

# SYMBIOSIS

ONG, COLLEEN N. | 2017-00480

## AQUACULTURE REVITALIZATION & COASTAL DEFENSE SYSTEM OF MANILA BAY

The Philippines is known to have one of the largest coastlines in the world, with a plethora of life found within its shores. With this, and the archipelagic geography of the country, many Filipinos have their livelihoods depending on the Philippines' coastlines. These areas are teeming with numerous communities, and the coasts have become a lifeline for the residents. Although living in a country surrounded by water should imply the abundance of seafood, many of the resources have been constantly neglected throughout the years, causing a dramatic shift in the whole country's security and fragility.

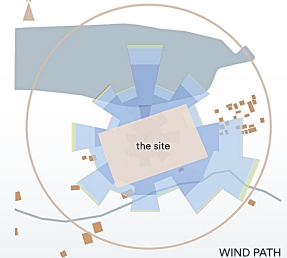
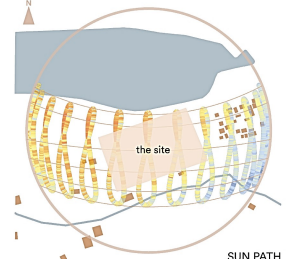
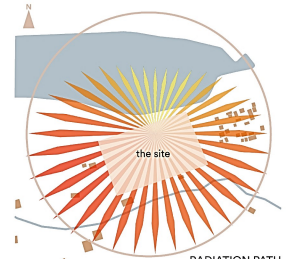
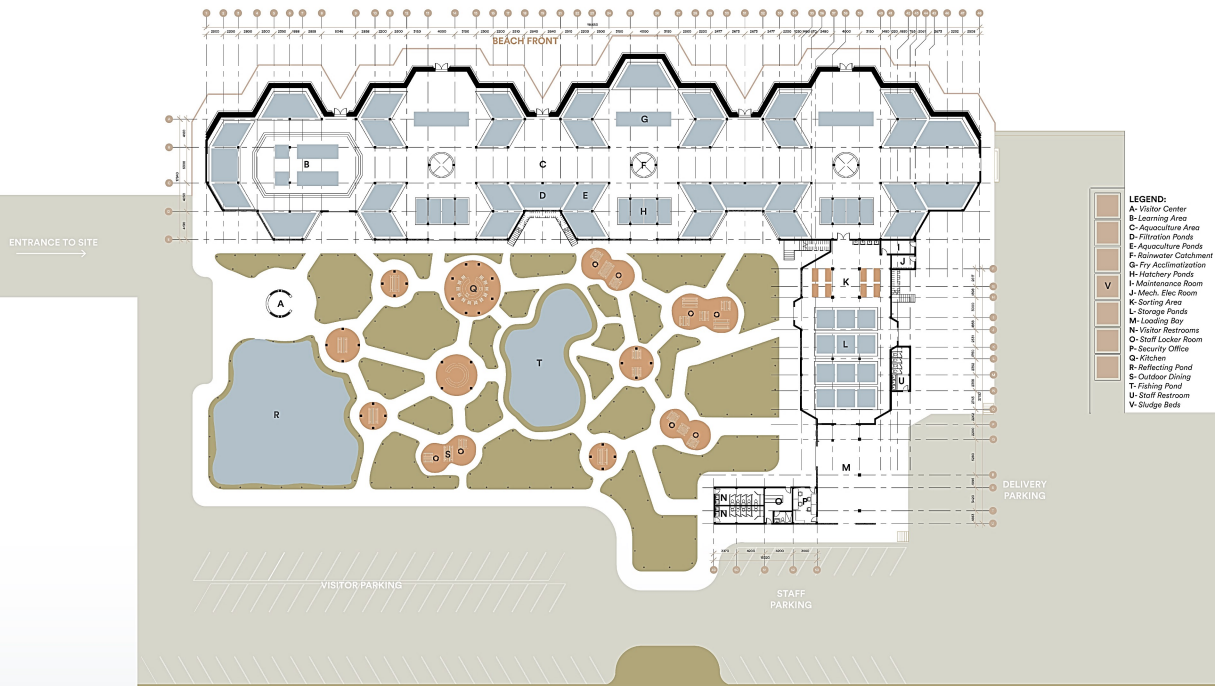
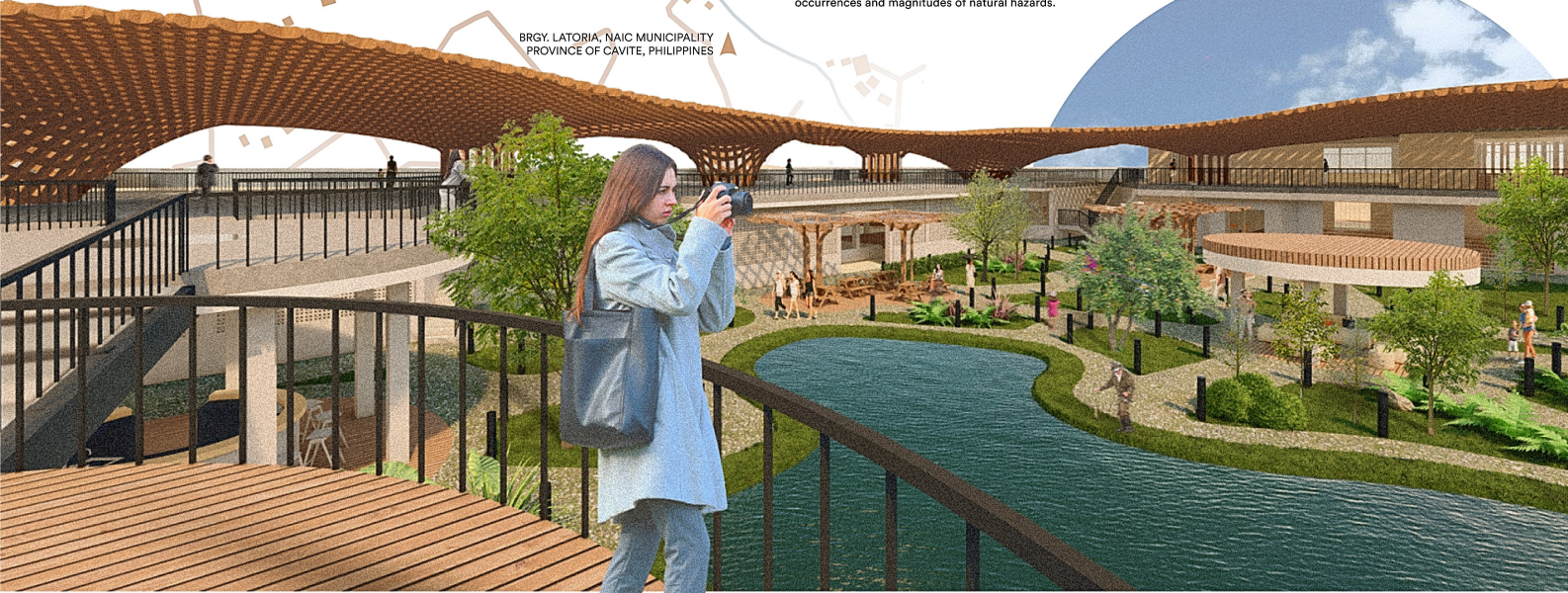
Sustainable aquaculture is now deemed responsible for increasing the seafood available worldwide, helping to achieve the United Nations' Sustainable Development Goal of food sustainability for everyone around the globe in the near future. It is predicted that by 2030, 62% of all seafood produced for human consumption will be sourced through aquaculture. This is also found to be one of the most resource-efficient methods of sourcing food, and the least environmentally impactful way to produce protein, if done correctly.

