

Dakuwaqa and the Roots of Resilience: A Tribute to Sea Turtles

Since the island is exposed to cyclones and strong winds, the project began with a climate issue in mind: hurricanes, so it was considered that the wavy shape can better distribute wind forces, minimizing structural damage. When studying the problems of hurricanes in the area, the following event caught my attention: Cyclone Winston (2016), where the Marou Bridge survived because the islanders attribute it to the intervention of Dakuwaqa, the shark god, and the ancestors who held it during the storm. It is plausible that the inhabitants of Marou may have performed a kava ceremony before Cyclone Winston to ask for divine protection for the bridge. This leads me to ask, what is the kava root? It is a perennial plant that belongs to the pepper family (Piperaceae). The most used part is THE ROOT. In the research regarding traditional Fijian crafts, especially those pieces that reflect the deep connection of the local culture with nature. During this study, we discovered that sea turtles hold a special place in Fijian mythology and traditions, as they are protected by Dakuwaqa, th god of the sea. Duwaqa is a powerful deity in Fijian mythology, known as the protector of the ocean, reefs, and sea creatures. Although often depicted as a shark or a shark-related figure, he is also linked to sea turtles, considered sacred animals in Fiji. According to legend, turtles are symbols of longevity, wisdom, and connection to the sea-values deeply rooted in the Fijian worldview. However, these majestic creatures now face serious threats, including pollution, loss of nesting grounds, climate change, and poaching.

The Silent Impact: How Turtles Keep Oceans Healthy

Why is the sea turtle important?

This motivated the project to evolve from a mere cultural inspiration to an effort to care for and protect sea turtles. By combining modern ideas with ancient traditions, we seek to raise awareness about the importance of preserving these species and their habitat. By honoring the figure of Dakuwaqa and his role as guardian of the ocean, we drew on Fiji's ancestral wisdom to address current environmental challenges. This approach not only seeks to protect turtles but also to strengthen the bond between local communities and the sea that sustains them.

Because they help keep seagrasses healthy, it's just like grass on land that needs to be cut to grow better. They, along with manatees, prune the grasses as they feed, preventing them from becoming overgrown and encouraging their growth. Without turtles, seagrasses have declined in recent decades.



Considering the above, the proposal, and in recognition of the need for at least six turtles to reach adulthood, has considered designing three nests or nuclei with six eggs or energy modules.

The number 3 has a very special meaning in Fijian culture and also in nature. It represents fundamental things such as balance, harmony, and the connection between important forces. Sky, Earth, and Sea: These are the three essential elements that sustain life in Fiji. Past, Present, and Future: This idea unites ancestors, who are part of history. Family (Father, Mother, and Child): The family is the heart of Fijian society.

The Three Spiritual Realms: In Fiji, there are three spiritual worlds: Burutu, which is the spiritual realm; Vanua, which is the earthly or terrestrial realm; and Sau, which represents the underworld.

The number 6 has a special meaning because it expands on what the number 3 represents, adding ideas of diversity, collaboration, and structure. This can be seen in several important aspects for Fiji:

The Six Fundamental Pillars: These are essential elements that sustain life and culture in Fiji. They are the sky, the earth, the sea, family, ancestors, and nature.

The Six Villages: This number also represents how communities in Fiji collaborate with each other.

Geographical Division of Fiji: Fiji is divided into six main regions: Viti Levu, Vanua Levu, Taveuni, Kadavu, Yasawa, and Mamanuca.

This poster is presented as a conceptual exploration emerging from in-depth research into the resilience of nature, the richness of Fijian culture, and the urgent need for marine conservation. Through each of the titles comprising this proposal, a vision unfolds that goes beyond mere functionality, seeking to establish a profound connection between the Marou community, its environment, and the iconic green turtle.

From Fragility to Hope: Raising Awareness for Six Turtles per Nest in Fiji

To put things in perspective, there are seven species of turtles in the world, four of which are common in Fijian waters. These four species are also listed on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species.

