Tajur Biru Sea Tribes against the Sea Level Rise

Tajur Biru sea tribe, also known as "*orang laut*" or "*suku laut*", are indigenous seafaring community located in Lingga regency, Riau Province, Indonesia. They pile their houses 2.5 meters above the ground, so that they stay above the high tide level of the sea. Nowadays, their existence is very much threatened by the climate crisis, and it is not solely by the rising sea level, but by its domino effects as well. Their individually constructed wooden - structure make them prone to the future storm surges. Their existing house's floor will also be submerged by 30cm in the 2100 sea level rise. The ocean warming and acidification will affect their resources, as the fishes will be driven away to deeper water and seashells will be prone to acid. Freshwater will even be more scarce as the saltwater intrusion occurs.
An intervention is needed to save and preserve the indigenous community.

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Project's Name: Littoral Biomimicry

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Littoral Zone Animal Biomimicry

Use rhe concept of byssal threads for tensile bracing structure

Swim bladder in fish

Inspired the idea of pneumatic deisgn

Nematocyst hunting strategy on sea anemone

Adapted to be the layout for village to get

The shape of barnacles

Inspired the idea of the building foundation

Evisceration to building removable parts

High Tide

Mid Tide

Low Tide

Using biomimicry to face the challenges of sea rise

Biomimicry is the idea of taking inspiration from natural selection solutions adopted by nature and translating the principles to human engineering. By using biomimicry, we create more sustainable, efficient solutions that harmonize with the environment. In this case, the littoral zone animal systems are used as design inspirations.

Littoral zone animals are known to be resilient against the tides and changes in sea levels. And much like littoral zona creatures with the changes of tides, "Tajur Biru" villages are facing the same challenges too. These coastal communities, much like resilient creatures, have to be able to adapt to the changing conditions. They have to rely on their resourcefulness and adaptability to protect their homes and preserve their way of life in the face of encroaching tides.

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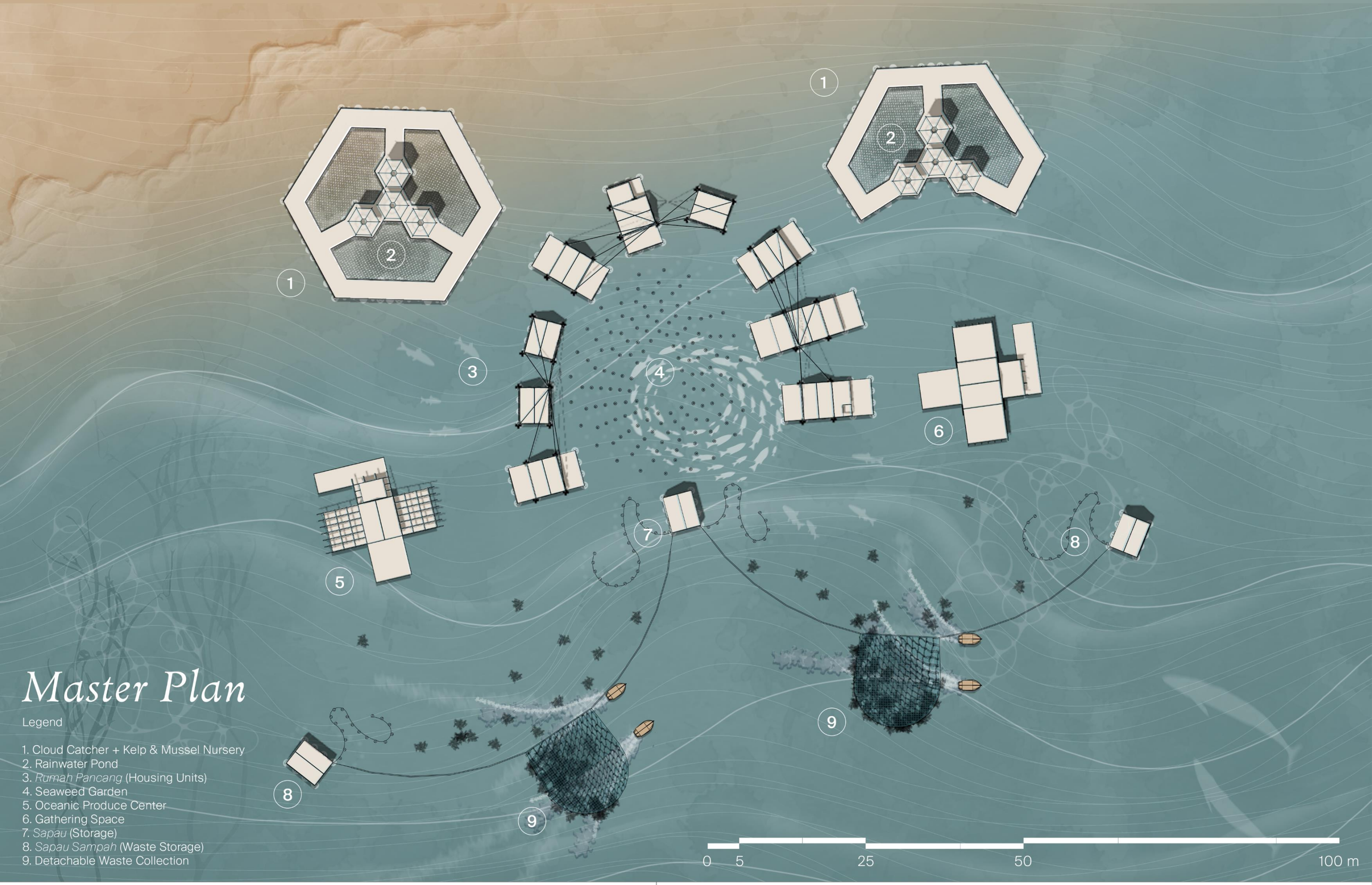

