MAROU
THE POWER OF COMMUNITY

GRIGORII MATIUNIN STUDIO SITTA FACULTY OF ARCHITECTURE, CTU IN PRAGUE

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CLIMATE RESILIENCE AND ADAPTATION FOR ISLAND COMMUNITIES

Marou Village, located on Naviti Island in the Yasawa archipelago of Fiji, is a coastal settlement of 67 households facing critical challenges in the context of a changing climate. Like many remote island communities, Marou experiences periods of severe drought during the dry season and flooding during heavy rains. Rising sea levels threaten to contaminate freshwater wells, while reliable access to electricity remains limited. Currently, cold storage for fish and medical supplies is unavailable locally, and fuel for basic energy needs is both costly and difficult to transport. The island's steep terrain, shallow coastal approach, and dependence on tide-sensitive boat access add layers of complexity to any infrastructure project.

"Marou: The Power of Community" responds to these challenges through an integrated design that combines renewable energy generation, water harvesting, and community functions in a single, land-based infrastructure. The project is centered on three energy towers that rise from the landscape—each drawing aesthetic and structural inspiration from traditional Bure Kalou (spirit houses) and Fijian sailing vessels. These towers anchor the site visually and functionally, housing solar photovoltaic panels on their north-facing facades to optimize solar exposure. Additional panels are placed on building roofs throughout the site, contributing to a minimum installed capacity of 75 kW.

Rainwater is harvested in a variety of ways: from rooftops, through gravity-fed channels that guide stormwater into a series of filtration ponds, and through a fog-harvesting system that captures moisture from the air - helping to address water scarcity during the dry season. The integrated water system supports both drinking water storage and agricultural use.

Local materials form the foundation of the project, with approximately 85% of construction components sourced from Naviti Island. Thatched coconut or sago palm roofs, timber framing, and magimagi (woven coconut fiber) lashings reduce reliance on imports and lower carbon emissions. These methods are familiar to many residents and invite broad community participation in the construction process-encouraging mutual learning, cultural continuity, and local economic opportunity.

The site functions as more than an energy and water hub. It incorporates shared spaces for agriculture, aquaculture, small-scale animal farming, play, and waste management. These elements are designed to work together as a system, creating interdependencies between people, landscape, and infrastructure. A waste management system converts organic waste into biogas, providing a backup energy source when solar generation is low. This approach supports a circular system where food, energy, water, and waste are interconnected, reinforcing both resilience and local livelihoods.


Gunu
Nasoqo
17°07'14.11" S
Somosomo
Korovou Eco
Yasawa High School
Marou
177°15'23.20" E
Malevu
Soso
Kese

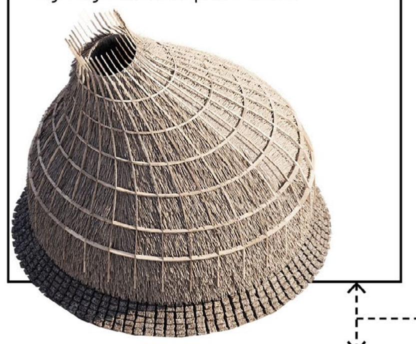
PROGRAM (Components of the Marou Village Ecosystem)

The Marou Village ecosystem is built on interconnected, regenerative systems where energy, water, waste, and food cycles support one another. Key components include solar-powered energy towers, water harvesting and filtration systems, agricultural land, aquaculture ponds, insect and livestock farms, biogas facilities, and community spaces - all working together to create a resilient, self-sufficient environment.

RAIN WATER
GRAVITATIONAL WATER

9 BIOGAS STORAGE

Biogas storage holds gas from the digester, offering backup energy for cooking and lighting when solar power is low.



