

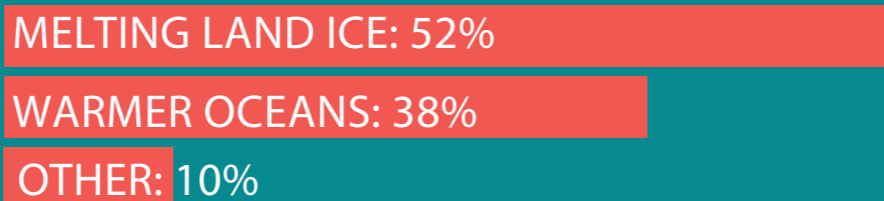


N E W E D G E

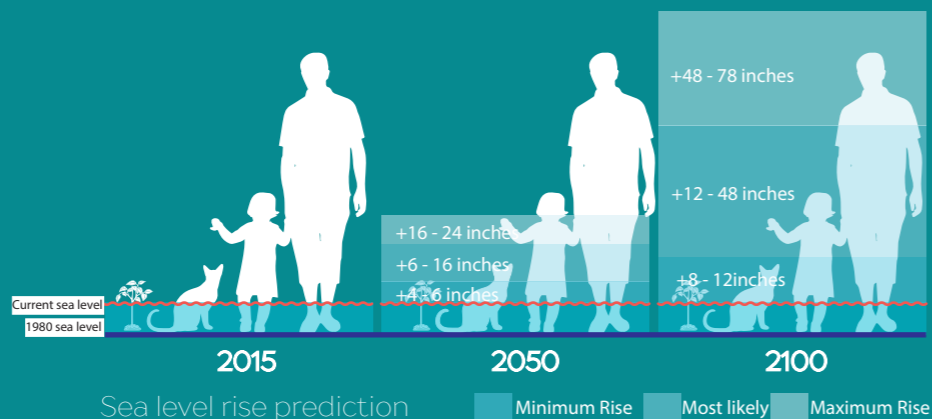
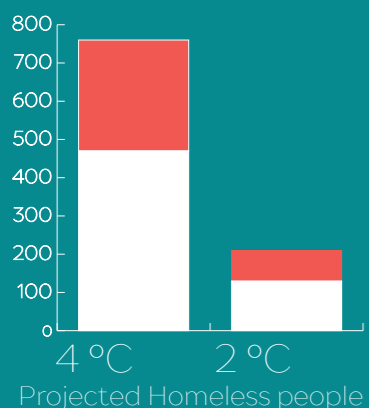
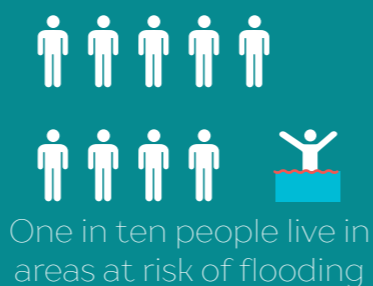
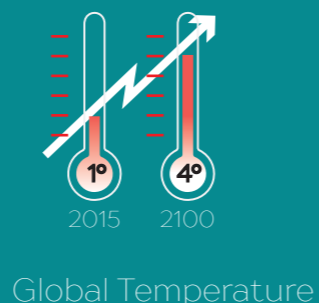
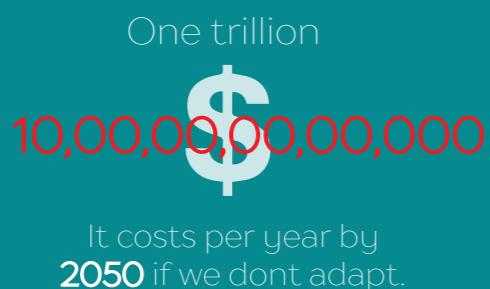
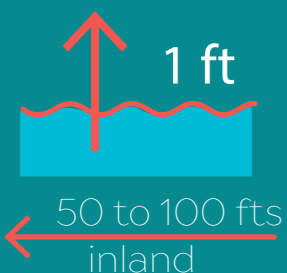
Extending Shore Boundaries

The design was approached from a scientific background, which will encounter the problem at its crux and offer multi-layered ECO-infrastructural systems. The diverse forces of the context were expected to synthesize with each other and evolve a synergic bond that brings the social, ecological and economical resilience to the context

OVER THE PAST CENTURY, the burning of fossil fuels with the unbalanced human and natural interaction has released enormous amounts of heat-trapping gases into the atmosphere. Global sea level has been rising at an increasing rate since the 20th century.