Master Plan

Legend

1. Cloud Catcher + Kelp & Mussel Nursery
2. Rainwater Pond
3. *Rumah Pancang* (Housing Units)
4. Seaweed Garden
5. Oceanic Produce Center
6. Gathering Space
7. *Sapau* (Storage)
8. *Sapau Sampah* (Waste Storage)
9. Detachable Waste Collection

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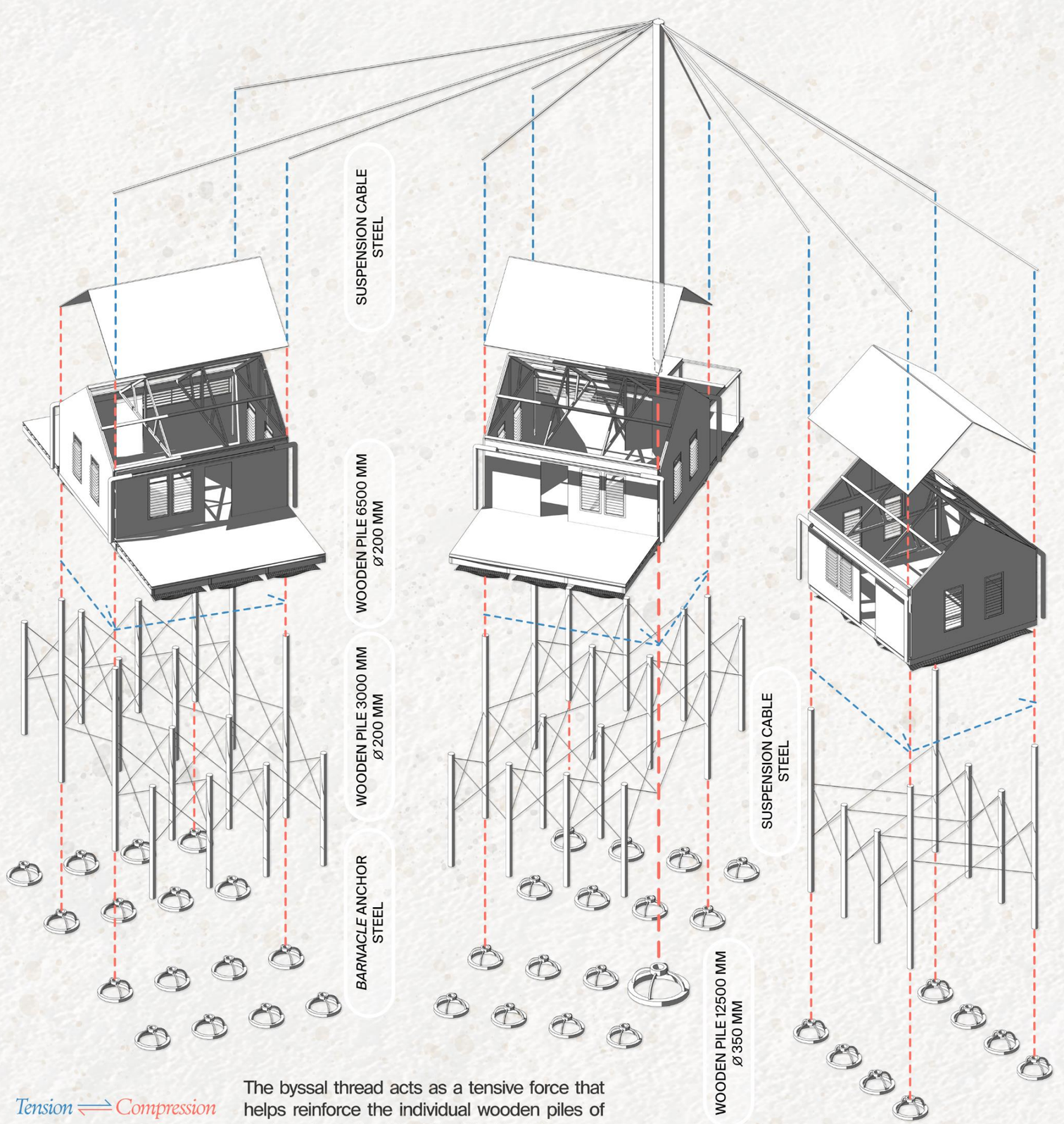
The Byssal *Thread*

Ocean Waves as Lateral Force

Byssal thread is a structure that utilises a wooden foundation and steel cables to distribute lateral loads. This structure serves the same function as the thread on oysters that they use to tie themselves to rocks tide pool.

In every several units, there is one central core structure and anchor that acts as the primary load-bearing component. These large structures receive transferred lateral loads from the structurally-interconnected units.

Suspension: Force's Distribution



Tension ⇌ *Compression*

The byssal thread acts as a tensive force that helps reinforce the individual wooden piles of the housing units of the Tajur Biru Sea tribe.

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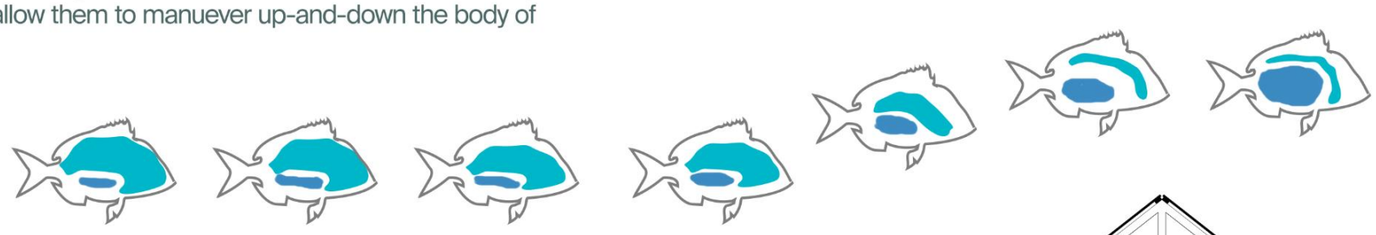
pneumatic *design*

as the design variable to keep the housing units buoyant and flexible during the ebbs and flows.