According to WWF, tens of thousands of turtles are lost each year due to overexploitation and illegal trade. On average, turtles lay 100 eggs per nest, with a hatching rate of around 90%, of which only one hatchling reaches adulthood. This statistic alone underscores the urgent need to protect these marine creatures.

References

Jackie De Burca, published April 8, 2024.

WWF-Pacific publication, updated March 4, 2018.



Three Nests, Six Eggs: Harmony and Structure in Fijian Tradition

Why three nests and six eggs?

Nesting and Birth: A Sacred and Vital Ritual for the Green Sea Turtle

Most significant cycle

The reproductive cycle is the most representative of the green turtle, both from a natural and cultural perspective.

Cultural Symbolism:

- In Fiji, green turtles are symbols of fertility, longevity, and spiritual connection. - The act of nesting and hatching reinforce the idea of the continuity of life and the balance between the human and spiritual worlds.

Ecological Importance:

- It ensures the survival of the species despite environmental threats. - It is a delicate process that depends on the protection of nesting beaches, underscoring the need for conservation.

Relevance in Scientific Studies: - Studies of the reproductive cycle have revealed key information about turtle behavior, physiology, and ecology.

- Furthermore, it is a priority area for conservation due to its vulnerability to factors such as beach loss, climate change, and illegal hunting.

Together, each theme seeks to convey a clear message: the urgency of protecting sea turtles is not only an environmental cause, but also a cultural imperative and an opportunity to build a sustainable future in harmony with nature and the ancestral wisdom of the Naviti community. The primary function of this presentation is to articulate the convergence of these conceptual, research, and proposal aspects into a coherent and meaningful vision.

A Meaningful Rotation: The Turtle Egg and the Helix of Design

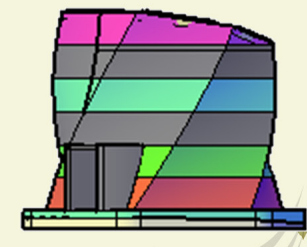
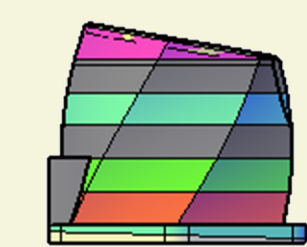
General Shape of Turtle Eggs

- Sea turtle eggs, such as those of the green sea turtle (Chelonia mydas), are generally spherical or oval in shape.
- However, some eggs may be slightly flattened at the ends, which is perfectly normal.
- Species and Shape Variations.
- Green Sea Turtle (Chelonia mydas):
 - Their eggs are roughly spherical, with an average diameter of 4-5 cm.
 - They may show slight flattening if under pressure in the nest.
- Importance of Shape
 - Functionality:
 - The spherical or slightly flattened shape allows the eggs to be evenly distributed in the nest, maximizing space and minimizing the risk of damage.
 - Protection:
 - The flexible shell helps absorb minor impacts, while the spherical shape distributes pressure evenly.

Irregular Hexagons: From Shell to Environmentally Conscious Solar Design

Geometric Shapes: The Turtle Shell**

The green turtle's shell has unique geometric patterns that combine irregular hexagons, pentagons, and quadrilaterals.



The module has been designed to resemble a turtle egg, symbolizing its flattening. The 10-degree rotation every meter in each section of the module creates a helical element, and a vertical inclination was also considered so that, like the egg, the force of the air is distributed and diverted, preventing it from being a destructive element of the module. At the same time, this 60-degree rotation symbolically indicates the internal changes within the egg. It will also allow for different views from different observer perspectives.

Considering this physical quality of irregular hexagons, it was decided to give the module this physical quality of irregular hexagons in the upper part, by means of a cut from south to north to obtain the 10% slope for the solar panels.

