
GRIGORII MATIUNIN
STUDIO SITTA
FACULTY OF ARCHITECTURE, CTU IN PRAGUE

MAROU
THE POWER OF COMMUNITY

GRIGORII MATIUNIN STUDIO SITTA FACULTY OF ARCHITECTURE, CTU IN PRAGUE

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.

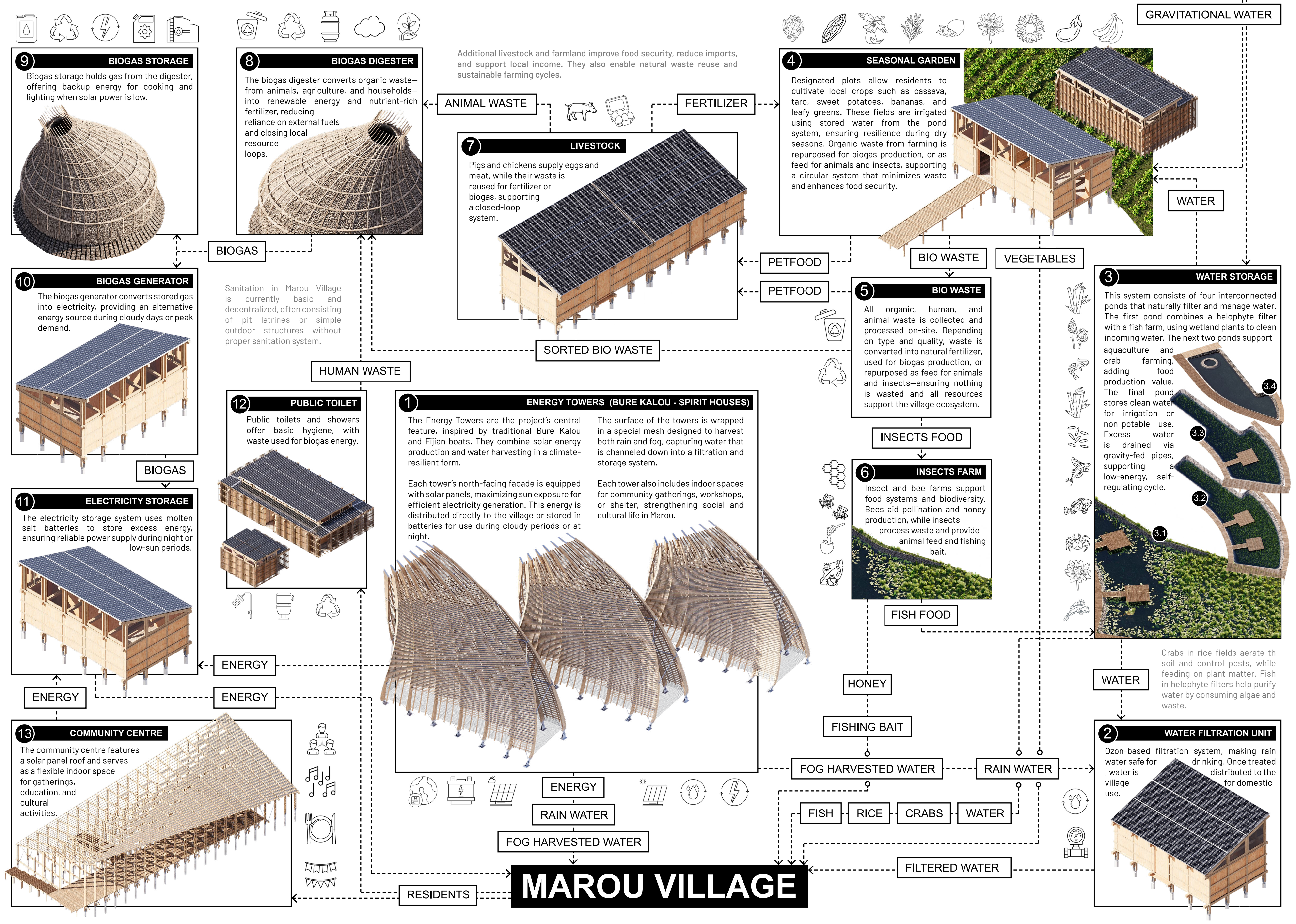
1 NAVITI ISLAND

2 MAROU VILLAGE

GRIGORII MATIUNIN STUDIO SITTA FACULTY OF ARCHITECTURE, CTU IN PRAGUE

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.