These principles are a biomimicry approach inspired from the buoyancy system found in the swim bladder of a fish. Fishes inhale oxygen from their gills, filling their swim bladder with air and displacing the water content, which makes them lighter and allow them to manuever up-and-down the body of water.

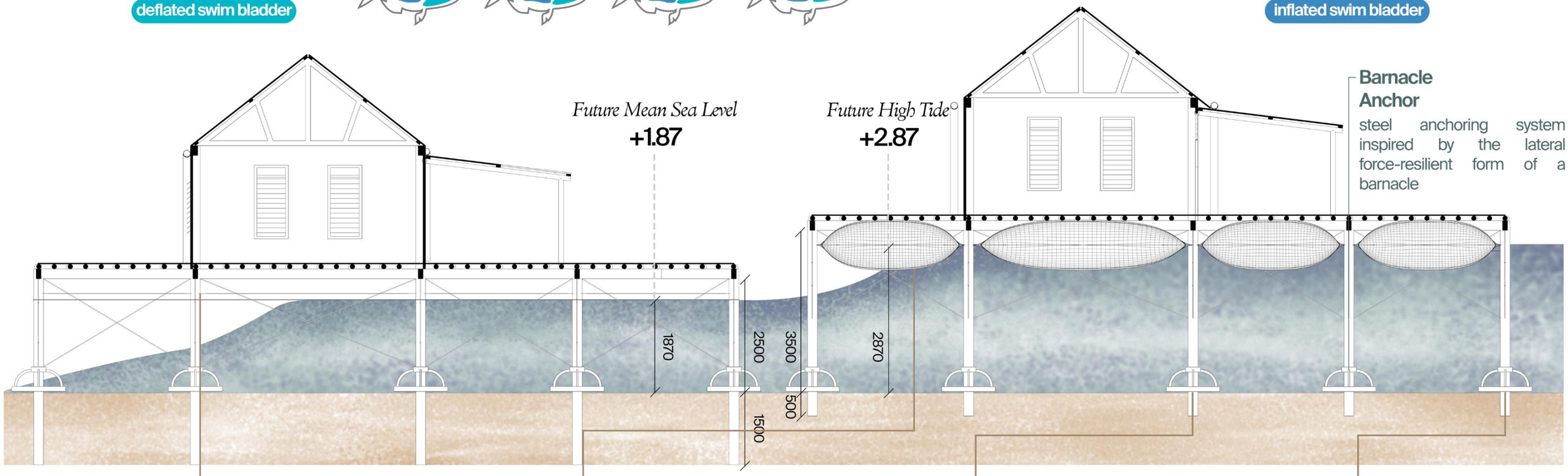
enhaled oxygen

deflated swim bladder



inhaled oxygen

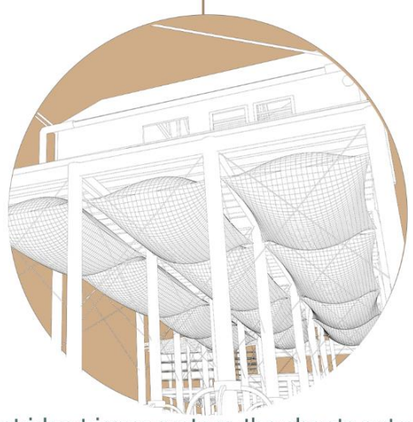
inflated swim bladder



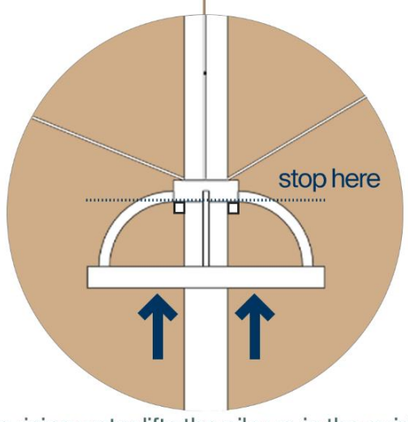
Barnacle Anchor

steel anchoring system inspired by the lateral force-resilient form of a barnacle

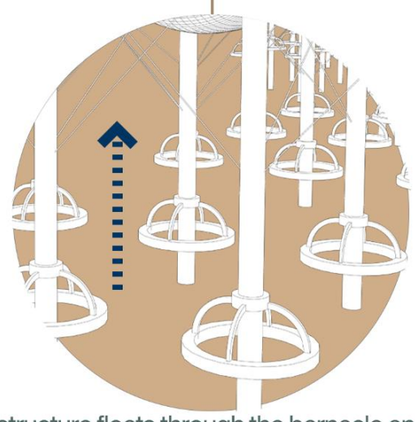
On a low-tide, the pneumatic structure is a dormant sheets layered under the wooden beam



Using a catridge trigger system, the sheets automatically inflated when in contact with the body of water



The rising water lifts the pile up, in the guided axis of the barnacle anchor (and its stopper)



The structure floats through the barnacle anchor, changing the house floor level and keep them afloat