8 BIOGAS DIGESTER

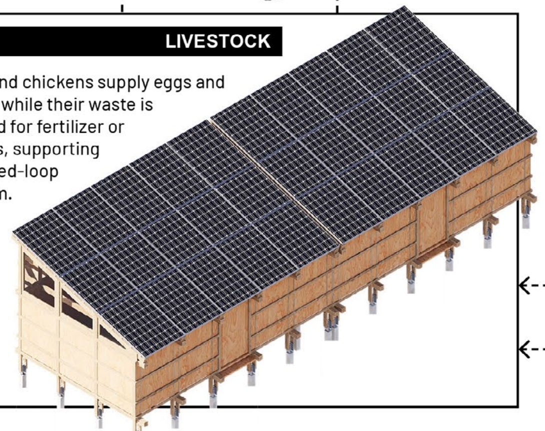
The biogas digester converts organic waste—from animals, agriculture, and households—into renewable energy and nutrient-rich fertilizer, reducing reliance on external fuels and closing local resource loops.

Additional livestock and farmland improve food security, reduce imports, and support local income. They also enable natural waste reuse and sustainable farming cycles.

ANIMAL WASTE
FERTILIZER

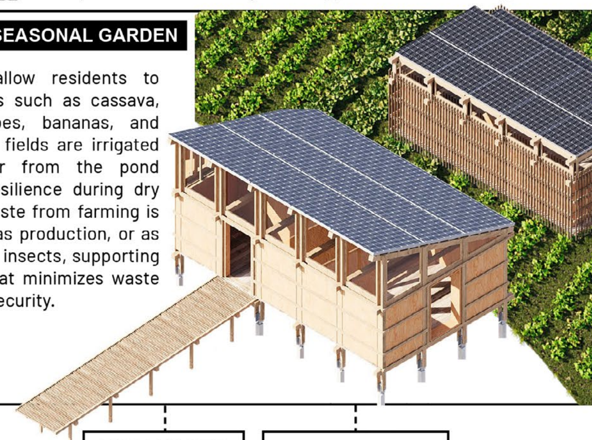
7 LIVESTOCK

Pigs and chickens supply eggs and meat, while their waste is reused for fertilizer or biogas, supporting a closed-loop system.



4 SEASONAL GARDEN

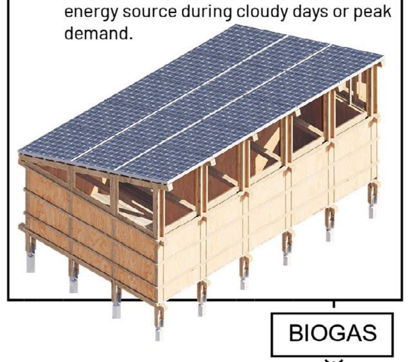
Designated plots allow residents to cultivate local crops such as cassava, taro, sweet potatoes, bananas, and leafy greens. These fields are irrigated using stored water from the pond system, ensuring resilience during dry seasons. Organic waste from farming is repurposed for biogas production, or as feed for animals and insects, supporting a circular system that minimizes waste and enhances food security.



WATER
BIOGAS
PETFOOD
PETFOOD
BIO WASTE
VEGETABLES

10 BIOGAS GENERATOR

The biogas generator converts stored gas into electricity, providing an alternative energy source during cloudy days or peak demand.



Sanitation in Marou Village is currently basic and decentralized, often consisting of pit latrines or simple outdoor structures without proper sanitation system.

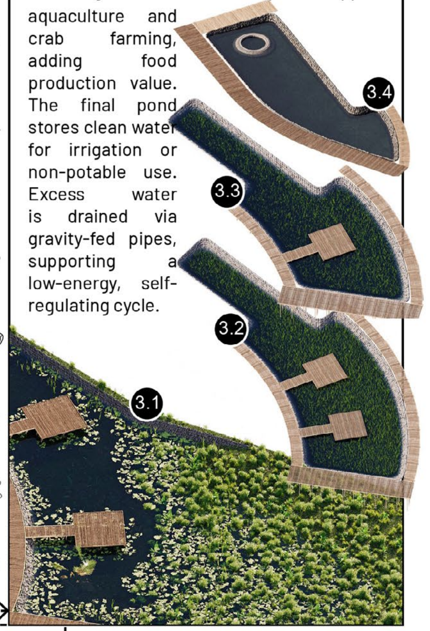
SORTED BIO WASTE
HUMAN WASTE

5 BIO WASTE

All organic, human, and animal waste is collected and processed on-site. Depending on type and quality, waste is converted into natural fertilizer, used for biogas production, or repurposed as feed for animals and insects—ensuring nothing is wasted and all resources support the village ecosystem.