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:

WOOD L · WOOD S/M · THATCH · LASHING · CLAY · STONE · STEEL · TECHNOLOGIES

MATERIAL EFFICIENCY IN CONSTRUCTION:

	STRUCTURAL ELEMENTS	SECONDARY STRUCTURES	FACADE SYSTEMS	LASHING	ROOFING SYSTEMS	FOUNDATION	STEEL CONNECTIONS	TECHNOLOGIES
No.	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8
Source	Local / Wood L	Local / Wood M	Local / Bamboo	Local / Lasching	Local / Tchatch	Local / Stone	Import / Metall	Import / Tech
Usage:	Structural frames; Structural posts	Structural elements of walls, roofs and floors	Facades, floors and decorative elements	Nails - Lashings; Tie beam structures	Roofing material; Shockproof cover	Foundation, reinforsing, stormwater protection	Foundation; Wood framing	Facade and roofing; Indoor
Material:	Vesi (Intsia bijuga wood); Dakua (Agathis bijuga)	Coconut palm; Rosawa, Kauvula, Yaka	Bamboo stem; Bamboo fiber	Coconut fiber ropes; Magimagi	Sago palm; Coconut palm leaves	Stone or coral stone; Earth - packed base	Carbon steel; Stainless steel	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.

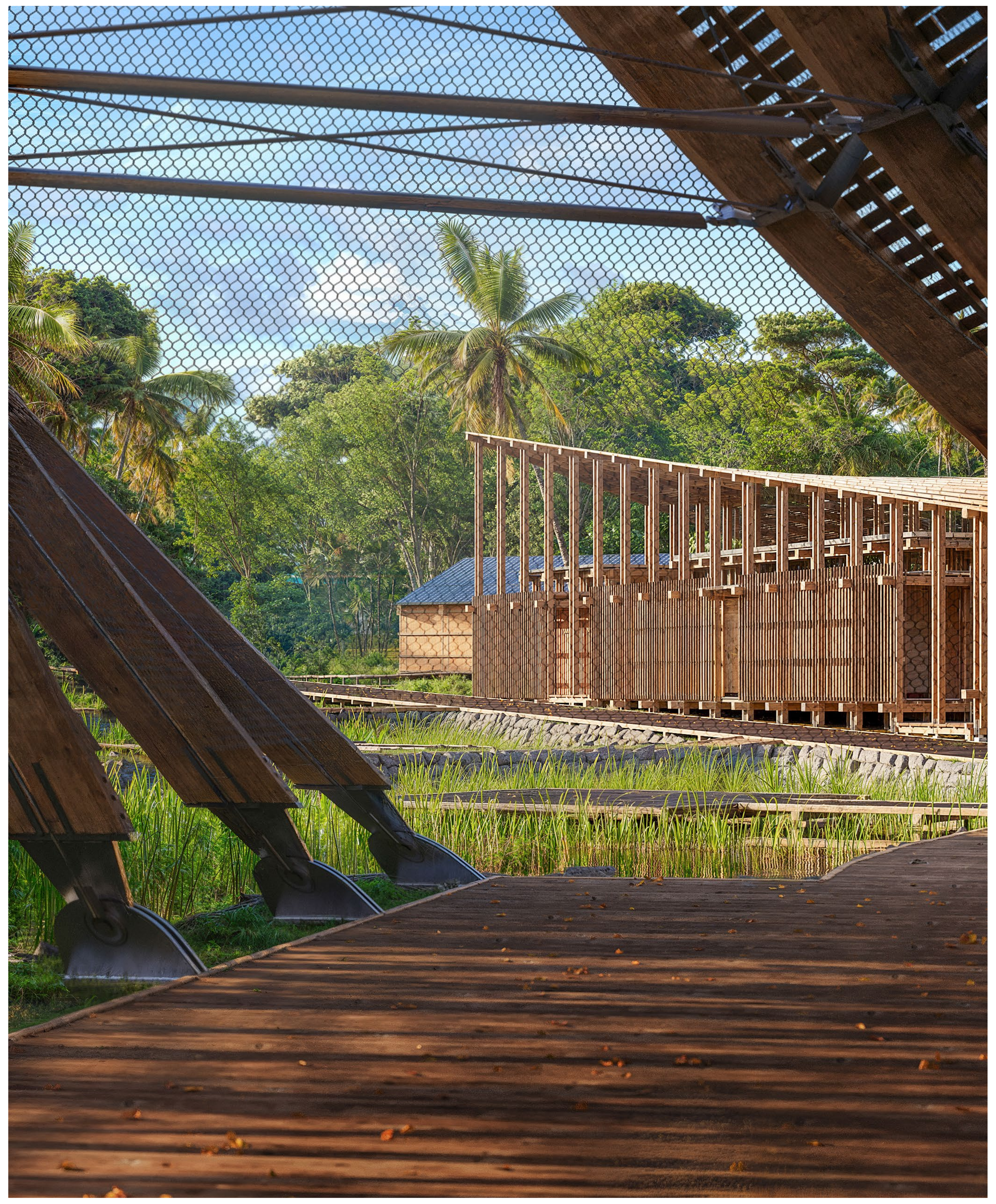
7. MUTUAL LEARNING Encourage the exchange of knowledge to improve technical skills, cultural understanding and share traditional practices.

