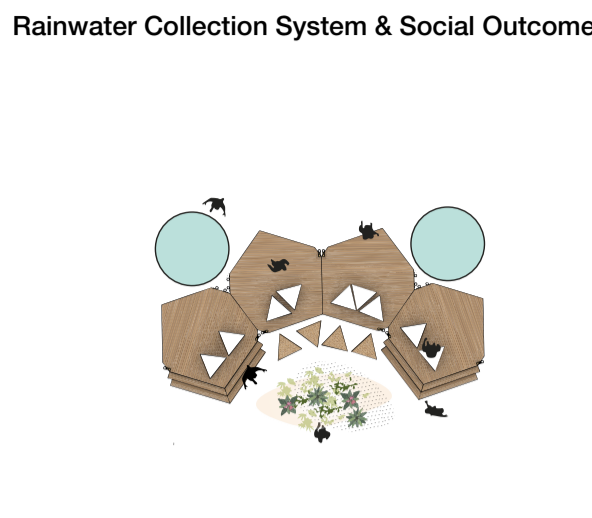
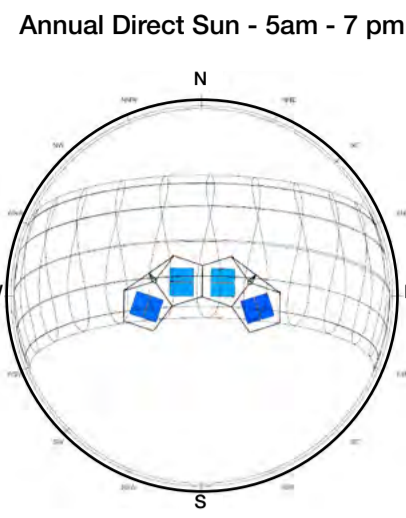
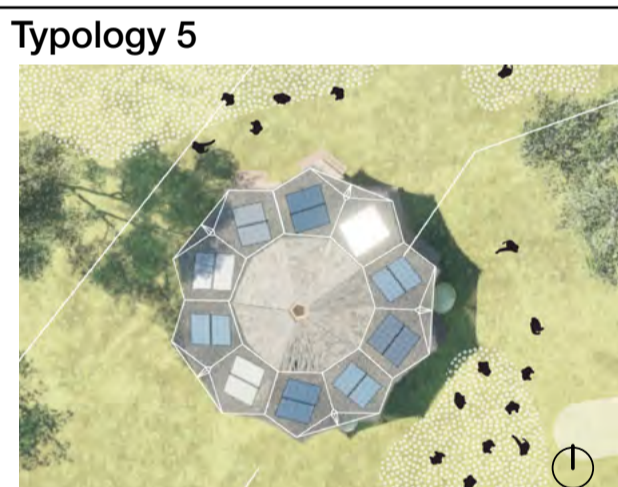
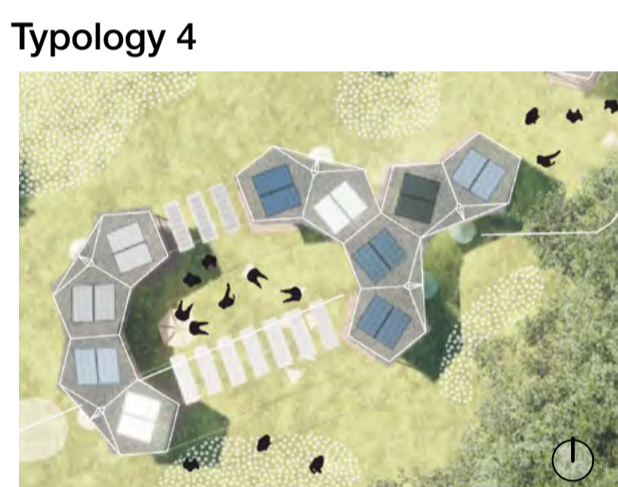
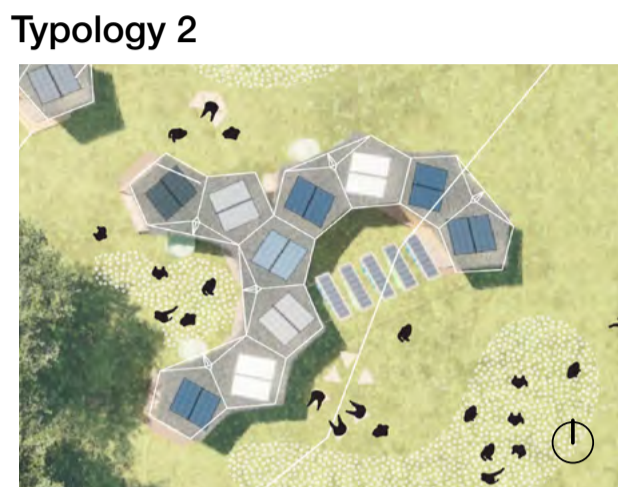
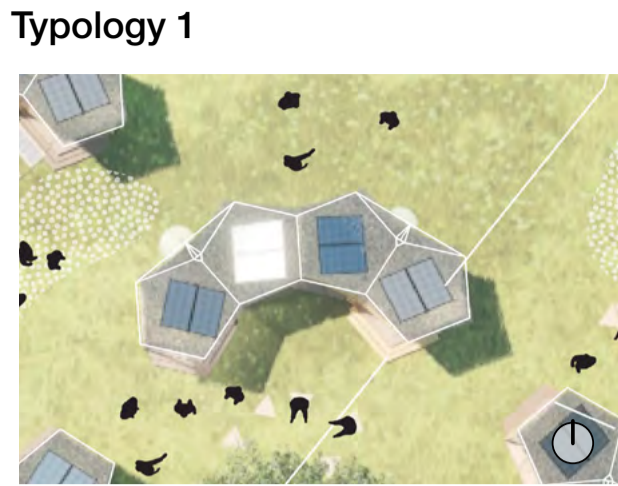