3 WATER STORAGE

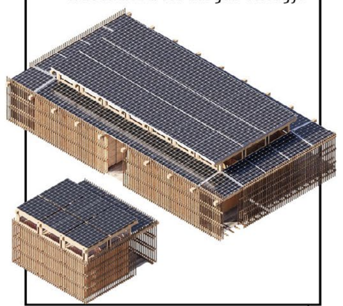
This system consists of four interconnected ponds that naturally filter and manage water. The first pond combines a helophyte filter with a fish farm, using wetland plants to clean incoming water. The next two ponds support aquaculture and crab farming, adding food production value. The final pond stores clean water for irrigation or non-potable use. Excess water is drained via gravity-fed pipes, supporting a low-energy, self-regulating cycle.



BIOGAS

12 PUBLIC TOILET

Public toilets and showers offer basic hygiene, with waste used for biogas energy.



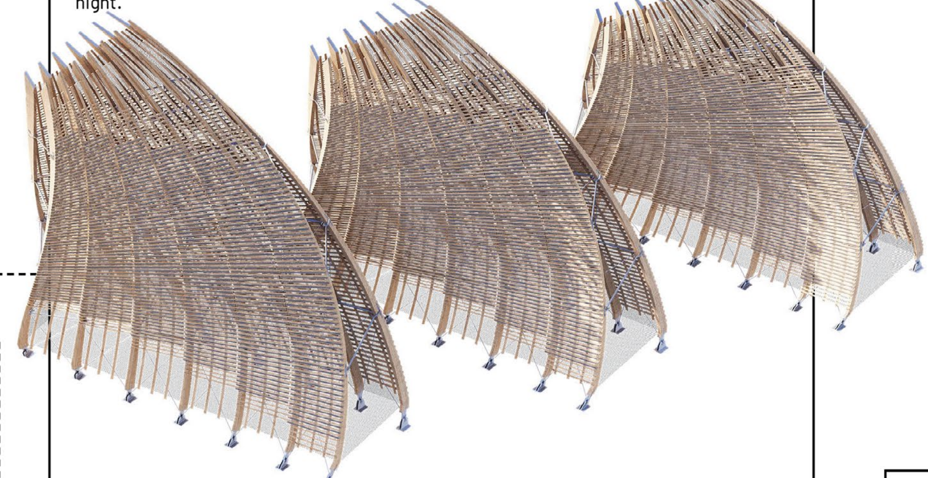
1 ENERGY TOWERS (BURE KALOU - SPIRIT HOUSES)

The Energy Towers are the project's central feature, inspired by traditional Bure Kalou and Fijian boats. They combine solar energy production and water harvesting in a climate-resilient form.

Each tower's north-facing facade is equipped with solar panels, maximizing sun exposure for efficient electricity generation. This energy is distributed directly to the village or stored in batteries for use during cloudy periods or at night.

The surface of the towers is wrapped in a special mesh designed to harvest both rain and fog, capturing water that is channeled down into a filtration and storage system.

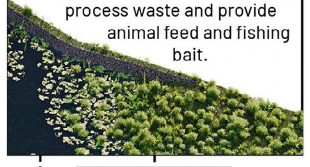
Each tower also includes indoor spaces for community gatherings, workshops, or shelter, strengthening social and cultural life in Marou.



INSECTS FOOD

6 INSECTS FARM

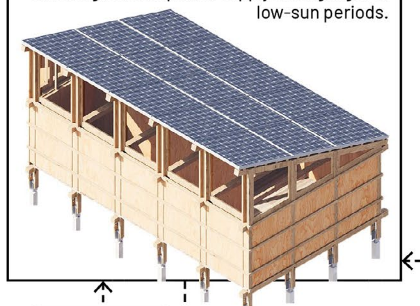
Insect and bee farms support food systems and biodiversity. Bees aid pollination and honey production, while insects process waste and provide animal feed and fishing bait.