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

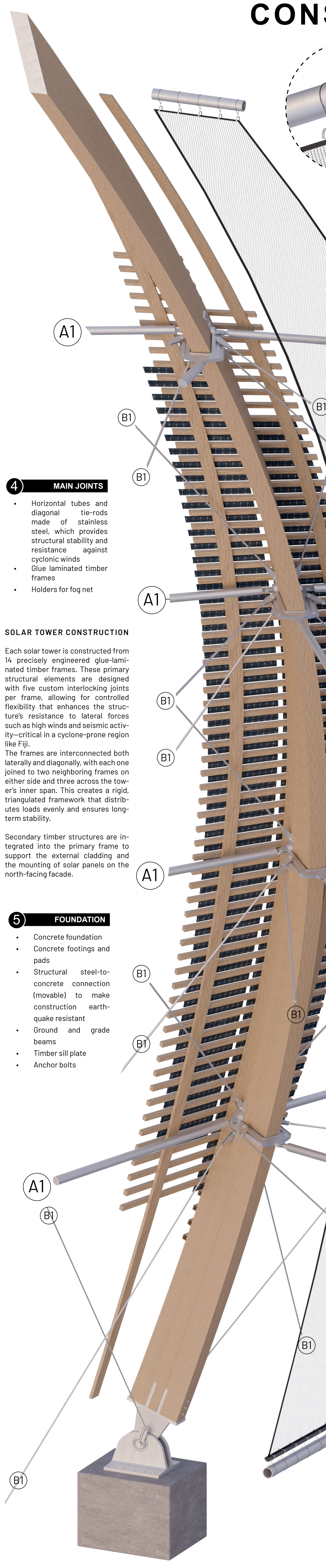
BUILDING UP COMMUNITY:

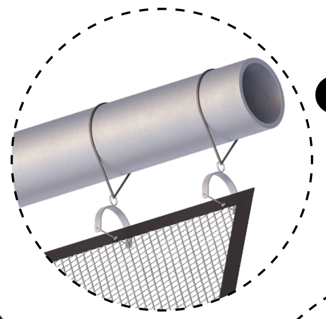
1. SHARED SPACE

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.

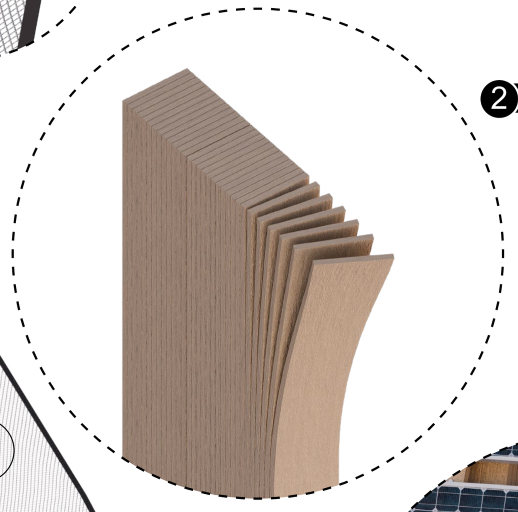


CONSTRUCTION (Details + Materials + Technologies)