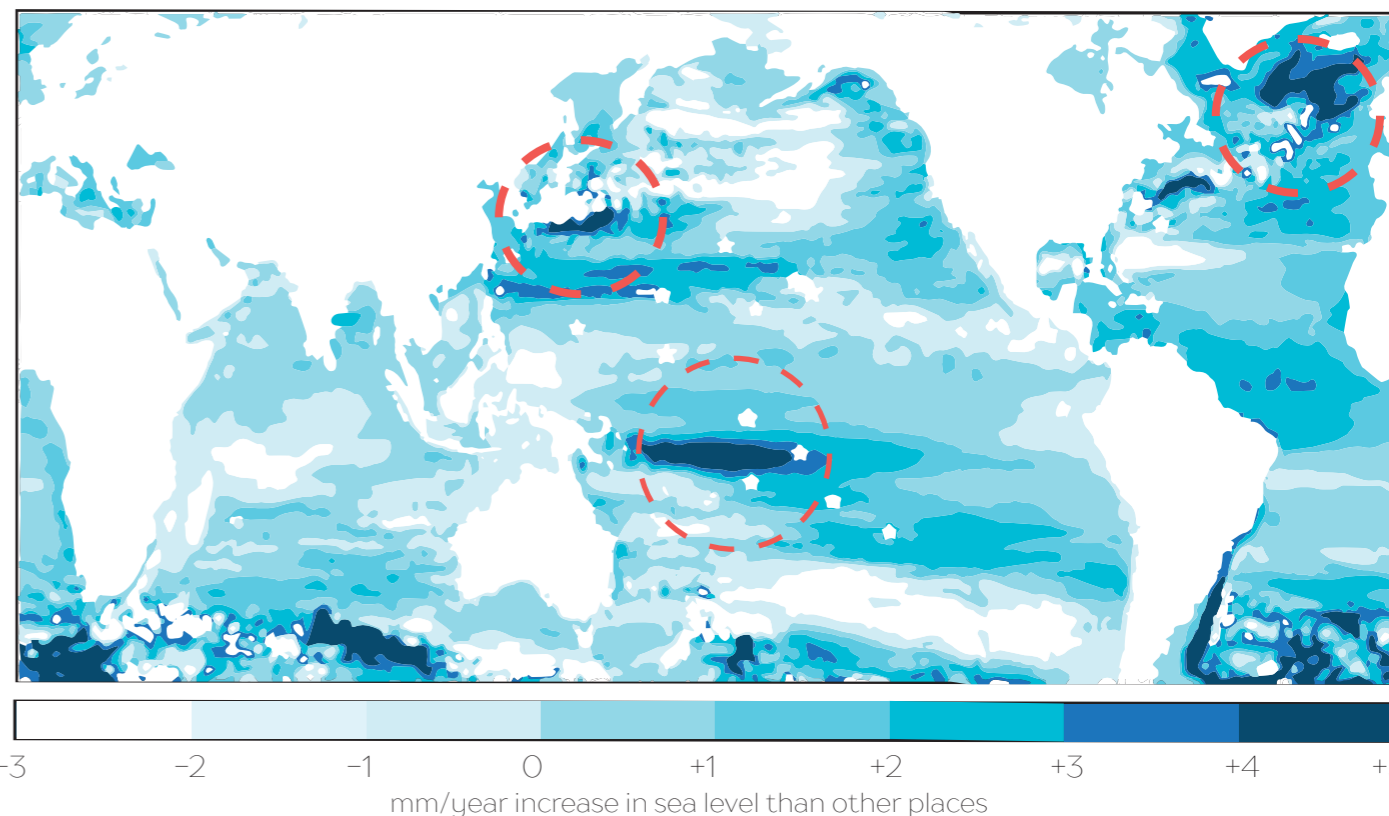
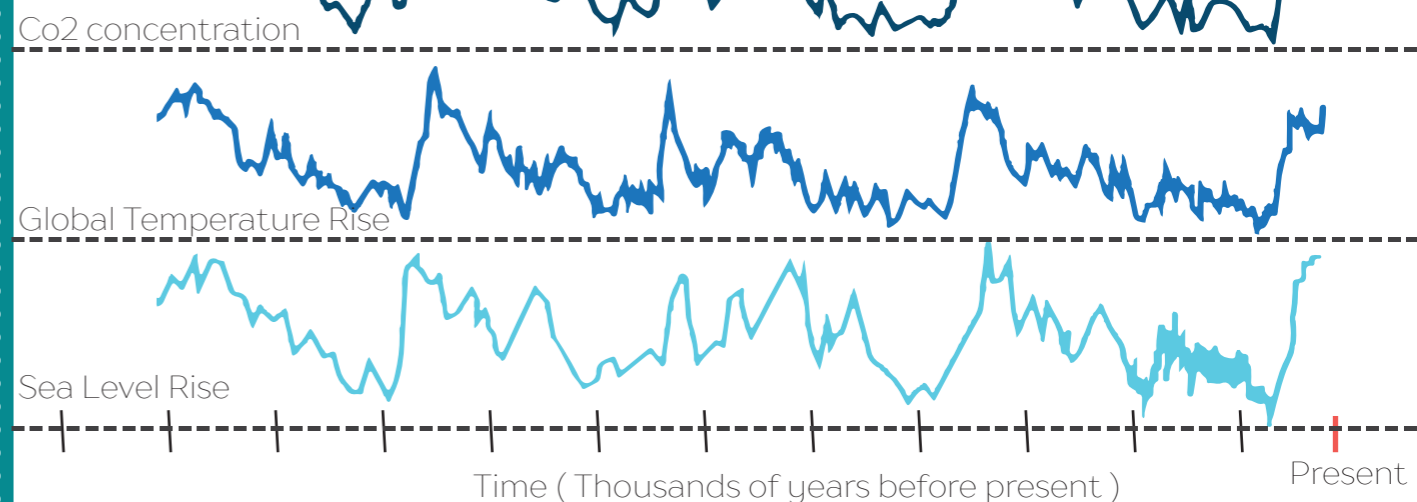