Vatu Rua Kaukauwa

Masterplan Phase One



Assumptions	
Typical Solar Panel Capacity:	400 watts
Photovoltaic Panel Efficiency:	15%
System Loss Factor:	85%
Cost per installed watt:	\$12 usd

2 Modules (4 pentagons, 8 PV panels)

Average energy produced per panel: 1.5kWh daily approx

Total energy produced per typology: 6kWh daily approx

Rainwater storage capacity: 2 tanks of 14,000 Liters each

Total rainwater storage capacity per typology: 28,000 Liters per typology.

Indicative total cost: \$38,000.00 usd approx

5 Modules (10 pentagons, 20 PV panels)

Average energy produced per panel: 1.35kWh daily approx

Total energy produced per typology: 27kWh daily approx

Potential Additional Flexible Panel Energy: 6kWh daily

Rainwater storage capacity: 2 tanks of 14,000 Liters each

3 tanks of 3,000 Liters each

Total rainwater storage capacity per typology: 37,000 Liters per typology.

Indicative total cost: \$95,000.00 usd approx

3 Modules (6 pentagons, 12 PV panels)

Average energy produced per panel: 1.45kWh daily approx

Total energy produced per typology: 17kWh daily approx

Potential Additional Flexible Panel Energy: 6kWh daily

Rainwater storage capacity: 3 tanks of 14,000 Liters each

42,000 Liters per typology.

Indicative total cost: \$57,000.00 usd approx

5 Modules (10 pentagons, 20 PV panels)

Average energy produced per panel: 1.35kWh daily approx

Total energy produced per typology: 27kWh daily approx

Potential Additional Flexible Panel Energy: 12kWh daily

Rainwater storage capacity: 3 tanks of 14,000 Liters each

2 tanks of 3,000 Liters each

Total rainwater storage capacity per typology: 48,000 Liters per typology.

Indicative total cost: \$95,000.00 usd approx

5 Modules (10 pentagons, 20 PV panels) & Central Roof

Average energy produced per panel: 1.35kWh daily approx

Total energy produced per typology: 27kWh daily approx

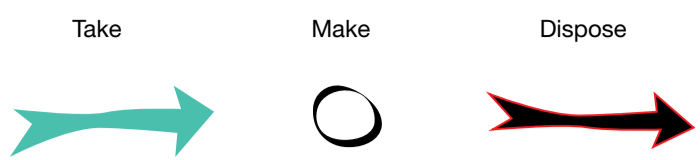
Rainwater storage capacity: 3 tanks of 14,000 Liters each

2 tanks of 3,000 Liters each

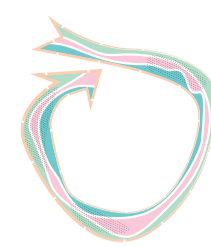
Total rainwater storage capacity per typology: 48,000 Liters per typology.