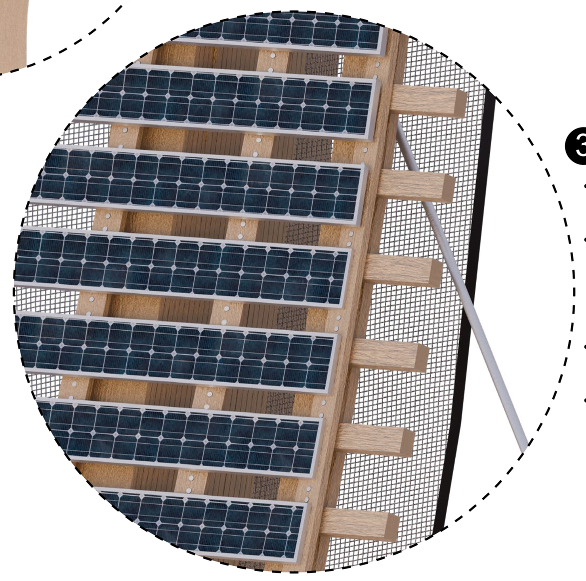




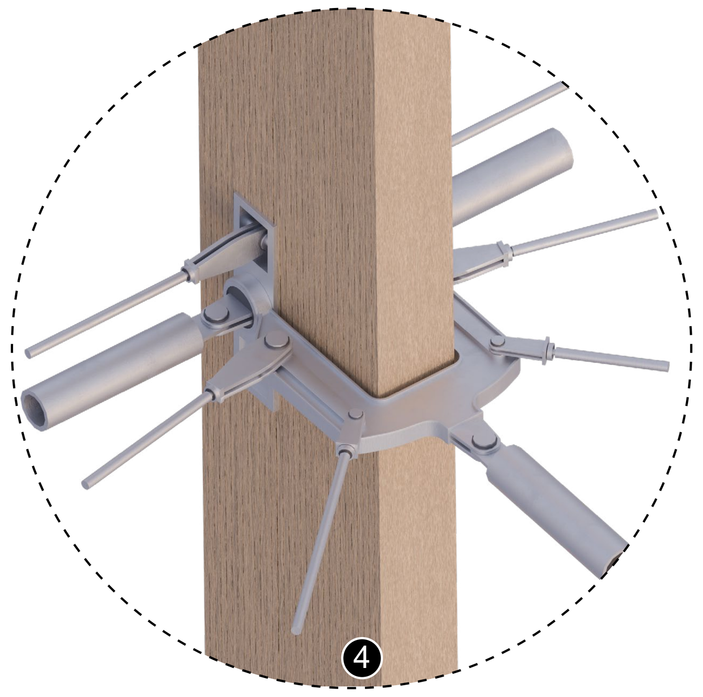
1 FOG NET (TOP PART)
- Steel support structure (frames, beams)
- Fog nets from HDPE or nylone



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

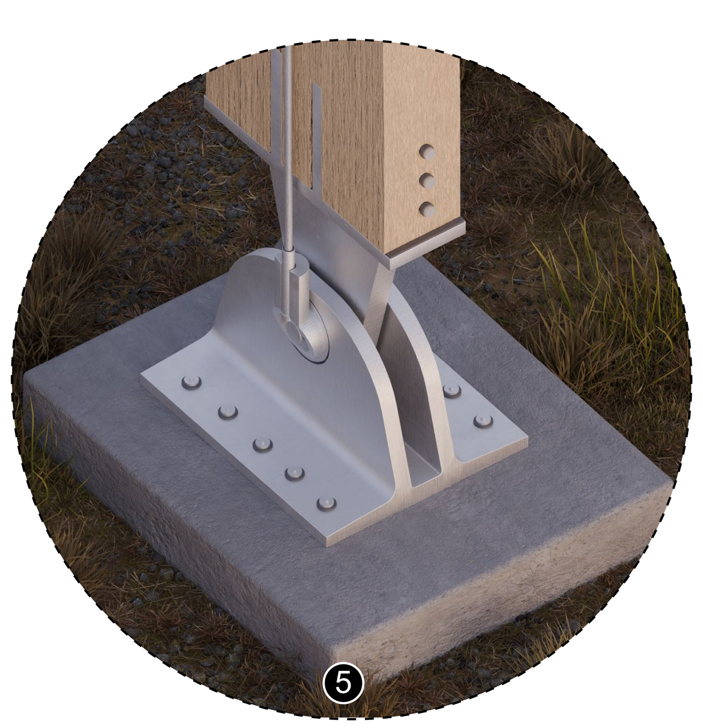


4 MAIN JOINTS
- Horizontal tubes and diagonal tie-rods made of stainless steel, which provides structural stability and resistance against cyclonic winds
- Glue laminated timber frames
- Holders for fog net

