



HexaChroma

"Harvesting the Sun, Collecting the Rain"

1. Concept Narrative

Discuss materials, design concept, visitor and community experience, co-benefits, shared land uses, and any other important aspects of your design.

HexaChroma is a modular canopy system designed as a replicable unit, inspired by the geometry of nature and the practicality of community infrastructure. Each unit features a **hexagonal funnel-shaped canopy** constructed with a steel structure integrated with polycarbonate **panels** and **high-efficiency silicon photovoltaic cells**.

The funnel shape serves a dual purpose:

Maximizing solar exposure on all faces for power generation Optimally capturing rainwater, which is channeled through the structure and stored in a base reservoir

Each canopy module has a surface area of **51 square meters**, producing approximately **10.2 kW** of clean electricity. To meet the competition's minimum requirement of **75 kW**, the proposal includes **8 HexaChroma units**, together generating **81.6 kW**.

The harvested rainwater is collected and stored at the base of each unit. A **low-energy pump system** transfers the water to a centralized storage tank used by Marou Village, while the electricity feeds into the local power grid. This integrated design provides both **energy and water resilience**, especially critical during the region's dry season.

Designed as a **puzzle-like modular system**, HexaChromaallows for easy assembly, flexible expansion, and community involvement during implementation. It offers not only functionality but a vibrant public space where people can quite literally **cool off in the colorful shadows** of clean energy and freshwater security.





2. Technical Narrative

What technologies does your design incorporate? Why did you choose them?

Technologies Incorporated in HexaChroma:

Silicon Photovoltaic (PV) Panels (High-Efficiency IBC Modules):

The use of high-efficiency **silicon PV panels** (specifically **Interdigitated Back Contact** or **IBC** technology) ensures maximum energy output with the least amount of space. These panels are reliable, durable, and capable of delivering a high **22.8% efficiency**, which is crucial for meeting the energy needs of the Marou Village with limited area.

Rainwater Harvesting System (Funnel Structure with Polycarbonate Panels):

The **funnel shape** of each HexaChromaunit, combined with **polycarbonate panels**, is designed to **optimize water collection** while ensuring durability. Polycarbonate is lightweight, impact-resistant, and weather-resistant, making it an ideal material for collecting rainwater. The funnel maximizes the capture of rainwater, directing it efficiently into storage, ensuring that the village can rely on this water source, especially during the dry season.

Integrated Water Pumping System:

A low-energy **pump system** is incorporated to **transport harvested rainwater** from each HexaChromaunit to the central storage tanks in the village. This system is energy-efficient and helps ensure a steady water supply to Marou Village, especially during periods of low rainfall.

Modular Design (Puzzle-like Assembly):

The **modular, puzzle-like design** allows for easy expansion and adaptability. As the village grows or if more units are needed, additional HexaChromaunits can be added without disrupting the existing system. This flexibility is essential for meeting future energy and water needs while also allowing for community participation in the assembly process.

Polycarbonate Faces for Solar and Water Collection:

Polycarbonate material is not only lightweight and durable but also **translucent**, which means it can allow for **diffuse sunlight** to pass through to the solar panels while providing rainwater capture capabilities. This dual-function material helps optimize both solar energy generation and water harvesting without sacrificing either.





How much energy and water does your installation generate each year?

Energy Generation: 148,920 kWh/year (for 8 units) Water Harvesting: 816,000 liters/year (for 8 units)

This system will significantly contribute to both **clean energy generation** and **freshwater availability** for Marou Village, especially during the dry season

What are the system inputs? (for example, sunlight or rainwater) What are the system outputs? (for example, electricity or clean drinking water)

The **system inputs** for HexaChroma are **sunlight** and **rainwater**. These are natural, renewable resources that the system is designed to capture efficiently. Sunlight powers the solar photovoltaic panels to generate electricity and paint the floor during the day, while rainwater is collected through the funnel-shaped canopy structure.

The **system outputs** are **clean electricity** and **harvested freshwater**. The electricity is delivered to the village's power infrastructure, helping to meet daily energy needs. The collected rainwater is stored and pumped to the village's central tanks, providing a sustainable source of freshwater, especially during the dry season. Together, these outputs support both energy resilience and water security for Marou Village.





3. Prototyping and Pilot Implementation Statement

How will your team approach the prototyping process and full-scale pilot implementation process and how will you collaborate with the local community in both of those efforts?

We will start by building a small working model of one HexaChroma unit to test how well it collects rainwater, produces electricity, and fits together. During this stage, we will work closely with people in Marou Village to get their feedback and make improvements.

For the full-size pilot, we will build one complete unit in the village. Local community members will help with construction so they can learn how the system works and how to take care of it. We believe it's important to include the community in every step, so the project truly meets their needs and becomes something they feel proud to use and maintain.

4. Operations and Maintenance Statement

How will your design be operated and maintained during its life? How will the local community contribute to operations and maintenance?

The HexaChroma system is designed to be **easy to operate and maintain** over time. Once installed, the **solar panels** will function with minimal upkeep, requiring only **occasional cleaning** and basic checks. The **rainwater harvesting system** will need regular inspections to make sure the filters, gutters, and tanks stay clean and free of debris.

We will provide **training to local community members** so they can take care of the system themselves. This includes learning how to clean the panels, check the water system, and operate the small pump. We hope to work with local schools and leaders to create a simple maintenance schedule that community members can follow.

By giving the village the **skills and tools to manage the system**, we aim to make HexaChromaa long-lasting part of daily life in Marou. Community involvement from the beginning helps make sure the project stays useful, sustainable, and truly owned by the people who use it.





5. Environmental Impact Assessment

What effects might your installation have on natural ecosystems and what steps can be taken to mitigate any foreseeable issues?

The HexaChroma installation is designed to have a **low impact on natural ecosystems** by using **renewable energy** and **collecting rainwater** in a sustainable way. The modular structure is lightweight and does not require heavy foundations, which helps avoid disturbing the land or local vegetation. Since it doesn't rely on fossil fuels or large-scale construction, it helps reduce carbon emissions and land degradation.

However, we recognize that any new structure can affect the environment. To avoid issues, we will **carefully choose installation sites** that do not interfere with natural water channels, wildlife paths, or important vegetation. We will also make sure that **water collection and storage systems are sealed** and well-managed to prevent mosquito breeding or contamination. Materials used will be **non-toxic and durable**, reducing the risk of pollution or frequent replacements.

By working with local experts and listening to the community, we can make sure that HexaChromasupports the village's needs **without harming the surrounding ecosystem**.