Indicative total cost: \$125,000.00 usd approx

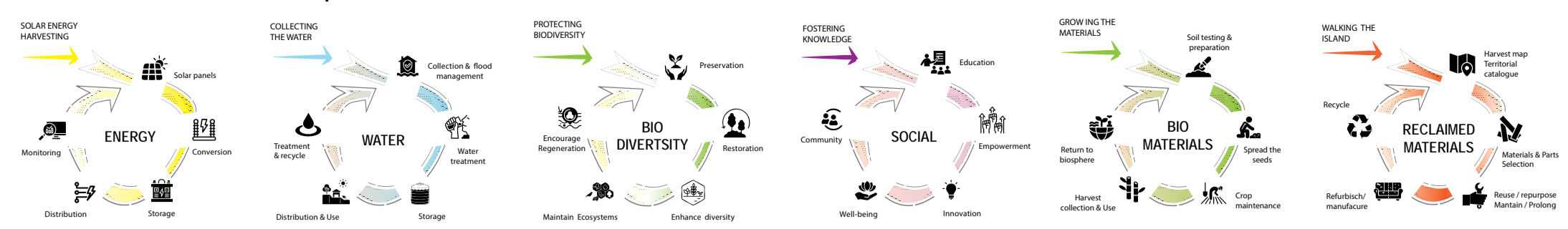
Linear Economy



Circular and Metabolic Economy



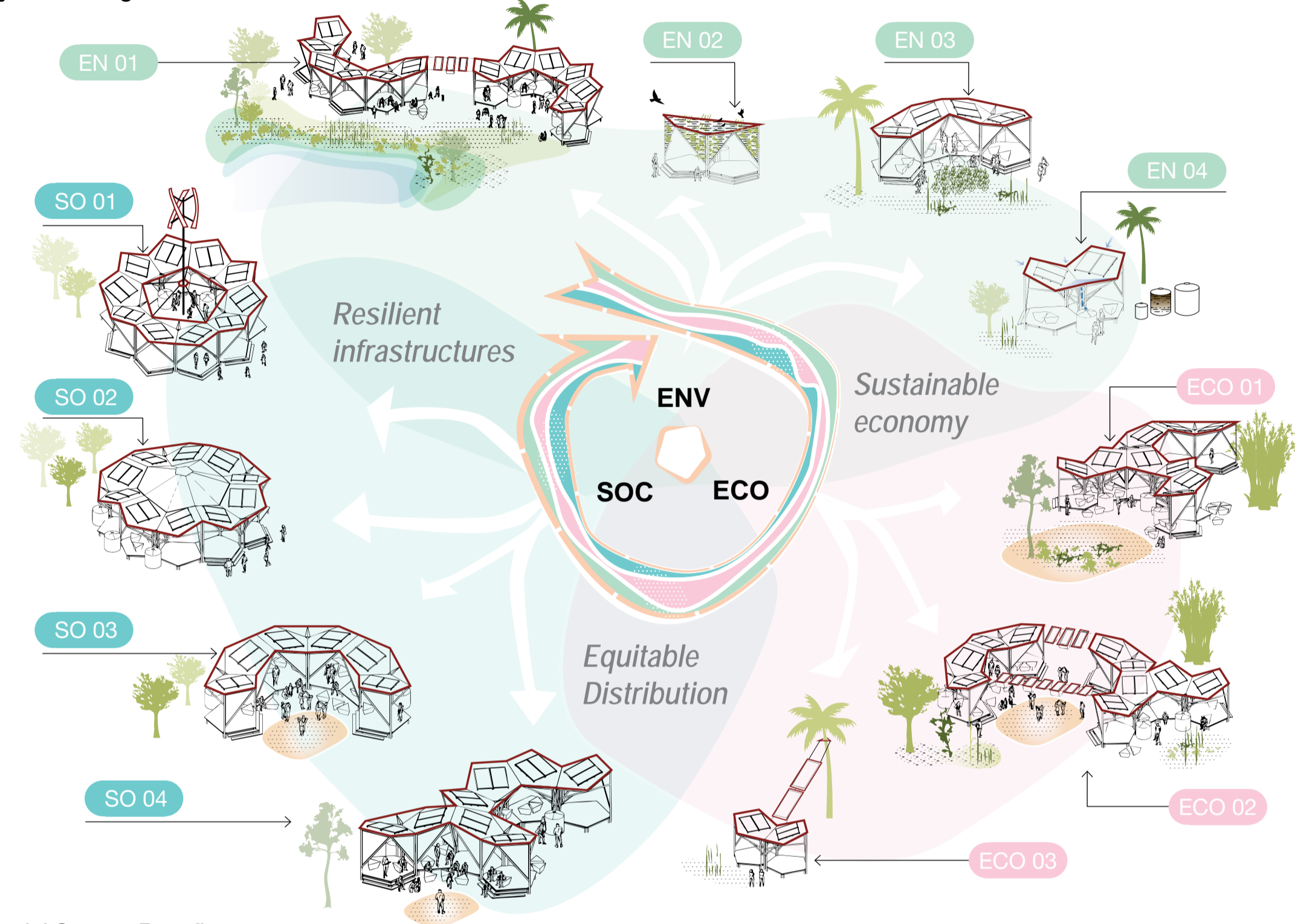
Circular and Metabolic Principles



Rooted in the principles of sustainable development and a regenerative, metabolic economy, the Vatu Rua Kaukauwa typologies unfold as a phased architectural strategy. The initial phase focuses on securing two foundational needs: access to renewable energy and efficient rainwater harvesting. Alongside these priorities, the strategy also initiates the cultivation of local bamboo and native plant species, serving both flood mitigation and ecosystem restoration goals. Solar power is selected as the primary energy source for its adaptability, high efficiency, and suitability to coastal conditions—it performs well even in indirect sunlight.

The modular nature and ease of installation of solar panels make them ideal for decentralised mini-grid systems, and the familiarity of the Marou community with this technology enables the repurposing of existing panels, amplifying both social and environmental impact. Rainwater harvesting is seamlessly integrated into the architectural design, with a modular roof composed of three slopes that channel water into a standard downspout system, easily adaptable to a variety of tank types.

System configurations



Social System Benefits

SO 01 Organised in a Typology 5 layout, the Vertical Axis Wind Turbine (VAWT) is a central feature. The design includes centralised water collection and an open roof, ideal for VAWT installation. This setup enhances energy harvesting, efficiently capturing and utilising wind power for sustainability.

SO 02 Typology 5 in Phase 2 transforms into a versatile community centre, featuring full coverage for rain protection while maintaining natural lighting at its core. This multifunctional design generates energy and collects water in perimeter tanks, ensuring resilience and sustainability.

SO 03 Typology 3 showcases a central U-shaped design that harmoniously blends with its surroundings. Perfect for outdoor community meetings, presentations, communal meals, and other shared activities, it fosters connection and collaboration.