FISH FOOD

11 ELECTRICITY STORAGE

The electricity storage system uses molten salt batteries to store excess energy, ensuring reliable power supply during night or low-sun periods.



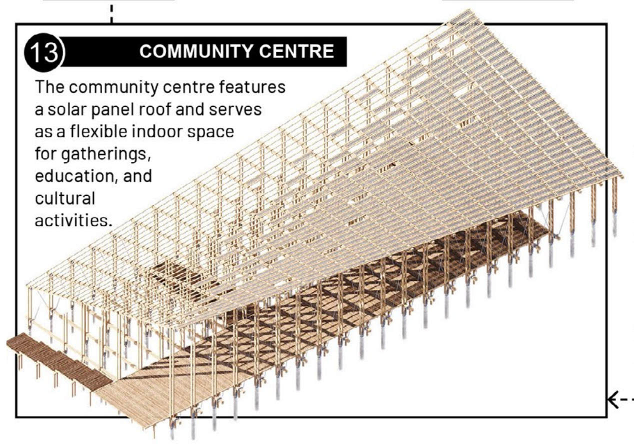
ENERGY
ENERGY
ENERGY

Crabs in rice fields aerate th soil and control pests, while feeding on plant matter. Fish in helophyte filters help purify water by consuming algae and waste.

WATER
HONEY
FISHING BAIT

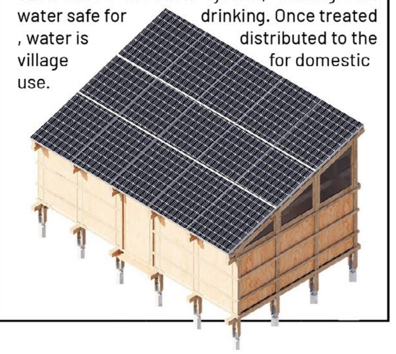
13 COMMUNITY CENTRE

The community centre features a solar panel roof and serves as a flexible indoor space for gatherings, education, and cultural activities.



2 WATER FILTRATION UNIT

Ozon-based filtration system, making rain water safe for drinking. Once treated, water is distributed to the village for domestic use.



FOG HARVESTED WATER
RAIN WATER
ENERGY
RAIN WATER
FOG HARVESTED WATER
FISH
RICE
CRABS
WATER
FILTERED WATER
RESIDENTS

MAROU VILLAGE

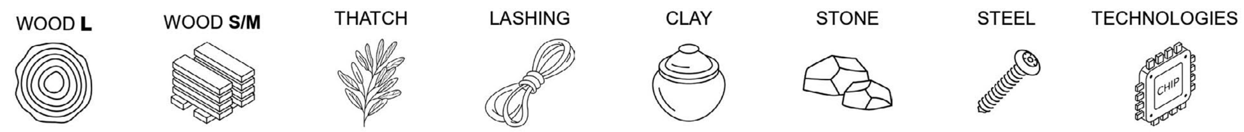
COMMUNITY (Sustainability + Traditions + Material Ecology)

MATERIAL ECOLOGY

The design prioritizes the use of local, biodegradable materials sourced directly from Naviti Island. This approach reduces the need for long-distance transportation, significantly lowering construction costs and carbon emissions, while also supporting local businesses and traditional economies. The material palette includes durable native wood for structural framing, thatch from sago palm or coconut leaves for roofing, lashings made from coconut fiber (magimagi) to tie smaller beams, and locally sourced stone and clay for foundations and stormwater protection features. These materials are not only ecologically appropriate but also culturally rooted, drawing from generations of Fijian building knowledge.

