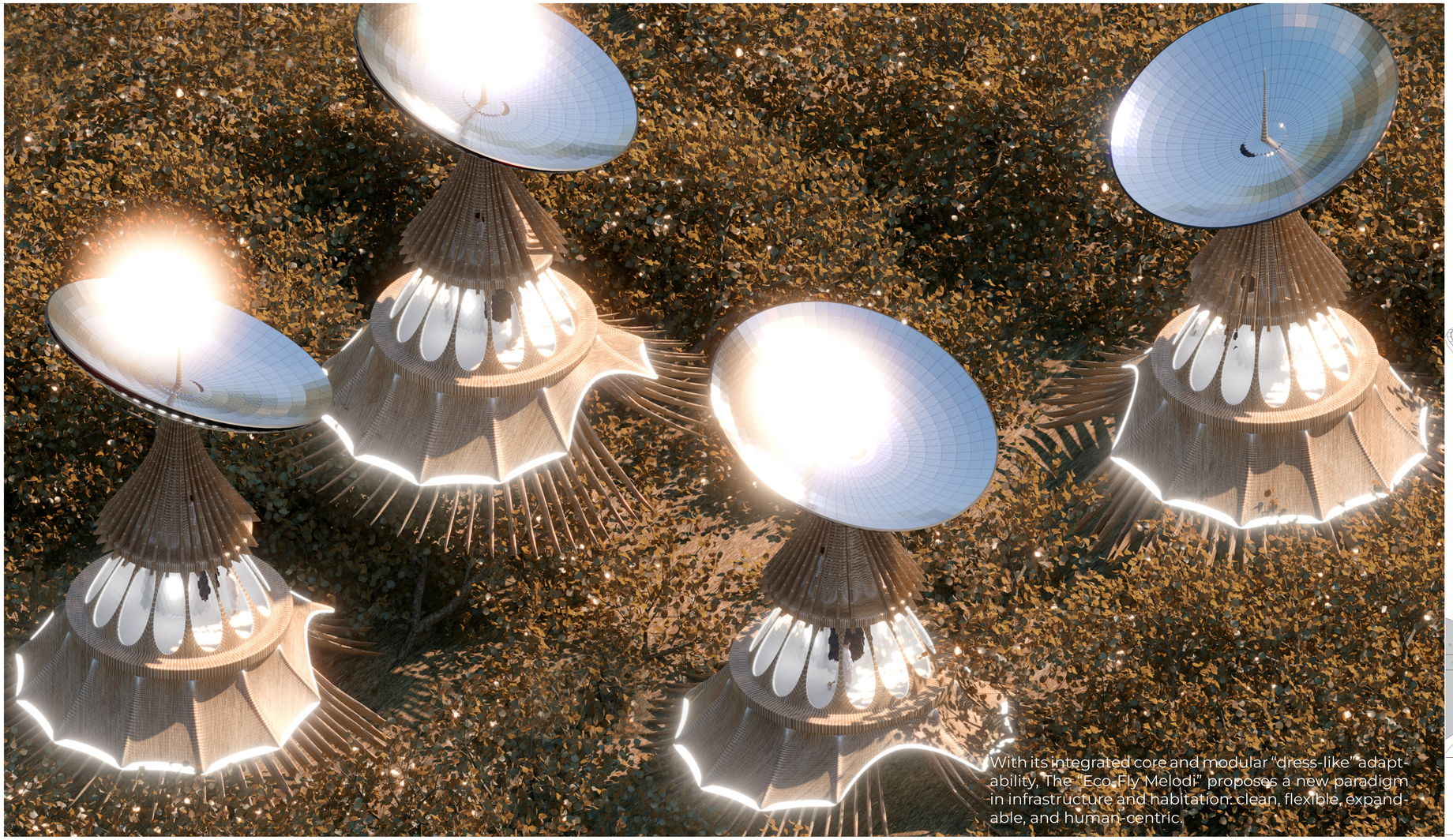


Led Lighting

• **Parabolic Mirror:** A planar parabolic mirror fabricated from aluminum, 5 m in diameter, providing a projected (focal) area of roughly 19 m². This mirror concentrates sunlight onto the high-efficiency photovoltaic panel.

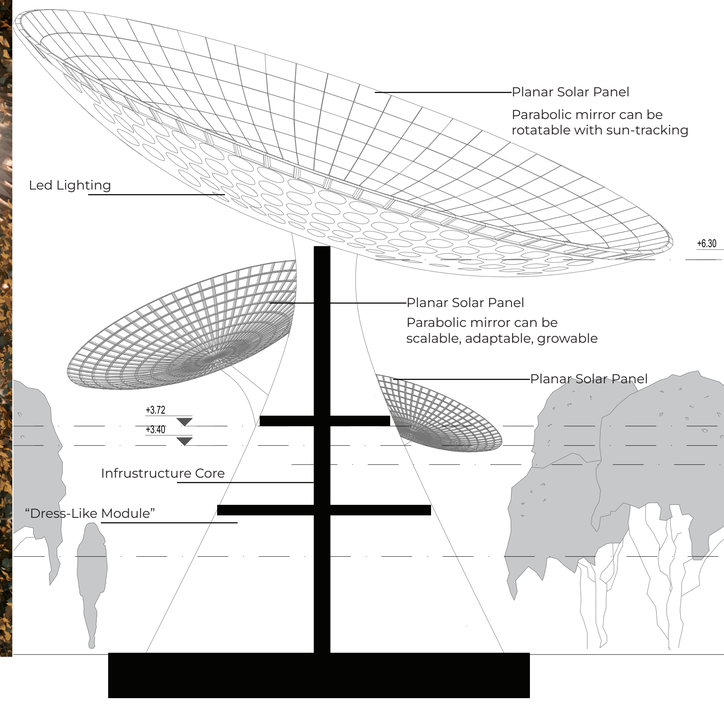
o Sun-Tracking: A control unit employs encoders, position sensors, and sun sensors (similar to cubesat technology) to continuously monitor the sun's position and coordinate the dual-axis movements for optimum solar tracking.
Solar Concentrator and Orientation System

• **Photovoltaic Panel:** A 1×1 m panel positioned at the focal point, converting concentrated solar energy directly into electricity.