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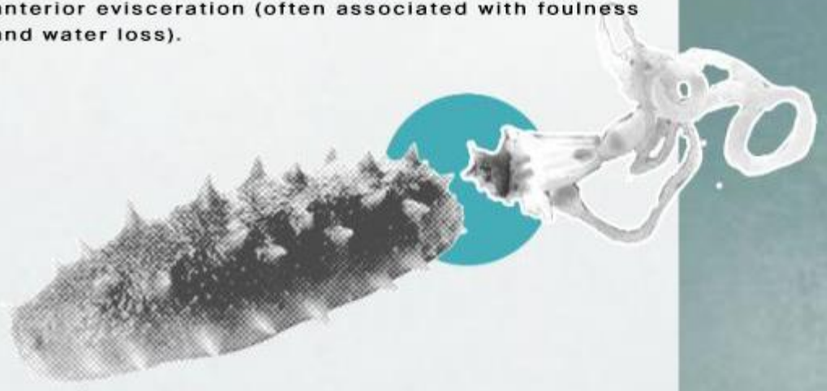
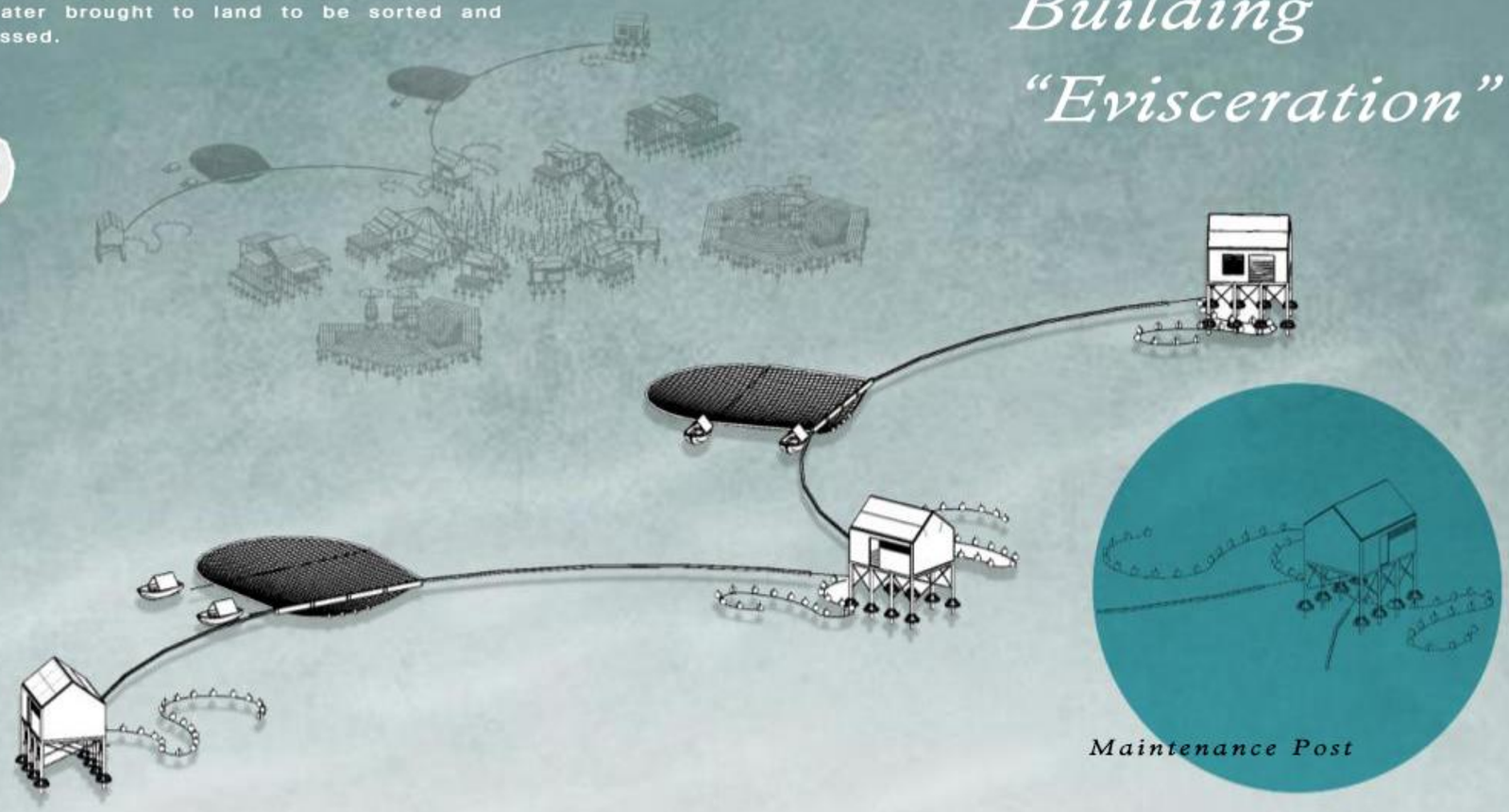
Evisceration is a defense mechanism of sea cucumber to release part of their digestive system. This often caused by outside threat, such as predators, water loss, or pollutions. There area two types of the evisceration, anterior and posterior. In this case, the system will be inspired more by the anterior evisceration (often associated with foulness and water loss).



The concept adapted to removing parts of the building system that can be replaced

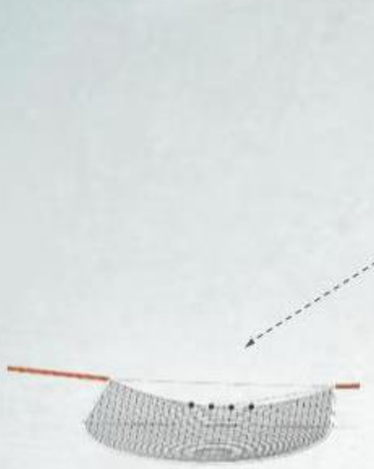
This idea fits the concept of ocean cleaning. The villagers has a habit of throwing trash in the sea, and over time it will cause serious pollution. The cleaning system works by catching floating trash and later brought to land to be sorted and processed.