Even if global warming emissions were to drop to **ZERO** by 2016, scientists project another **1.2 TO 2.6 FEET** of global rise by 2100 as oceans and land ice adjust to the changes we have already made to the atmosphere.



C O N S E Q U E N C E S

Exceeding 400 ppm



Sea level is NOT SAME at all Point

Large, regional ocean currents which move large quantities of water from one location to another also affect relative sea level without changing the actual volume of the ocean.

“If we don’t make changes to our coastal management practices, we will end up with management solutions that will continue to undermine the social economic and ecological viability of coastal communities.”



DECODING THE SCENARIO



TUVALU, in the South Pacific, is an independent island nation within the British Commonwealth. Its 9 islands comprise small, sparsely populated atolls and reef islands with palm-fringed beaches and WWII sites. Off Funafuti atoll, the capital, the Funafuti Conservation Area offers calm waters for diving and snorkeling among sea turtles and tropical fish. Both Funafuti and Vaiputu has more than **75%** of population when combined

Total : 26 km² **Population** : 10,640 **Density** : 475.88/km²

"Maybe when the impacts are at their worst, we will be gone. That's why we are trying, we are putting all our efforts into our grandchild. So he can have a good life in the future" You can't plant trees like breadfruit, bananas, cabbages and vegetable gardens we can't plant them here.

- Pelia Mofete (Resident)

Let's do it for Tuvalu. For if we save Tuvalu we save the world

- Prime Minister Sopoaga

Coconut and Pulaka having difficulties in growing because of salination of the soil.

I have to tell my people that climate change is real, what is happening today is because of human activities sometimes people think that it is the end, the end is coming, but its not the right way to say that, its not the end but it's a wake up call to us

- Rev. Teleke Peleti Lauti
Christian Church of Tulavu.

People are moving back to higher grounds unfortunately theres no room over there for all

Groundwater is increasingly becoming undrinkable due to sea-water intrusion. It is brackish and salty. Islanders are relying on rain water catchment because saltwater intrusion into their aquifers is adversely affecting drinking water.

Areas of the island are flooding that would not have flooded ten or fifteen years ago.

"Sea level is increasing four mm every year a small change is really significant for us you know one in the middle of sea level rise and two others are low but Tuvalu is so low lying that is big"

Hilia Vavae
(Directory Tuvalu
Meteorological Service)

Spring tides have steadily gotten higher. King tides have also grown over the last years with the increase of the average atmosphere temperatures; sea water is now bubbling up through the porous coral landscape.

Tourism and Fishing are the main economic resources of the nation apart from exporting Copra (dried coconut).

Island is formed by a ring of coral that originally grew completely around the shoreline of an island, and which continued to grow upward on top of itself as the island subsided or eroded away.

Average height of the islands is less than 2 metres (6.6 ft)

Islanders can either abandon threatened areas, retreat to higher grounds, or build walls to hold back the sea. However this resistance strategy costs 4000 dollars per meter. it is not certain whether they will receive enough foreign aid to compensate for the costs. Seawalls are also not very effective in Tuvalu; most are damaged and are in urgent need of repair.