Environmental Protection

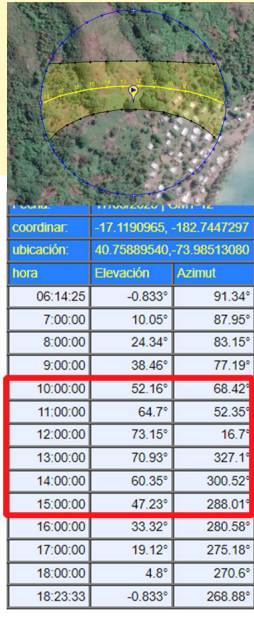
This project combines a solar power generator and a purified water collection system with the mission of protecting sea turtles, essential to ecological balance. On Naviti Island, where many have the opportunity to observe their nesting on the beaches, we want to convey a message that inspires both local communities and visitors.

Through educational workshops, awareness-raising talks, and practical actions such as beach cleanups, we seek to raise awareness about the importance of protecting nests, reducing the use of plastics, and caring for the ocean. If you are a visitor, take this learning home and share it in your community, expanding this chain of environmental care.

Every action counts. Together we can ensure that turtles continue to swim freely in our oceans and that future generations can enjoy their beauty. The change starts with you!



From Sun to Energy: The Importance of Radiation in the Project

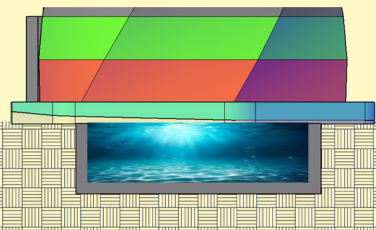


Hours of highest elevation

Dual Purpose: Protective Base and Rainwater Collector



Rainwater



The module sits on a hexagon with rounded tips built from stones, and a channel has been designed around it to collect rainwater that runs from south to north, where it is collected underground. The channel is formed by activated carbon and gravel at the top of the base to allow for cleaning of any debris. Rainwater from the module's roof falls from the north side.

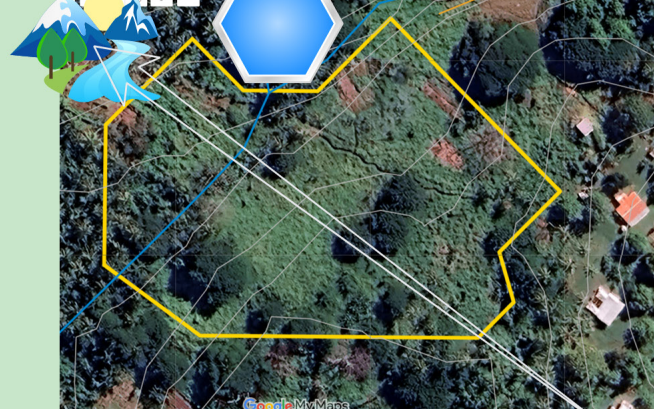
The base is specifically designed to serve two main functions: to support the solar modules and to provide additional protection against potential future weather hazards. The base is 50 cm high, designed to prevent problems arising from landslides or flooding that could occur due to heavy rains or mudslides on the mountain.

This elevated design ensures that the solar modules remain protected, even if the terrain changes due to extreme conditions. Furthermore, the base features a straight shape and rounded corners, making it easier to install and improving its stability while allowing for efficient module mounting.

In short, this base not only supports the modules but also keeps them protected, anticipating potential adverse weather scenarios. It is a solution that combines functionality and foresight, ideal for ensuring the long-term durability of the system.

The Footprint of Territory: Shape, Trees and Mountains as the Genesis of Design

The land or lot and its context, has a half hexagon shape at the top, has three trees almost in the center, on the east side there is a view of the Vatu Rua mountains is almost linear with an average distance of 1600 m horizontally, the land in the afternoon receives the shadow of the mountains.



Just as the turtle's hexagon has been taken, this configuration on the land or lot is also reaffirmed with an irregular hexagon for the module.

These three trees have been given importance within the complex.

Cultural Symbolism:

In the Fijian worldview, the number 3 has a profound meaning related to balance, harmony, and life cycles.