SO 04 A typology derived from Typology 2 offers flexibility with a U-shaped design by incorporating modules in varying positions. This configuration is ideal for creating three distinct centres, each dedicated to a unique social purpose, fostering adaptability and community engagement.

Environmental System Benefits

EN 01 Composed of two Typology 3 modules arranged in a U-shape and connected by flexible photovoltaic modules. This layout allows the building to adapt to the terrain and respond to controlled flood zones on one side, while creating a social space on the other. Some species include: Intsia bijuga, Decaspermum vitense, Hibiscus tiliaceus, supported by native sedges (Rhynchospora, Fimbristylis)

EN 02 Composed of the fundamental two-pentagon module, it is designed to function as a holistic ecosystem for birds and native species, with both the roof and panels serving as habitats to support and promote local biodiversity.

EN 03 Configured with Typology 1, utilising two main modules, this layout establishes a central area for production, integrating small crops and gardens.

EN 04 The primary module, consisting of two pentagons, is engineered to harvest rainwater and store it in standardised tanks with capacities from 1,000 to 14,000 litres. Its adaptable design enables the seamless integration of both natural filtration systems and advanced reverse osmosis filters, ensuring a reliable and safe water supply.

Economic System Benefits

ECO 01 Utilising Typology 2 in a compact layout, this configuration serves as a versatile module that generates energy, harvests rainwater, and establishes a productive core for cultivating crops like taro, cassava, breadfruit, bananas, coconuts, and yams. Additionally, it incorporates a dedicated social space to foster community interaction.

ECO 02 Typology 4 integrates modular photovoltaic units to form a central hub, while productive activities and water collection are efficiently arranged along the two flanking sides

ECO 03 Using the primary two-pentagon module, this configuration focuses on energy production by connecting to nearby homes, trees, and taller structures, ensuring photovoltaic modules are ideally positioned for maximum solar energy efficiency.