VOICES OF TUVALU

"EVEN AN INCH MATTERS"



POSSIBLE STRATEGIES TO CONTROL SEA LEVEL RISE:



INACTION RETREAT RETROFIT REINFORCE

Context:

Tuvalu is highly vulnerable and seeks for long-lasting solution that works in synergy with the communal livelihood and ecological richness. The process of inaction, retreat and retrofit might have a high possibility of taking people away from their ecology. Thus, reinforcing the available opportunities could be the right choice.

REINFORCE:



Basis of Reinforcing the design for an optimum solution.



TIME

To smoothen the present situation and tackle the challenges of future and evolve with time (not getting outdated)



To balance man and nature; involving economy and environment.

SUSTAINABILITY



To strengthen the societal bonds and ensure net positive impact for livelihood.

COMMUNITY

OPTIMISING THE FORCES OF NATURE

The global sea level rise being a process enacted by the forces of nature, they have become the driving agents of design approach. The threats were conceived as the new opportunities then the natural cycle becomes part of the design process.



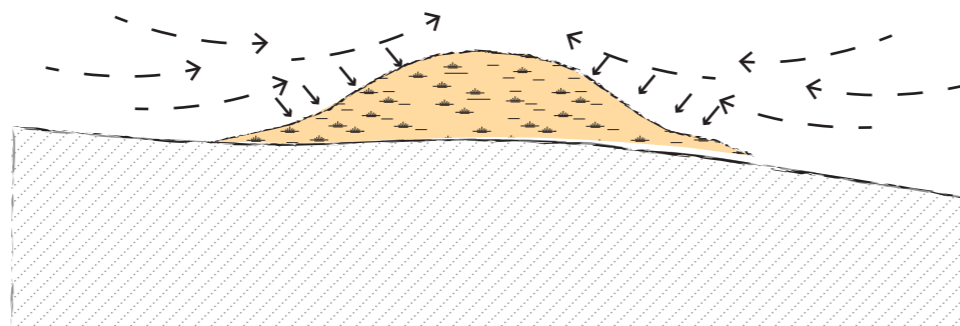
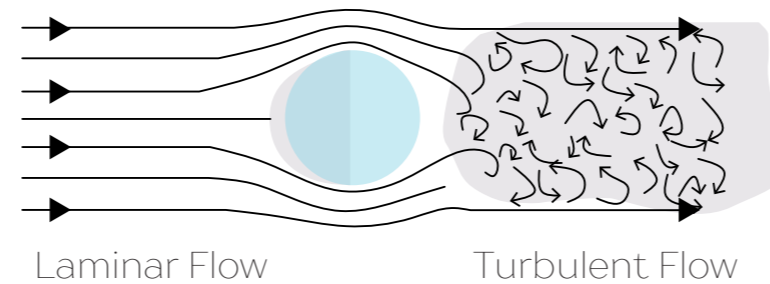
=



Forces of Nature - Wind

Laminar Flow: the flow of a air when each particle of the air follows a smooth path, paths which never interfere with one another. One result of laminar flow is that the velocity of the air is constant at any point in the air.

Turbulent Flow: irregular flow that is characterized by tiny whirlpool regions. The velocity of this air is definitely not constant at every point