• **Dual-Axis Orientation Mechanism:** The mirror is mounted within a decorative spherical joint that conceals its orientation apparatus:

o Rotating Platform (Horizontal Movement): A platform rotates about a vertical axis by means of a toothed wheel and a reduction gearbox (typically 1:10–1:20), allowing precise horizontal adjustments.

o Cable-Based Tilt Mechanism (Vertical Movement): The mirror is connected through two steel cables at its top and bottom that wind onto precision winches (with diameters set approximately D/10 to D/20, where D is the sphere's diameter) for gradual, precise tilt adjustments.



Growable and Movable Structures: The system's modularity means it can be expanded, reduced, or relocated based on changing needs, making it ideal for evolving environments. It can grow in both size and function, ensuring that future requirements can be easily incorporated into the design. “Eco-Fly Melodi” adaptive solar modules structures are also cultural and social spaces. At night, LED elements embedded in the underside of the parabolic mirrors create ambient light, enable visual storytelling or projection mapping, and define vibrant social areas for events, performances, and gatherings—entirely powered by the stored solar energy of the day. The entire design ethos is centered on adaptability:Modules can be scaled vertically or horizontally, structures can be grouped or isolated, units can adapt to land or water environments. The same core mirror technology can be reconfigured to suit remote islands, disaster-relief housing, energy farms, eco-resorts, or urban extensions. The “Eco-Fly Melodi”concept is visually compelling—its a planar parabolic mirror reads as a futuristic crown or umbrella, evoking both elegance and technological prowess. The modules' ability to be “dressed” or “worn” onto the infrastructure core mirrors the versatility of fashion, creating an architecture that feels alive, dynamic, and responsive. The “Eco-Fly Melodi” is not merely a only energy tower—it is an evolving system. It can: Can be livable module, power entire islands, public space, floatable cabana version, providfe a economy and local job oppourunity for local community, can be independence community space, house tourists or displaced communities, Grow food, Host events, Adapt to future technologies and energy demands. With its integrated core and modular “dress-like” adaptability, The “Eco-Fly Melodi” proposes a new paradigm in infrastructure and habitation: clean, flexible, expandable, and human-centric.

Photovoltaic Production Focus: At the heart of the energy generation is a parabolic mirror constructed from aluminum (5 m in diameter) that concentrates sunlight onto a high-efficiency photovoltaic panel (approximately 1×1 m) installed at its focal point. This photovoltaic system is the primary energy producer, converting concentrated solar radiation into electricity. Additionally, the mirror is designed with integrated gutters, so that rainwater is channeled into a cistern within the foundation, thereby supporting local water conservation. The kinetic subsystem functions solely as an energy storage device.

The Eco-Fly Melodia system integrates renewable energy generation, kinetic energy storage, and immersive artistic engagement into a single community-based infrastructure. Two options for energy storage via flywheel systems have been developed: Option A uses two 3-meter-radius metal disks rotating at 150 rpm, each storing 5 kWh of energy and weighing approximately 16.2 tonnes, for a total of 32.4 tonnes. Option B employs four smaller disks, each storing 2.5 kWh at 200 rpm and weighing about 4.56 tonnes, with a combined mass of 18.24 tonnes. In both configurations, the disks are arranged in counter-rotating pairs to neutralize angular momentum, reducing vibration and stress. A large, 5-meter-diameter parabolic aluminum mirror, mounted on a dual-axis orientation system, tracks the sun to concentrate light onto a high-efficiency photovoltaic panel positioned at its focal point. Horizontal and vertical mirror adjustments are achieved through a toothed rotation mechanism and precision cable-based winches, with sun-tracking managed by a sensor system inspired by cubesat technology. The mirror structure also integrates a rainwater collection system, directing water via concealed gutters into a cistern embedded in the foundation for conservation and auxiliary use. As a signature feature, rotating flywheels activate a mechanical wooden carillon, producing varying melodic tones, while synchronized LED lights on the mirror add a dynamic visual layer, offering an engaging audiovisual experience. The system's inputs—solar energy, kinetic force, and rainwater—are transformed into electrical power, water supply, and sensory outputs. The prototyping phase involves scaled model testing and community workshops for training in fabrication, control systems, and sun-tracking technology. Following refinement, a full-scale demonstrator will be implemented in Fiji using locally sourced materials. Operation is managed through a user-friendly interface monitoring flywheel dynamics, solar orientation, and water collection, while routine maintenance covers mechanical checks, mirror cleaning, and system calibration. Environmental stewardship is ensured through low-impact construction, locally sourced or recyclable materials, erosion-reducing design, and biodiversity-conscious site integration. With a focus on self-sufficiency, cultural integration, and scalability, Eco-Fly Melodia represents an innovative, sustainable model for off-grid communities in Fiji and similar rural environments.