Ecological Function:

- They provide shade.
- They attract native fauna and promote biodiversity.
- They reinforce the stability of the landscape through their roots.

Organic Connection:

The three trees become living elements that guide the natural flow of visitors to different areas.

Considering the island's worldview, the phrase "without roots, there are no cultures" is not only a reminder of the importance of preserving ancestral traditions and values, but also an invitation to integrate them into the present and future. My project aims to be a bridge between the ancient and the modern, demonstrating that technological innovation can coexist with respect for culture and the environment.

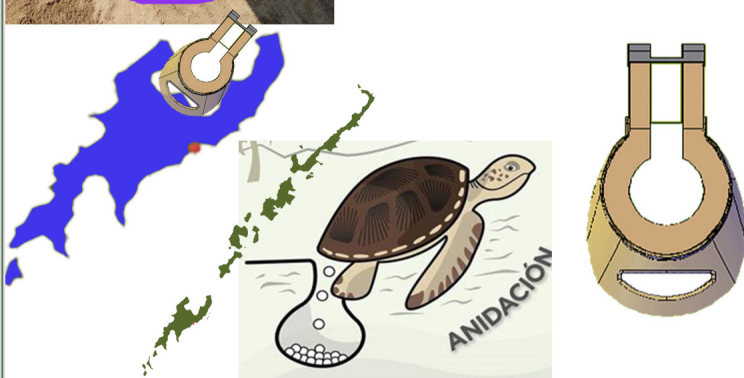
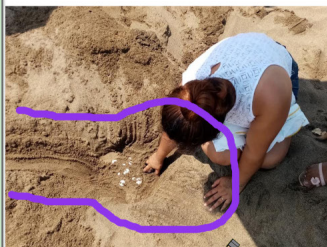


Converging Inspirations: A Conceptual Approach from the Island, the Nest, and the Mountain

After studying and proposing the design of hexagons with roots, it was considered that important elements were missing, so a prototype was designed. This prototype, which constitutes the central core of the project's energy management, provides specific access to this energy field and the island, also serving as the central battery storage and energy distribution point for the population. This prototype, called the access or tunnel, is relevant and confirms the worldview.

Based on the following: The island, which has two arms extending towards the sea to the north, resembling turtle nests, was chosen as an idea. The turtle nest itself, due to its construction for spawning.

Vatu Rua Mountain. This space is intended to provide information about the energy complex and will be a large window for contemplating Vatu Rua Mountain, seen from its elevated window.



Incorporating significant cultural elements:

Although the project took a significant turn from the local worldview as a source of information to promoting a real existential issue: the extinction of turtles, both points served to consider the conceptual design proposal. Therefore, without abandoning the identity of Fiji and Naviti, it is deeply reflected in an element called the Access Tunnel. From the main entrance, the Vatu Rua Mountain is the main view, as well as the bay itself to the north of the island with its outstretched arms. It is welcomed by a lobby decorated with sculptures inspired by turtle eggs. It ends in a small terrace with a window overlooking the void of the Vatu Rua Mountains. This space serves as a rest and information area. Each element of the project will highlight the cultural and natural connection with the environment.