Building "Evisceration"

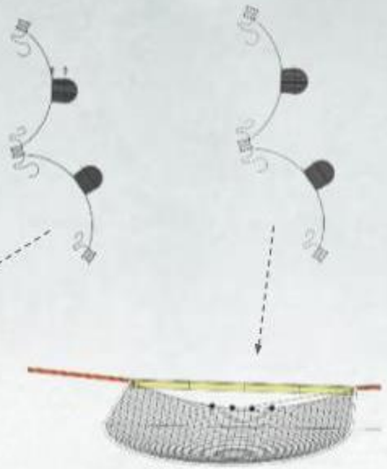


Maintenance Post

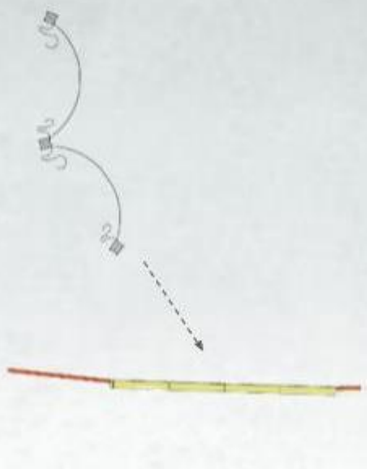
Trash Net System



Net is open to catch trash when the tide is low



Net is closed to prevent trash coming back to the village



On high tide, the net is taken to the land. After cleaning, it will be returned.

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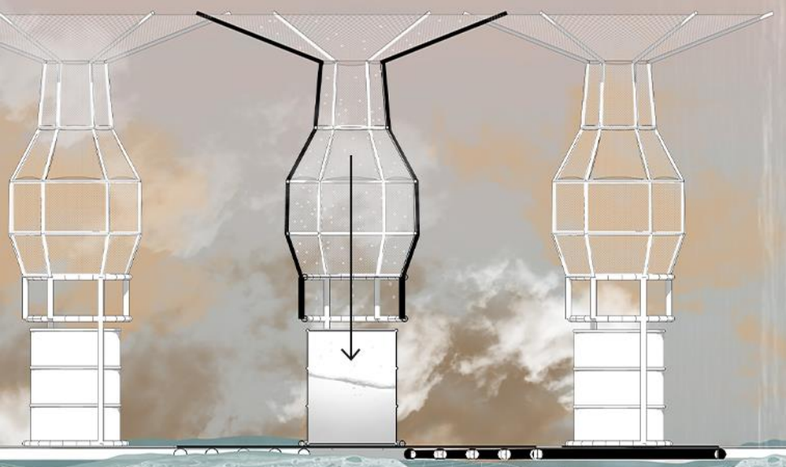
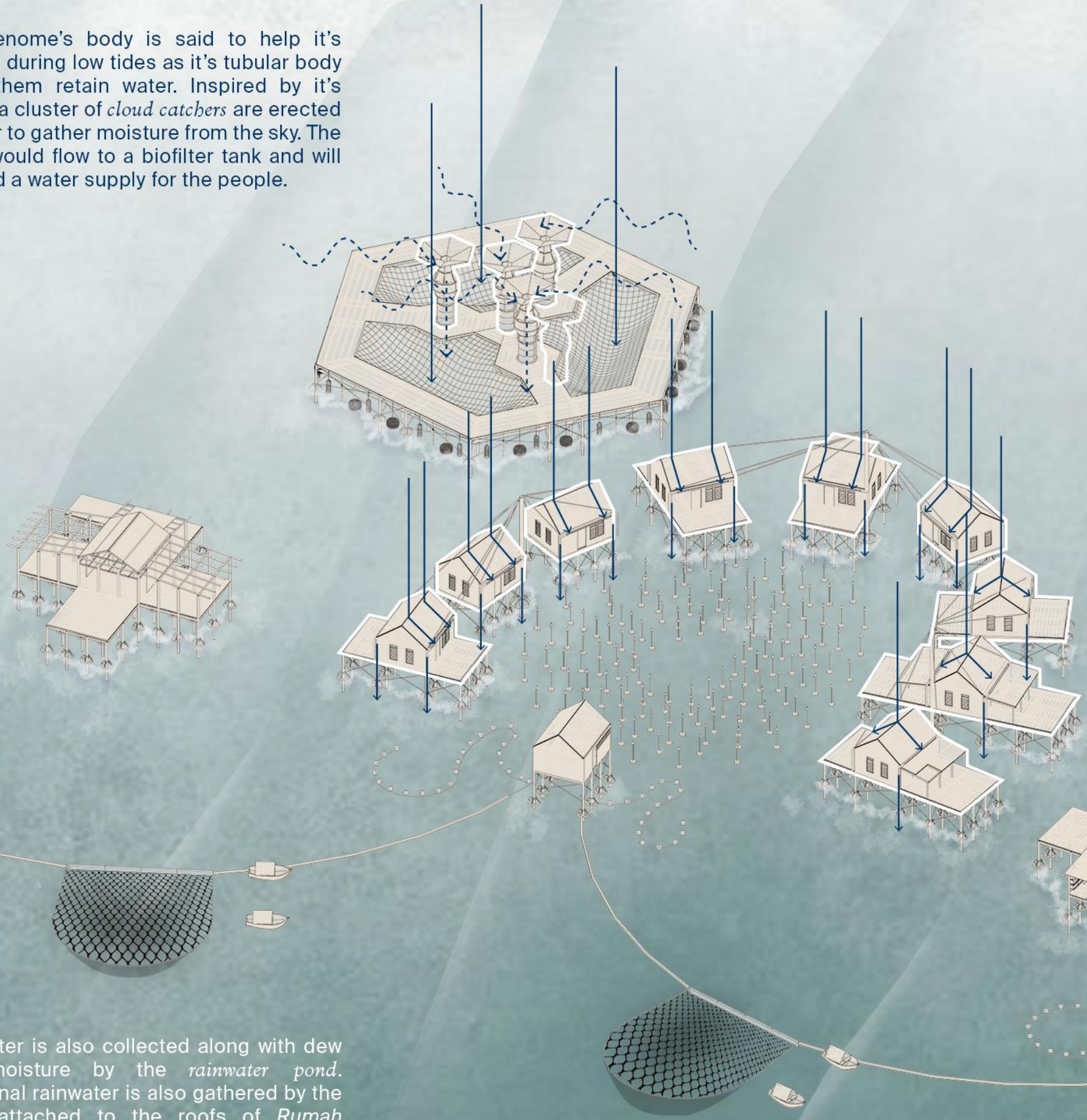


Cloud Catcher + Pond

Rain Gutter

An Anenome's body is said to help it's survival during low tides as it's tubular body helps them retain water. Inspired by it's shape, a cluster of *cloud catchers* are erected in order to gather moisture from the sky. The water would flow to a biofilter tank and will be used a water supply for the people.