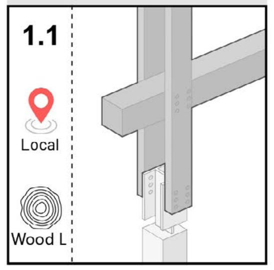
By using familiar materials and techniques, the construction process becomes more accessible to the community. Residents can actively participate in the construction and maintenance of the project, fostering local ownership and long-term sustainability.

MAIN MATERIAL GROUPS:



MATERIAL EFFICIENCY IN CONSTRUCTION:

STRUCTURAL ELEMENTS



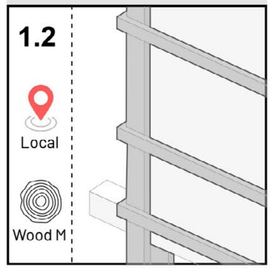
Usage:

- Structural frames
- Structural posts

Material:

- Vesi (Intsia bijuga wood)
- Dakua (Agathis bijuga)

SECONDARY STRUCTURES



Usage:

- Structural elements of walls, roofs and floors

Material:

- Coconut palm
- Rosawa, Kauvula, Yaka

FACADE SYSTEMS

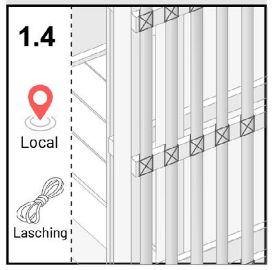
Usage:

- Facades, floors and decorative elements

Material:

- Bamboo stem
- Bamboo fiber

LASHING



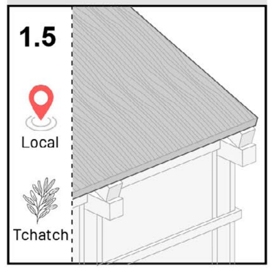
Usage:

- Nails - Lashings
- Tie beam structures

Material:

- Coconut fiber ropes
- Magimagi

ROOFING SYSTEMS



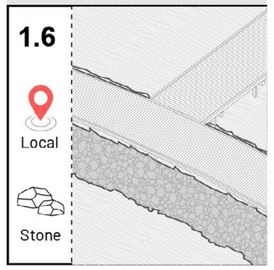
Usage:

- Roofing material
- Shockproof cover

Material:

- Sago palm
- Coconut palm leaves

FOUNDATION



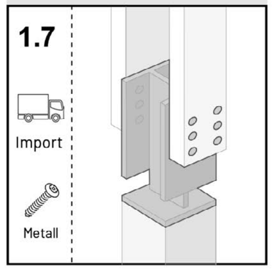
Usage:

- Foundation, reinforsing, stormwater protection

Material:

- Stone or coral stone
- Earth - packed base

STEEL CONNECTIONS



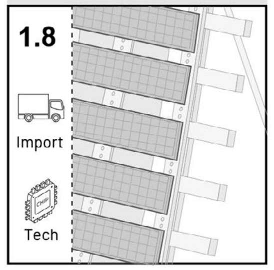
Usage:

- Foundation
- Wood framing

Material:

- Carbon steel
- Stainless steel

TECHNOLOGIES



Usage:

- Facade and roofing
- Indoor

Material:

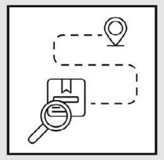
- UV Solar pannels
- Filtration systems

TRANSPORTATION:

ISN'T NEEDED

1. LOWER MATERIAL COSTS

Locally sourced materials reduce overall construction expenses by minimizing purchase and transport costs.

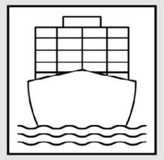


2. SUPPORT FOR COMMUNITIES

Utilizing local materials preserves traditional skills, strengthens local economies, and creates job opportunities for local communities.

3. REDUCED CO² EMISSIONS

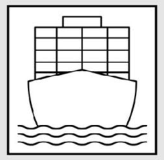
Avoiding long-distance shipping significantly cuts greenhouse gas emissions associated with transportation.



4. SIMPLIFIED LOGISTICS

On-island resource availability eases delivery challenges and construction planning in a remote location.