Reference Table: Materials and Resistance

MATERIAL	DESCRIPTION	TECHNICAL DATA	THEORETICAL RESISTANCE
Stainless Steel	Main support structure. Longitudinal tubes in 3" and 2.5" diameters.	-3-inch tubes: Outer diameter 76.2 mm, wall thickness 2 mm, weight per linear meter ≈3.70 kg/m. -2.5-inch tubes: Outer diameter 63.5 mm, wall thickness 2 mm, weight per linear meter ≈3.05 kg/m.	- Axial load capacity: - 3-inch tubes: ≈3,000-4,000 kgper tube. - 2.5-inch tubes: ≈2,000-3,000 kgper tube. - Resists winds up to300 km/hdue to high mechanical strength and helical design.
Bamboo	Vertical cladding for the faces of the structure.	- Average diameter:9 cm, length:1 m, weight per cane: ≈3.82 kg. - Total canes required:1,944 canes. - Total bamboo weight:7,430 kg (7.43 metric tons).	- Bamboo is a highly resistant and flexible material, ideal for absorbing lateral forces. - Its vertical arrangement evenly distributes wind loads, improving structural stability.
Combined Resistance	Stainless steel + bamboo.	- Combined load per face (vertical + lateral): ≈2,581 kg. - Total capacity per face with tubes: - Lower levels (3-inch): ≈7,000 kg. - Upper levels (2.5-inch): ≈5,000 kg.	- The combination of stainless steel and bamboo theoretically resists winds up to300 km/h. - The helical shape reduces aerodynamic drag, while bamboo acts as a natural shock absorber.

Building in Community

Prioritizing community participation:

The active inclusion of local residents was considered essential in helping to clad the stainless steel structure, consisting of six parts (elements in red) for each of the six levels (the assembled face in blue, assembling the six levels) required to build an energy prototype or model (module in colors). Each part consists of two stringer tubes and two 3-inch and 2.5-inch stainless steel posts. The first two levels are 3-inch and where a small mezzanine and ladder support will be placed. The rest of the module is then covered with 2.5-inch tubes, extending to the roof to support the solar panels. Their knowledge of the environment, their use of natural materials, and their needs ensure that the projects are relevant and directly benefit the community.

Another priority issue the project promotes is, for example, the significant collaboration with them on activities related to turtle conservation, fostering a sense of belonging and shared responsibility among locals and visitors.



Paying Tribute to Roots: A Sustainable Future Inspired by the Green Turtle

Paying tribute to roots and the inspiration for this project, we think of green turtles, emblems of balance and adaptation. They, like the communities of Naviti Island, teach us how nature and humanity can coexist in harmony to build a sustainable future. This project not only seeks to protect these majestic creatures, but also to honor their legacy and their deep connection to this land and its people.

Green turtles are much more than a symbol of the ocean; they are a living lesson in resilience. Their name comes from the greenish hue of their fat, the result of a diet rich in seagrass. This connection to their environment reflects the importance of caring for every aspect of the ecosystem, because everything is deeply interconnected. Just as green turtles feed on seagrass, we too depend on a healthy environment to thrive.

The design of this project is deeply inspired by the natural patterns on the shells of green turtles. The regular hexagons that make up its structure represent stability and resilience, essential qualities for facing the challenges of climate change and sustainable development. However, just as green sea turtles adapt their behavior according to environmental conditions, our rooftop breaks away from regularity to adopt irregular hexagon shapes, symbolizing the flexibility and creativity needed to solve complex problems.

Even the dark lines that outline the hexagonal scutes of the green sea turtles' shells inspired the integration of solar panels into the design. These panels, strategically placed atop the hexagons, not only generate clean energy but also act as a visual homage to the natural pattern of the shell, connecting modern technology with cultural tradition.

For the communities of Naviti Island, this project goes beyond infrastructure. It is a call to preserve their identity, their culture, and their connection with nature, including the protection of the green sea turtles that inhabit their shores. The brown paths, made from local materials like dried bamboo or wood, represent the shells of green turtles, while the contrast with the ochre roofs and vegetation reflects the life that surrounds them.



Key Technical Data

ELEMENT	DESCRIPTION
Shape	Helicoidal, inclined (wider base, narrower top).
Wind Resistance	Designed to withstand hurricane-force winds of up to300 km/hthanks to its helicoidal shape and inclination. Reduces aerodynamic drag and evenly distributes lateral loads.
Solar Panels	7 panels of 600 Wp per module, generating 4.2 kWp per module.
Total Modules	18 modules, generating a total of75.6 kWp.
Panel Inclination	10 degrees (optimal for tropical latitudes).
Energy Storage	Batteries located on the mezzanine, protected against humidity.