Overfishing and mismanaged aquaculture farms have become detrimental challenges for the locals, leading to commercial extinction, an off-balanced ecosystem, and an increase in the occurrences and magnitudes of natural hazards.

Rapid urbanization, unsustainable development, and the abuse of resources in the Philippines have aggravated the effects of geo-hazards like sea level rise, flooding, and storm surges. According to PEMSEA (Partnerships in Environmental Management for the Seas of East Asia), the disregard of coastal planning in new developments leads to a vulnerability, which threatens the safety of the public. With Manila Bay highly vulnerable to resulting inundation and flooding, action must be taken to develop and protect the coasts to mitigate it from permanent damage. This prompts the need to protect the coastal areas, where the impacts of such hazards are incredibly pronounced, endangering the safety of those residing by the coasts.

Cities become fragile when the people living in them are susceptible to different kinds of dangers, leading to the decline in their health or wellbeing. The proposed project, *Symbiosis*, aims to find a balanced solution that can not only create a sustainable system of aquaculture, but can also serve as a defense system against the coastal hazards.

BRGY. LATORIA, NAIC MUNICIPALITY  
PROVINCE OF CAVITE, PHILIPPINES

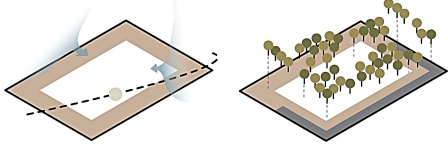


- LEGEND:
- A- Visitor Center
  - B- Learning Area
  - C- Aquaculture Area
  - D- Filtration Ponds
  - E- Aquaculture Ponds
  - F- Fishwater Catchment
  - G- Fry Acclimatization
  - H- Hatchery Ponds
  - I- Maintenance Room
  - J- Mech. Elec. Room
  - K- Sorting Area
  - L- Storage Ponds
  - M- Loading Bay
  - N- Visitor Restrooms
  - O- Staff Locker Room
  - P- Security Office
  - Q- Kitchen
  - R- Reflecting Pond
  - S- Outdoor Dining
  - T- Fishing Pond
  - U- Staff Restroom
  - V- Sludge Beds

GROUND FLOOR PLAN ON SITE  
SCALE: 1:300MTS



# SITE MORPHOLOGY

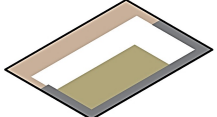


## 1. SITE ANALYSIS

The first step done was to create borders on the sides of the site, where structures can be found nearby. Analysis was also done to the site to determine how to maximise the potential of the land in terms of its natural site utilities.

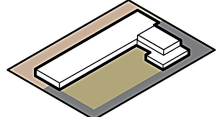
## 2. VEGETATION & PATHS

The next was the visualisation of the vegetation already present on the site, as well as leaving a buffer zone towards the front and back of the site. The vehicular circulation of the site was also accounted for, and can be seen in grey. The road was limited towards this area to keep the shoreline of the site free from any vehicles, preserving the coastline of the area.



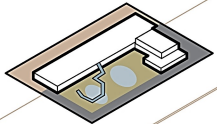
## 3. ZONES

The third step was to zone the site to account for the two main zones: aquaculture and community. The actual facility is reflected in the white surface, and the community area would be integrated in the greenery of the site.



## 4. HEIGHTS

A simple massing was created towards the front, allowing the structure to also serve as the seawall. The facility is meant to be a low-story structure in order to better immerse itself into the site where surrounding structures are relatively low in height.



