where we will be completing multiple versions to refine and improve the design until it accurately represents the final concept. I am incorporating locally sourced materials into my design, to stay aligned with the project's sustainability goals. During the prototyping phase, I will use substitutes or stand-in materials that resemble the properties of the local materials that will be used, allowing for practical testing and refinement. Given that the project is international, the prototype will be designed as well as created to be disassembled, making it easier to transport to Fiji. Once there, it can be reassembled efficiently on site. To prepare for any unforeseen damage during shipping, I will fabricate extra components to replace any that may be lost or broken in transit. I am deeply committed to this project and intend to be personally involved in every stage of its development. This includes traveling to Fiji to assist directly with the prototype assembly as well as the fullscale implementation. At the start, we plan to install between five and ten Umbrawell systems as a pilot implementation, to evaluate the effectiveness of each development for the community. Based on the feedback and results from this initial deployment, we will consider scaling up the project, potentially expanding to twenty-five or more Umbrawell systems. As an outsider to the community, successful implementation will depend on close interactions and developments with local residents. The involvement and knowledge of the community will be essential for both completing the installations and maintaining the systems over time.

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3. Operations and Maintenance Statement

The UmbraWell design will be fully operated and maintained by the local community, allowing them to learn and understand the system. The design of the UmbraWell is made up of a canopy that functions much like an umbrella, opening and closing to ensure the system is safely stored during unpredictable weather events, protecting it from potential damage. The locals will not only operate the system but will also benefit from the electricity it generates and the rainwater it collects and stores for their daily needs. The maintenance of the canopy will be an effort from and within the community. The materials for the canopy are made up of pandanus leaves, that will be harvested and processed by the locals, ensuring that the system is from the village's natural environment. Once the pandanus leaves are ready to be woven, the community will come together for a traditional weaving process, which serves as a social and cultural event. During this community gathering, people will share stories, pass down skills, and preserve the history all while learning the traditional craft of weaving that is used for more than shelter but also mats, bags, baskets and so much more. This process not only ensures that the system is built and maintained but also strengthens the community's connection to its traditions. The canopy itself will be made entirely from these locally sourced materials, with pandanus leaves woven together to form the canopy and to line the inside of the downspout. Additionally, coconut palm fronds and bamboo will be used to structure and frame the downspout, creating a design that is environmentally sustainable. With proper care, these locally sourced materials can last between five to ten years, though their lifespan will depend on the uptake and maintenance the community will provide. Since these materials are readily available in Marou Village, the community can regularly replace and treat them as needed, ensuring that the system will remain functional over time. This approach will provide a community-driven solution that combines modern technology with traditional practices, reinforcing both the practical and cultural needs of the people of Marou Village.



4. Environmental Impact Assessment

The UmbraWell is designed with environmental sustainability in mind, there may still be potential effects on the natural ecosystem that need to be carefully considered when placing each of the rainwater and solar collection structures. It is important to understand and address all of the potential impacts in order to make sure that the system benefits both the community and the surrounding environment in a positive way. While the goal is to enhance sustainability and reduce environmental harm, my design will be very interactive with the local ecosystem and will require planning and strategic placement. These systems are designed to collect rainwater for the community, but it's important to understand how integrating a design might affect the surrounding environment, such as wildlife and plant life. The canopy rainwater system is for storing water for later use, and there is a possibility that it may take away from and affect the vegetation or animals that depend on the rain for survival. To avoid this, careful thought will go into selecting locations for each UmbraWell that will provide for the needs of the community. For example, in areas where the UmbraWell is situated near farming land, specific structures will be placed to provide enough water for the farming areas, ensuring that the crops receive the necessary resources. Additionally, because the UmbraWell design involves the use of locally harvested materials, such as pandanus leaves and coconut palm fronds, it's important to consider the sustainability and reproduction rates of these plants. These materials have long been used in traditional architecture and crafts, so it is likely that the local ecosystem is already well-adapted to support their growth. However, it will be essential to monitor the farming and agriculture on the site to avoid too little or too much water being produced in this area. With careful attention to the reproductive cycles and growth rates of the plants will end up being an important part of this design as it will be made up of these natural materials. This will ensure that the collection of these materials does not impact on the long-term health of the plants or their ability to regenerate. Since these materials have been used for generations in local traditions, it is reasonable to expect that their reproduction will not be significantly affected by the scale of the project. However, collaborating with locals and the environmental experts will be essential in order for the plants to thrive. By addressing these





environmental impacts that may occur with this design and placement it can be implemented in a way that can benefit agriculture and the community.