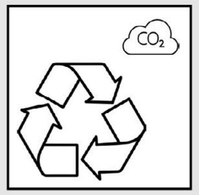
NEEDED



5. EXTERNAL SUPPLY

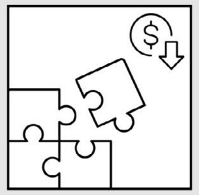
Non-local materials must be shipped from Viti Levu or imported from abroad, increasing vulnerability to delays, higher costs, and logistical complications.

ON-SITE IMPLEMENTATION AND ADAPTATION:



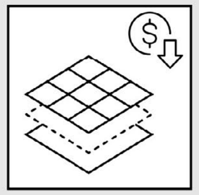
1. MATERIAL RECOVERY

Using modular parts streamlines construction, reduces costs, and minimizes errors.



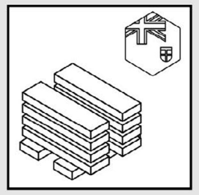
2. MODULARITY AND COMPONENTS

Focus on material reuse and biodegradable options to reduce waste and enhance sustainability.



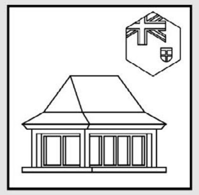
3. ADAPTIVE SPACES

Design flexible spaces that serve multiple functions, from energy production to recreation and agriculture.



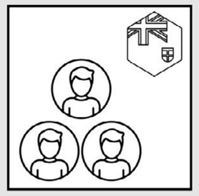
4. LOCAL MATERIALS

Prioritize locally sourced materials to cut costs, reduce carbon emissions, and connect with the environment.



5. TRADITIONAL CONSTRUCTION

Integrate local building traditions to ensure cultural relevance and community familiarity. Preserving the heritage while adapting to modern needs.



6. COMMUNITY ENGAGEMENT

Involving locals in both the construction and ongoing operations fosters a sense of ownership, valuable skills transfer and empowerment.

7. MUTUAL LEARNING

Encourage the exchange of knowledge to improve technical skills, cultural understanding and share traditional practices.

8. PERSONAL INVESTMENT

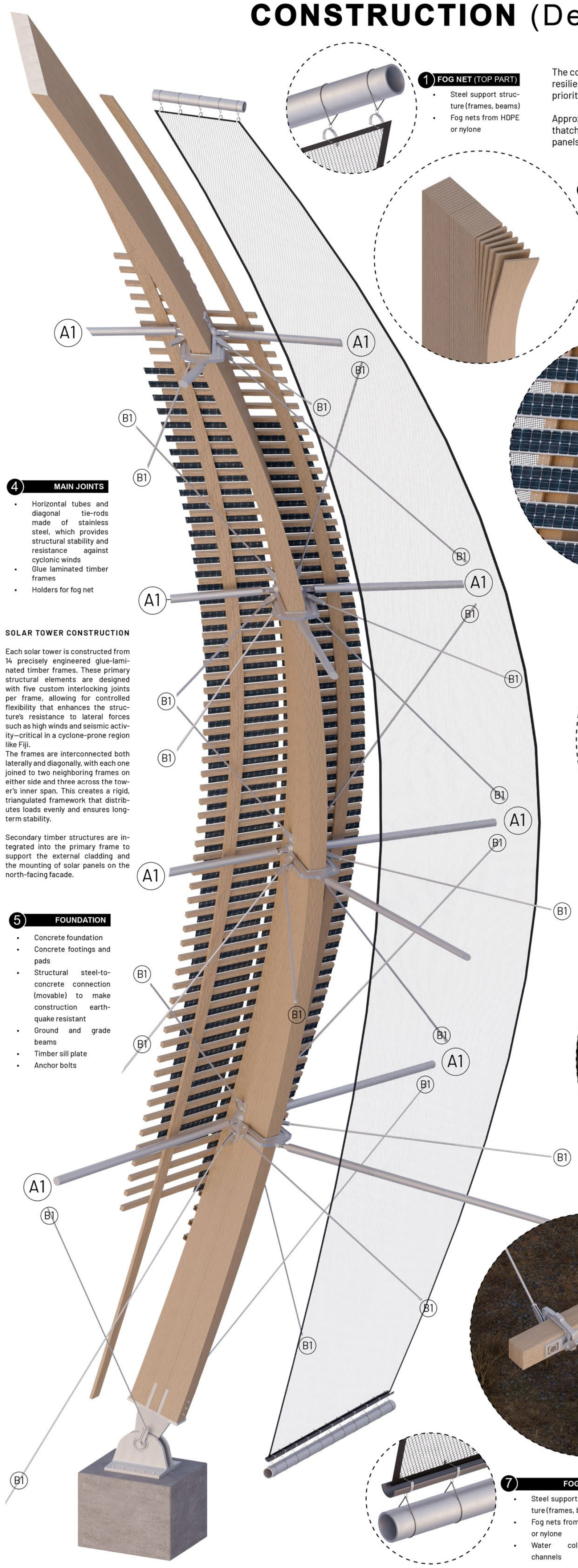
Foster a sense of pride and responsibility in the community for the long-term success of the project. Personal connection to the project