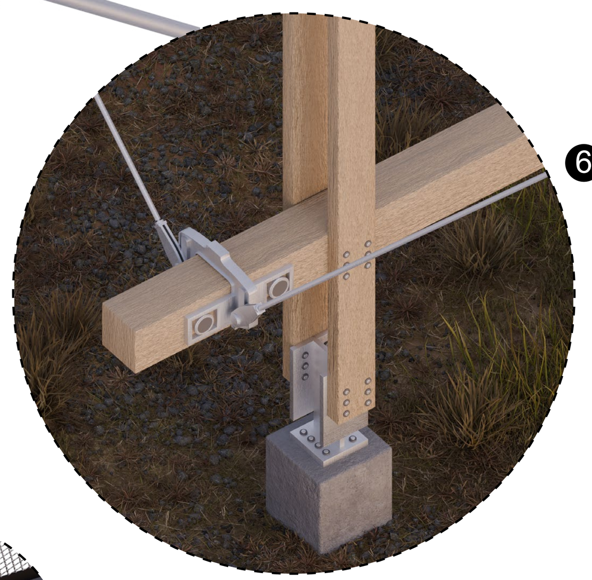
SOLAR TOWER CONSTRUCTION

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.

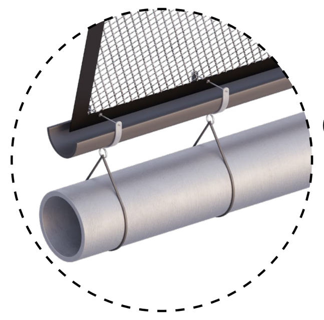
Secondary timber structures are integrated into the primary frame to support the external cladding and the mounting of solar panels on the north-facing facade.



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.

GRIGORII MATIUNIN STUDIO SITTA FACULTY OF ARCHITECTURE, CTU IN PRAGUE

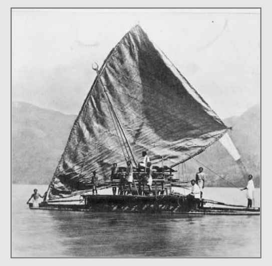
SHAPE (Traditional + Wind + Solar)

BURE KALOU

The Bure Kalou is a traditional Fijian spirit house or temple used for religious and ceremonial purposes, especially by priests. Its architectural shape is distinct and symbolic. The building typically has a rectangular floor plan, raised slightly above the ground on wooden or stone posts. It features a steep, high-pitched thatched roof that dominates the structure. The height of the roof often symbolizes the importance of the building and its connection to the spirit world. Traditionally, the Bure Kalou has no windows, only a low doorway, which contributes to its mystique and sacred nature. A prominent central ridge pole (doko ni vale) runs the length of the roof and is often symbolically significant, representing a spiritual axis. Sacred ornaments or offerings may be placed inside, and the exterior might include symbolic carvings or patterns.

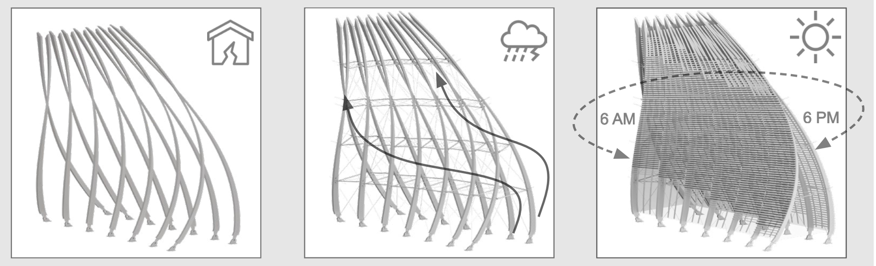
BURE KALOU
Picture of a bure kalou - a traditional Fijian religious building - near Laie, Hawaii.

+



DRUA BOAT
Is a large, double-hulled sailing canoe traditionally used for long-distance voyaging.

=



EARTHQUAKE RESISTANT
Anchor the tower and distribute seismic forces evenly, enhancing structural stability.

WIND RESISTANT
Joints are absorbing wind loads and reducing the risk of structural fatigue or failure.

ENERGY FACADE
Optimizing surface exposure to sun and wind, which maximizes the efficiency of integrated solar panels.