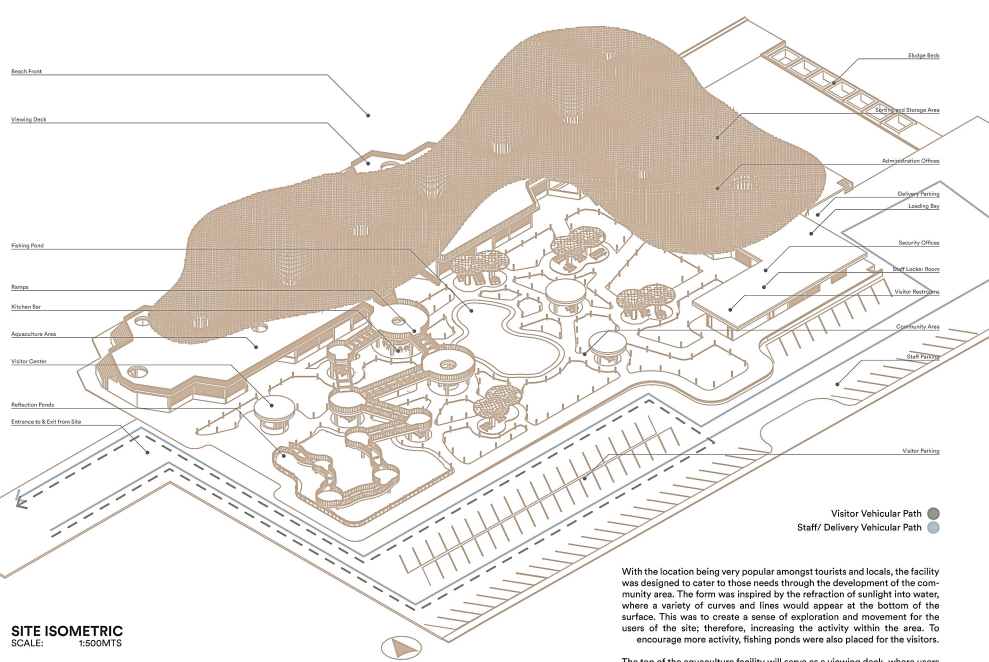
## 5. CONNECTIONS

Attention was given to the community area to better connect it to the built-up structure. A ramp was added to connect the lower and upper floors of the outdoor space, and ponds were also placed for the visitors' entertainment.



## 6. ROOF

With the rigid nature of the structure already present, the roof form was created to be more natural and porous to blend the project more into its location by the shoreline. The roof form also slightly varies in height to give an illusion of movement and fluidity.

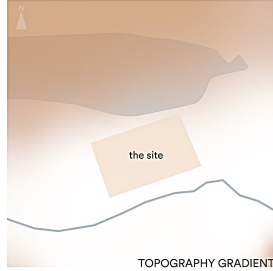


**SITE ISOMETRIC**  
SCALE: 1:500MTS

With the location being very popular amongst tourists and locals, the facility was designed to cater to those needs through the development of the community area. The form was inspired by the refraction of sunlight into water, where a variety of curves and lines would appear at the bottom of the surface. This was to create a sense of exploration and movement for the users of the site; therefore, increasing the activity within the area. To encourage more activity, fishing ponds were also placed for the visitors.

The top of the aquaculture facility will serve as a viewing deck, where users can look out at the Bay. The ramp connection between the community area and viewing deck was also established through the same refraction pattern, mimicking the rest of the community area to keep the cohesion.

# SITE ANALYSIS

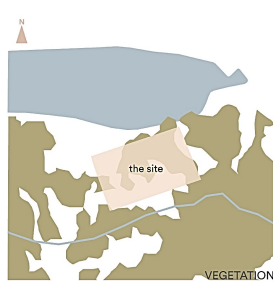


With areas nearer to Metro Manila considered majorly polluted, locations further from the capital city were prioritised to ensure the best quality of water and living for the cultured species.

The site of the proposed project is located in Naic, a municipality in the Province of Cavite. The area is generally characterised by the beaches and historical sites, as well as lands dedicated to agriculture in the inner areas. With a recorded population of 150,957 as of 2020, Naic now has the 9th highest population, and 44th most densely populated municipality/city in the Province of Cavite.

Latoria is one of ten barangays in Naic that can be found in the coastal areas facing Manila Bay, making it susceptible to the effects of storm surges, tsunamis, and flooding. More information was taken by locals of the area to find out that rainy seasons in the coasts are left most affected by winds and waves. Although there are coastal defenses like breakwaters present around the waters of the shore, they are still insufficient in protecting the coastal communities from the geo-hazards.

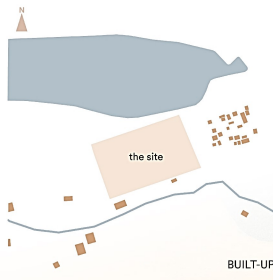
Barangay Latoria is a small section of Naic, filled with low-story residential towards the shoreline around the chosen site. These shorefronts are often frequented by tourists and locals for the beaches present. Satellite images from Google Maps show how the area also has a lot of reclaimed land by its shores. The breakwater barriers, perpendicular to the shoreline, accumulate more and more sand to expand the area, making it desirable to the property owners.



As seen in the topography gradient map, the site is relatively flat, with it being on the higher portion of the land compared to the areas nearer to the water. This would benefit the site, helping in keeping the area less prone to flooding.

There is an ample amount of vegetation within and around the site. Their preservation was taken into consideration during the design process.