BUILDING UP COMMUNITY:

1. SHARED SPACE

Supports group meetings, cultural practices, communal meals, and possibly workshops or classes. It strengthens local bonds, fosters knowledge-sharing, and promotes a more sustainable lifestyle centered around the village itself.

CONSTRUCTION (Details + Materials + Technologies)

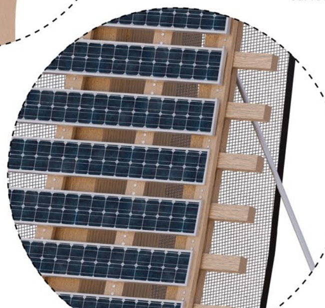


1 FOG NET (TOP PART)

- Steel support structure (frames, beams)
- Fog nets from HDPE or nylone

2 LAMINATED TIMBER

- Laminated timber layers (thickness 3-5 mm)
- Adhesive (Glue)
- Curved and custom shapes
- Surface finish with protective coating

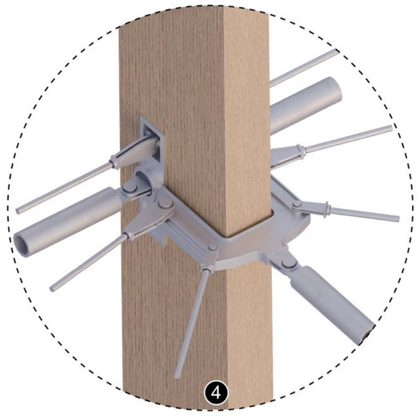


3 SOLAR FACADE

- Photovoltaic (PV) Panels (Monocrystal)
- Mounting system from vertical and horizontal rails from wood with some metal details.
- Mounting brackets and clamps
- Adjustable wooden frames

4 MAIN JOINTS

- Horizontal tubes and diagonal tie-rods made of stainless steel, which provides structural stability and resistance against cyclonic winds
- Glue laminated timber frames
- Holders for fog net



SOLAR TOWER CONSTRUCTION

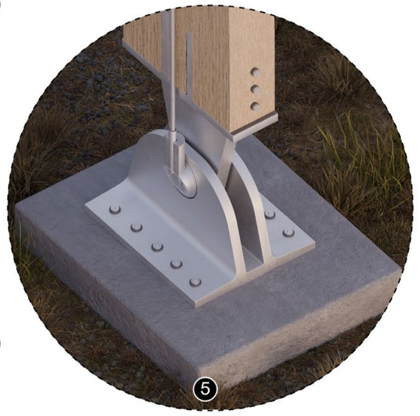
Each solar tower is constructed from 14 precisely engineered glue-laminated timber frames. These primary structural elements are designed with five custom interlocking joints per frame, allowing for controlled flexibility that enhances the structure's resistance to lateral forces such as high winds and seismic activity—critical in a cyclone-prone region like Fiji.