Rainwater is also collected along with dew and moisture by the *rainwater pond*. Additional rainwater is also gathered by the *gutter* attached to the roofs of *Rumah Pancang* before going through a filtering process and distributed back into the community.

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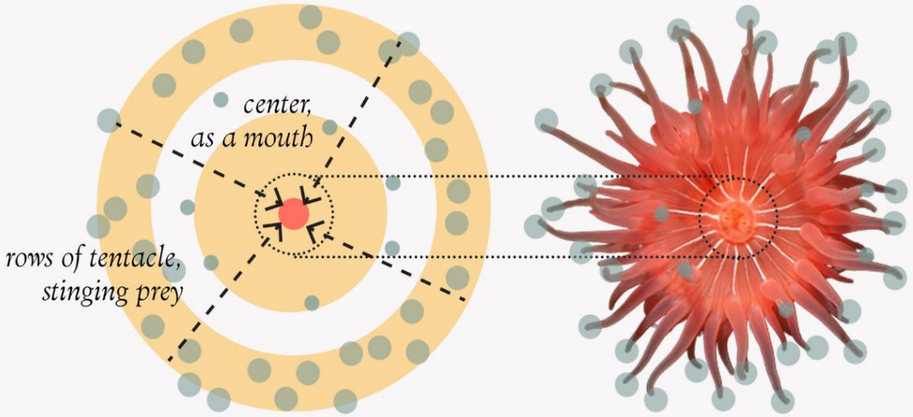
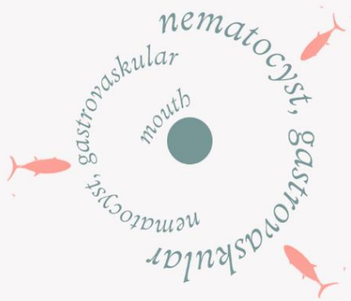
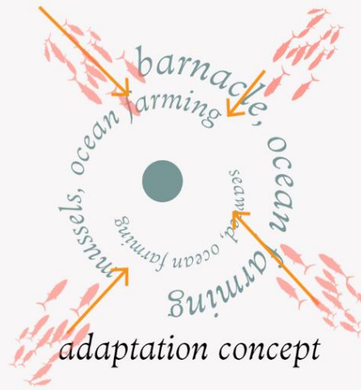


anemon shape

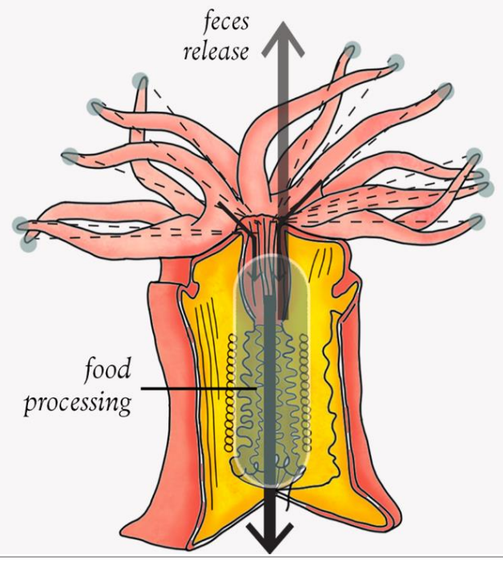
Anemones have a unique shape, where their tentacles which are useful for binding prey (with nematocyst stings) are located around their bodies, surrounding the mouth to enter food. Food digested in the gastrovascular system.