The built-up environment of the site features a small cluster of residential homes to the east of the site, and a few behind it, along the river. There are also some beach resorts along the shoreline, which are frequented by tourists. These existing structures are all relatively low in height, so the project form aimed to mimic this to keep a sense of cohesion with the rest of its surroundings.



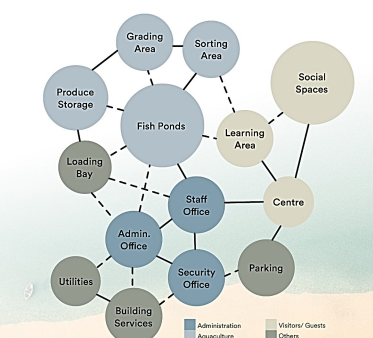
# SPATIAL ANALYSIS

## PROXIMITY MATRIX

	Fish Ponds	Harvesting Area	Produce Storage	Loading Bay	Administration Office	Staff Office	Security Office	Learning Area	Lobby/Centre	Social Space	Utilities	Building Services	Restrooms	Parking
Fish Ponds	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent
Harvesting Area	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent
Produce Storage	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent
Loading Bay	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent
Administration Office	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent
Staff Office	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent
Security Office	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent
Learning Area	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent
Lobby/Centre	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent
Social Space	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent
Utilities	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent
Building Services	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent
Restrooms	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent
Parking	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent

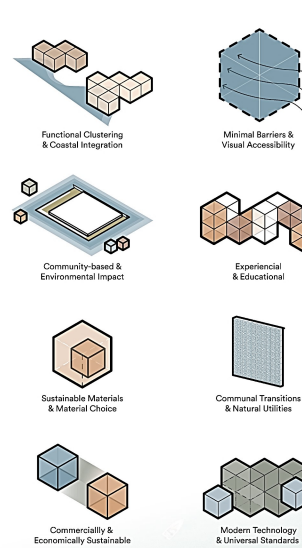
The proximity matrix was created to simplify the transition from one space to the next. These spaces were analysed based on the activity of the users done through research, and then placed on the chart in relation to the other spaces required by the project. The bubble diagram visualises this further to determine the zones needing proximity to each other.

## BUBBLE DIAGRAM



# DESIGN CONCEPT

## CRITICAL COASTAL SUPPLEMENT

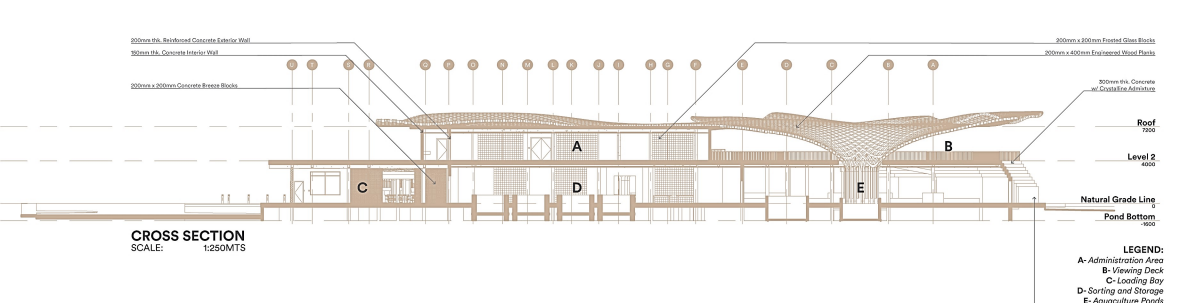
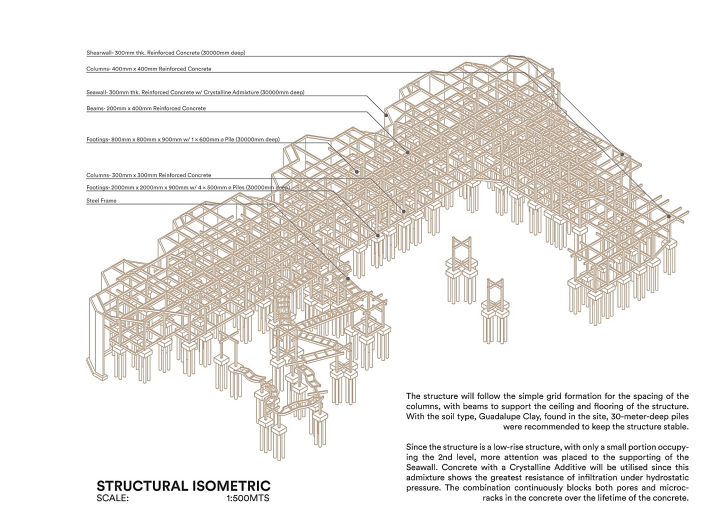
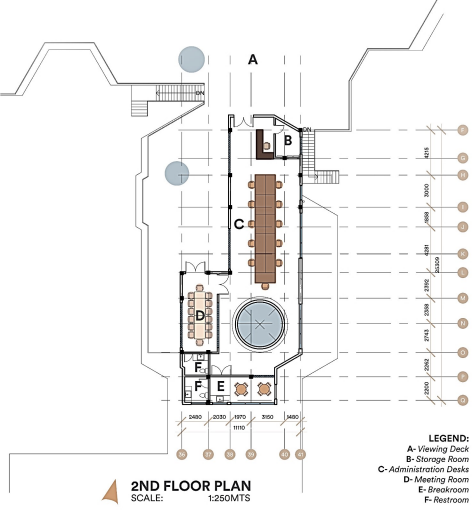