The frames are interconnected both laterally and diagonally, with each one joined to two neighboring frames on either side and three across the tower's inner span. This creates a rigid, triangulated framework that distributes loads evenly and ensures long-term stability.

Secondary timber structures are integrated into the primary frame to support the external cladding and the mounting of solar panels on the north-facing facade.

5 FOUNDATION

- Concrete foundation
- Concrete footings and pads
- Structural steel-to-concrete connection (movable) to make construction earthquake resistant
- Ground and grade beams
- Timber sill plate
- Anchor bolts



6 TIMBER FRAME FOUNDATION

- Concrete footings and pads
- Concrete piers/posts
- Ground and grade beams
- Timber sill plate
- Anchor bolts

7 FOG NET

- Steel support structure (frames, beams)
- Fog nets from HDPE or nylone
- Water collection channels

The construction of the Marou Village project is grounded in traditional Fijian building techniques combined with low-energy, climate-resilient strategies and modern technologies where necessary. Learning from generations of vernacular practice, the approach prioritizes community participation, material ecology, and long-term sustainability.

Approximately 85% of construction materials are locally sourced and renewable, including timber (such as vesi or dakua), bamboo, thatch, clay, and stone. The remaining 15% consists of essential imported components such as metal fasteners, steel joints, solar panels, batteries, and filtration technologies.

Foundations are built using large local stones or coral rocks, forming a stable base to resist erosion and manage stormwater. In some cases, earth-packed bases are reinforced with a mix of clay, gravel, and sand. Main structural frames and posts are embedded into these foundations or set on small concrete pads with steel joints for durability. Large structural elements like the glue laminated timber frames on Energy Towers and Community Center roofs are joined with horizontal tubes and diagonal tie-rods made of stainless steel, which provide structural stability and resistance against cyclonic winds. Smaller wooden elements and frames — such as walls, floors, and roofs of other infrastructure objects — are assembled using traditional magimagi lashings made from coconut fiber, minimizing the need for imported materials and tools to connect wooden parts togather.

Thatch, a key material in traditional Fijian construction, is used extensively for roofing, providing natural insulation and ventilation. Thatch roofs, made from sago palm or coconut leaves, are durable, lightweight. The flexibility of thatch also makes it suitable for creating curved rooflines.

1. CONSTRUCTION STEPS

TIMBER FRAME AND FOUNDATION

Timber frames are anchored into stone or concrete foundations using local wood and metal connections for strength and simplicity.

TIMBER SECONDARY STRUCTURES

Secondary structures like walls and floors are built from local timber, bamboo, and woven panels. They are lightweight, breathable, and tied with coconut fiber lashings.

FLOOR CONSTRUCTION

Floors are raised timber platforms supported by stone or earth-packed foundations, allowing ventilation and protection from flooding.

WALLS CONSTRUCTION

Walls are built from woven bamboo or timber panels, tied with coconut fiber ropes, allowing airflow while providing protection and durability.

ROOFS CONSTRUCTION

Roofs are covered with thatch made from sago palm or coconut leaves, providing insulation, ventilation, and resilience against strong winds.

FACADE CONSTRUCTION

Facades are made from locally sourced bamboo tied with magimagi (coconut fiber rope), offering breathability, low thermal mass, and a natural aesthetic that blends with the environment.

2. CONSTRUCTION STEPS

DIGESTER CHAMBER WALLS

The chamber walls are built using locally available stones, bonded with clay-mud mortar, forming a solid base capable of withstanding pressure.

DIGESTER DOME

To create the dome, stones are arranged in a curved shape using wooden frameworks or guide supports, allowing for even shaping and structural stability.

CLAY PLASTER

The interior is sealed with several coats of clay plaster, often mixed with cow dung or lime to enhance waterproofing and gas retention.

INLET TANK

An inlet tank is constructed from stone or clay, serving as the mixing point for dung and water before it flows into the main chamber through a simple pipe made from wood or clay.

ROOFING

Areas are protected with simple thatch roofing, shielding them from heavy rain and direct sunlight, which helps maintain consistent operation and extends the life of the structure.