circle concept

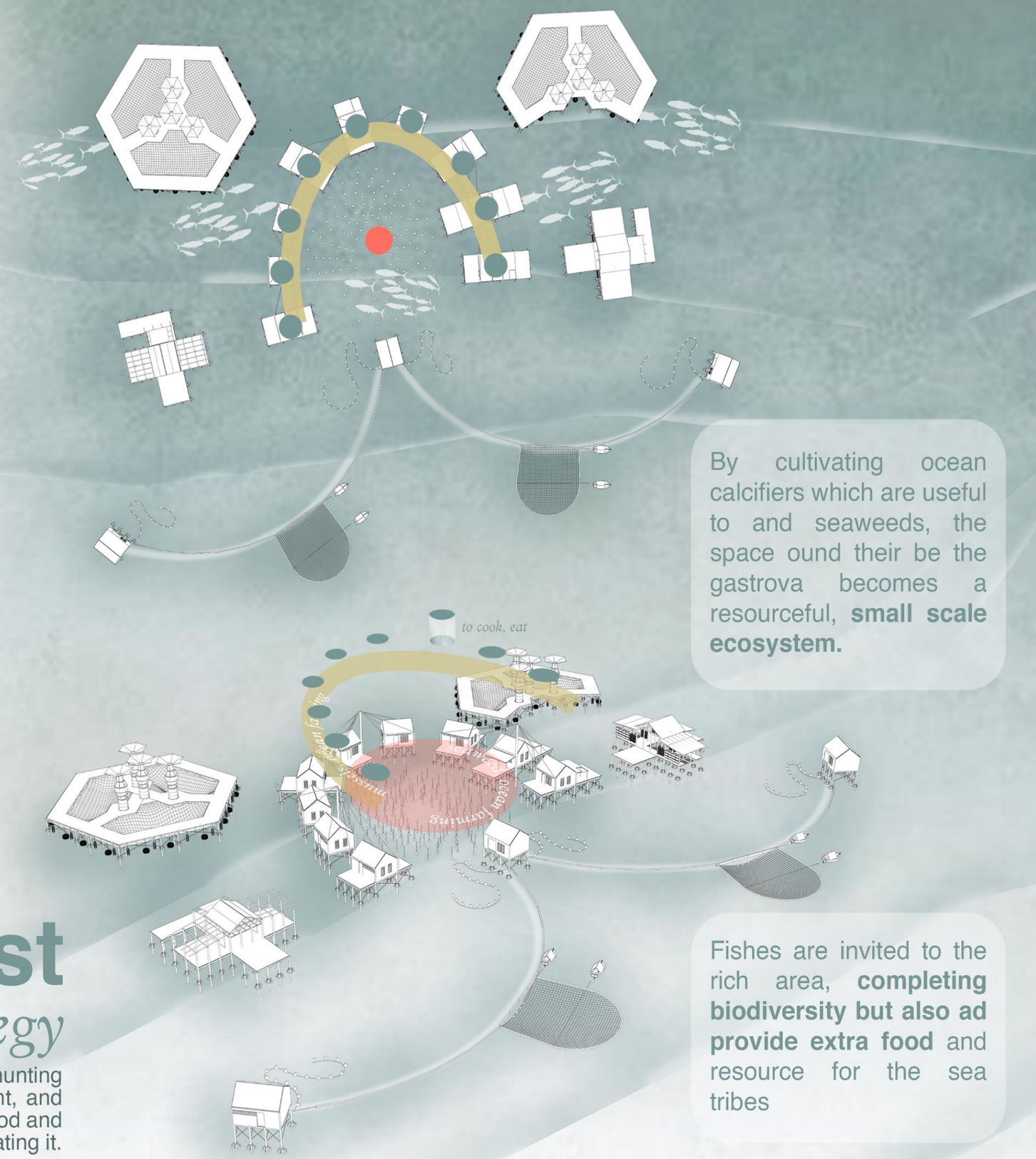


adaptation concept



Nematocyst
Hunting Strategy

This diagram shows how the nematocyst hunting strategy is the basis for the form, placement, and concept of sea people's strategy for taking food and cultivating it.



By cultivating ocean calcifiers which are useful to and seaweeds, the space ound their be the gastrova becomes a resourceful, **small scale ecosystem.**

Fishes are invited to the rich area, **completing biodiversity but also ad provide extra food** and resource for the sea tribes

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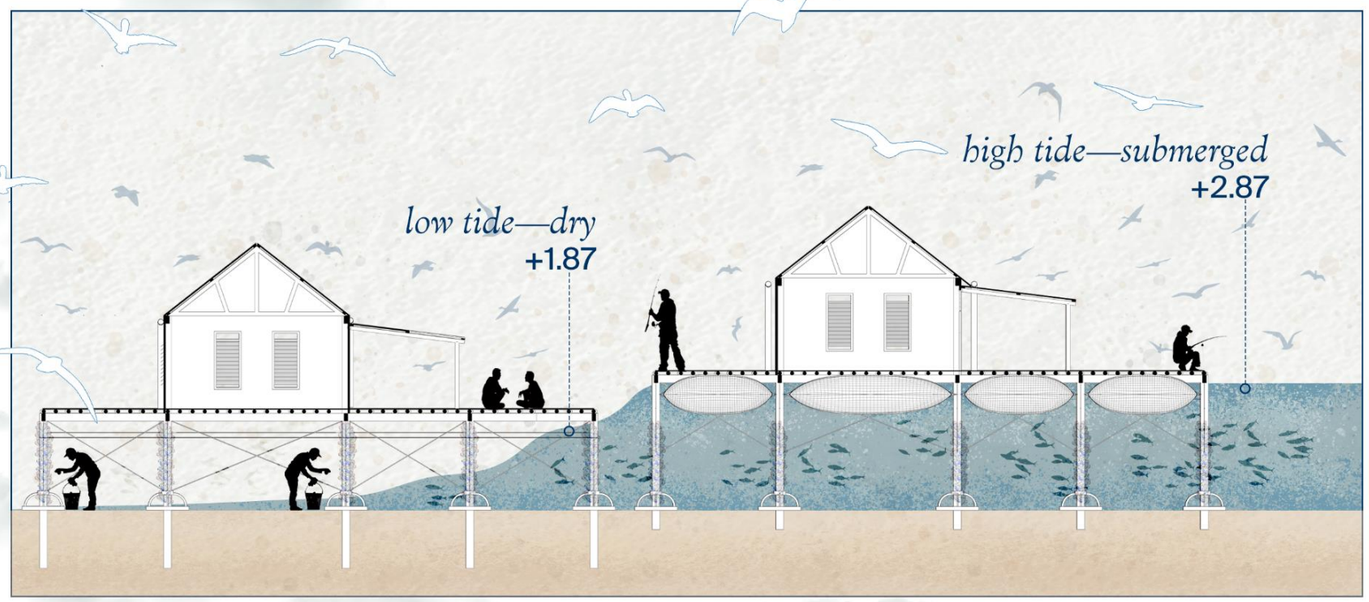