The overarching design concept of the project is to create a critical supplement for the coasts of Manila Bay. This would entail that the project, although not mandatory for the coast, would add value to the location and the users of the area. Besides physical protection from sea level rise and storm surges, sustainable food is another significant contribution of the project.

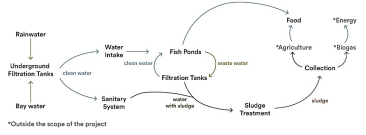
This goal would be achieved through the physical translations of seamless transitions, systematic & organized zonings, and open & accessible facilities. These were chosen to create a space that not only felt like an infrastructure, but to allow it to blend into, and serve the communities around it. Seamless transitions would allow for a fluidity for the movement of the users. Systematic and organized zonings would ensure the proper utilization of the infrastructure and aquaculture agenda. Lastly, the open and accessible facilities would enable a sense of community and exploration for the locals and tourists of the area.

The three translations were further broken down into more specified manifestations to be seen in the project, and will be used as key features of the development. These concepts and translations were chosen to fully maximise the site's potential.



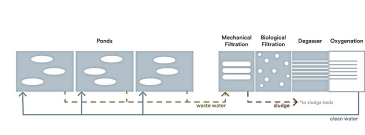


**SYSTEMS & DETAILS**  
**SYSTEM CIRCULATION**



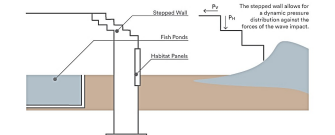
The system circulation for the project reflects the goal of sustainability, especially with water-use. Water will be taken from either Rainwater or Bay water, which will be lightly filtered to ensure no bacteria could infect the cultured species. This water will then be used for the fish ponds of the facility, wherein it would be constantly recycled for one week. Any waste product found in the water will be treated and collected with the sludge beds to the edge of the site. The sludge and waste will then be dried out and utilized for agricultural purposes outside the site.

**AQUACULTURE SYSTEM**



Water for the pond system is constantly cycled through a filtration system, which can be found in each section of the aquaculture area. The filtration pond has four sections to properly filter the waste water before returning back to the fish ponds. With the system being closed and indoors, contamination of diseases or outbreaks is controlled and minimized. This process also ensures that the water of Manila Bay remains unpolluted by the project.

**SEAWALL DETAIL**



The seawall will take up a large surface area facing the shorefront, and the utilization of habitat panels would better maximize this area. Habitat panels are intended to shelter the organisms and creatures that end up washed against the wall during strong waves.

**HABITAT PANELS**

For this project, the habitat panels were inspired by Trumpet Coral (*Caulerpa curvata*) Polyps, which are a type of coral that can be found in the Pacific Ocean, attached to rough surfaces such as rocks. The hexagonal tile will be created with marine-grade concrete reinforced with recycled plastic fibres, and are patterned in a continuous fashion to create a seamless transition from one panel to the next.