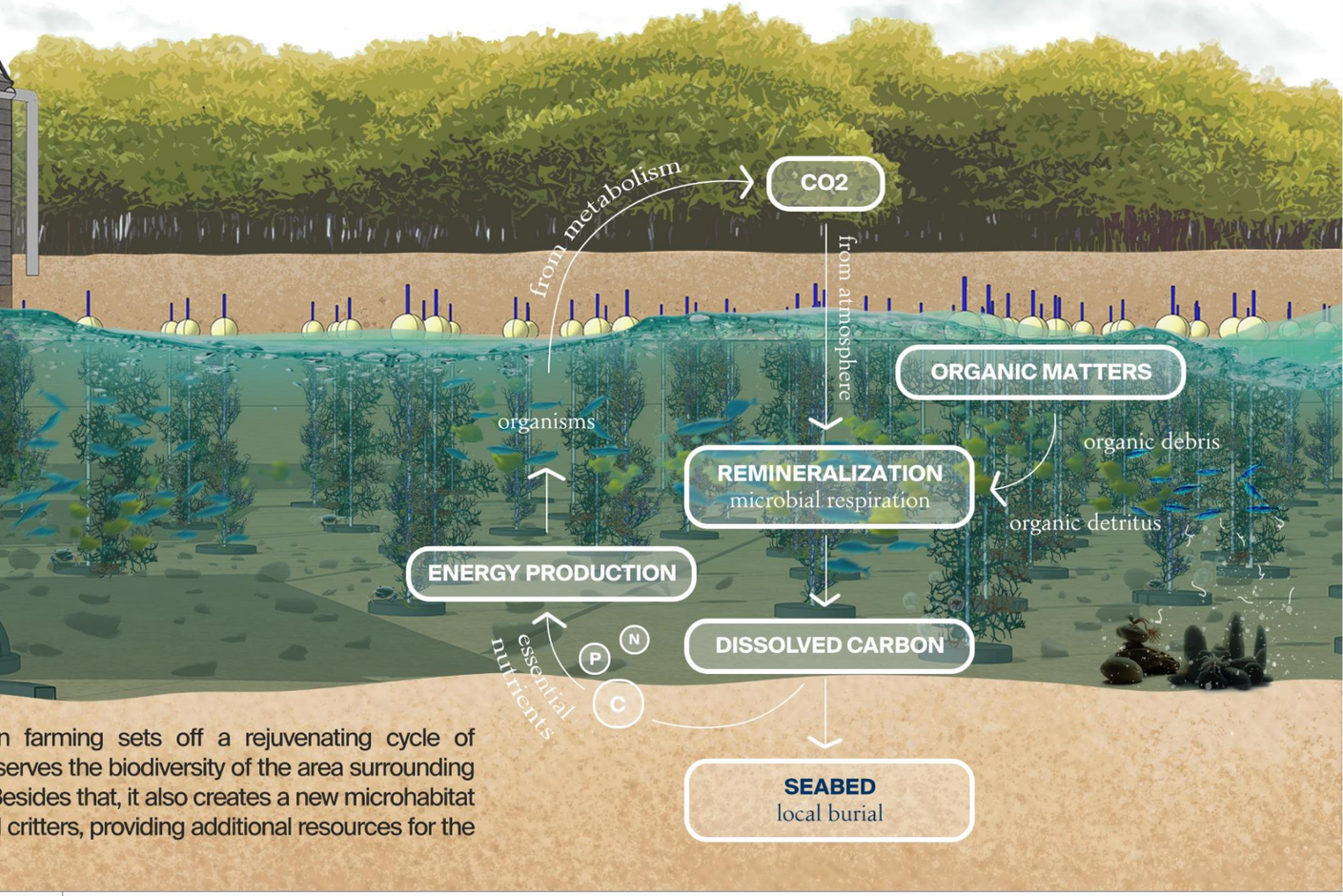

Ocean Farming
Remineralization

The Tajur Biru Sea tribe adapts to their surrounding environment. They often sail to fish in the middle of the sea in the search for food and as a source of livelihood. However, the needs of their consumption will eventually conflict with conservation as their fish swim deeper and become scarce amidst future ocean warming.

The presence of ocean farming sets off a rejuvenating cycle of remineralization that preserves the biodiversity of the area surrounding the Tajur Biru Sea tribe. Besides that, it also creates a new microhabitat for the demersal fish and critters, providing additional resources for the dwelling sea tribes.

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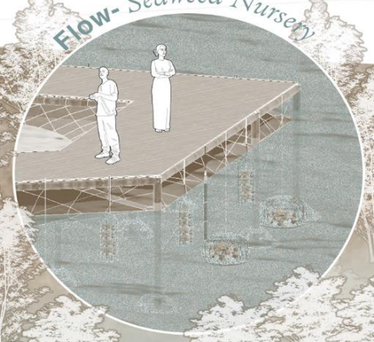
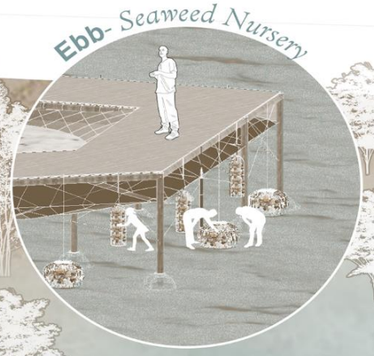
During high tide, Seaweed Nursery invited various fish to live so that the residents could fish the fish as well as breeding Mussel and other animals. Meanwhile, when the residents receded, they could take the seeds of shells, mussels, etc.





During high tide this building is beaten by sea water so it is not used. However, the building is still useful as a place to dry the Teritip (Barnacle) and seaweed. At receding, the activity in the building is running back, which is cleaning the bid and as a communal space to interact

Tide Scenario

This diagram shows changes in human activities and marine animals during tides and how tidals can help the effectiveness of these activities

During the tide, Mussel is drowned by sea water and get its food, inviting fish to live and residents can lure it. When receding, Mussel can be harvested.

During high tide, the Trash Collection collects rubbish in the net so that it does not enter the free ocean, while at receding the garbage is directed by the assistance of the flow of water to the nets.

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