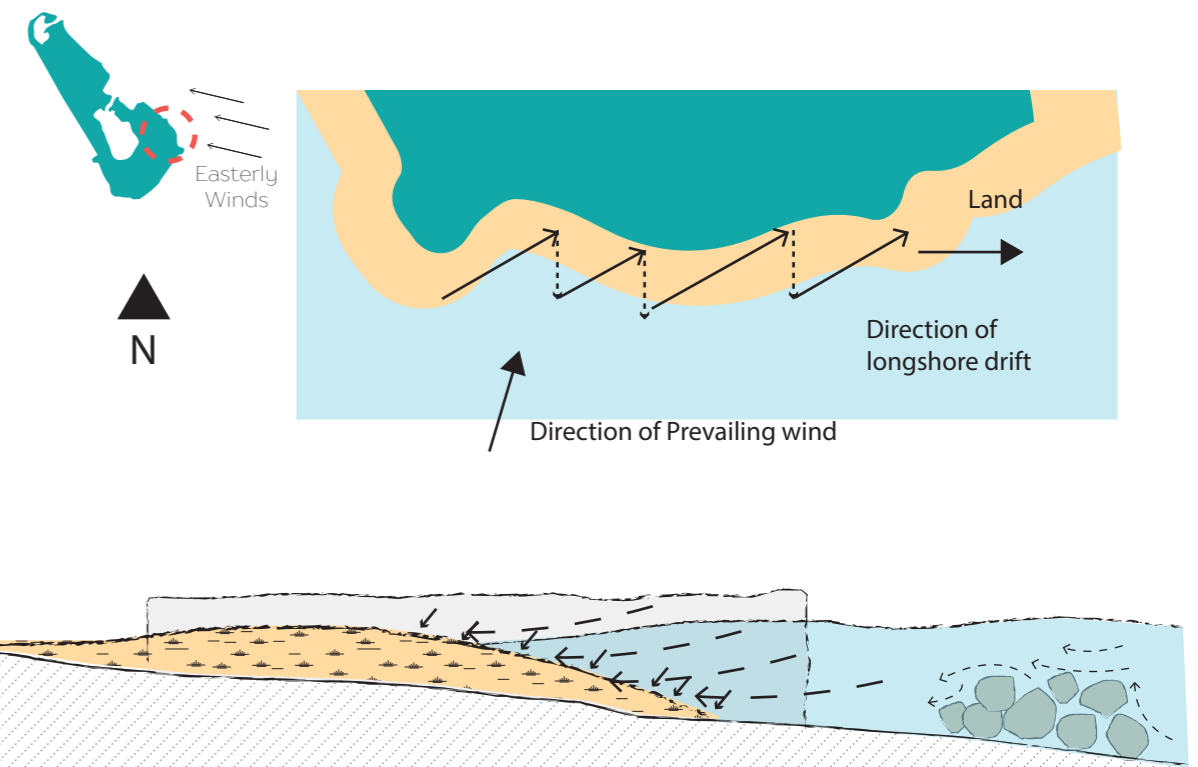


Both Destruction and Construction of a shore by Sea



Forces of Nature - Water

Longshore drift is a geographical process that consists of the transportation of sediments (clay, silt, sand and shingle) along a coast at an angle to the shoreline, which is dependent on prevailing wind direction, swash and backwash. For Tuvalu Easterly winds are the prevailing winds for most of the time.

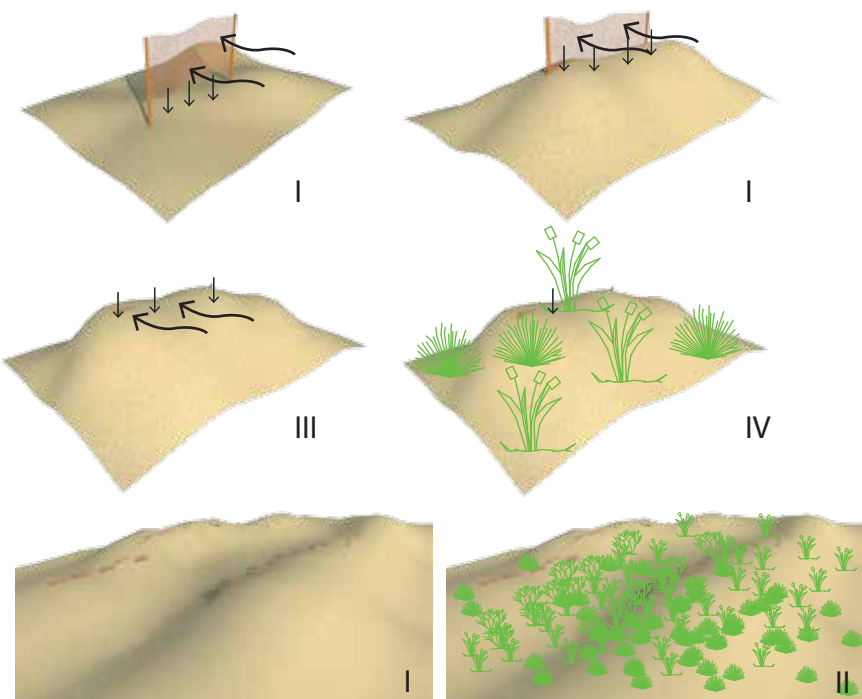


The continual process of sedimentation and erosion if strategically altered, can increase the efficiency of sedimentation which will help in constructing the **NEW LAND**. The sea shore's general process of erosion can be made minimal. The efficiency of the process will not only avoid the negative impact; but create a positive footprint as **"LAND"**. Thus a regenerative eco-cycle could be created.

A REGENERATIVE ECO-CYCLE – an optimistic design approach

The SYSTEM

The strategy to reinforce the context, by optimizing the natural forces of wind and water was formulated to work at three levels. The land becomes the highly valued source for livelihood. The water serves as the fuel for survival. The both in relation encompass the larger **ecological loop**. Thus the conversation between these two is the crucial part to be dealt with. The solution for sea-level rise cannot be found by shifting towards this or that, it lies in the balance. It's not about LAND or WATER. But, the conjunction of it. It's about the **LAND, WATER and the space in-between (THE GAP)**.



Marram Grass

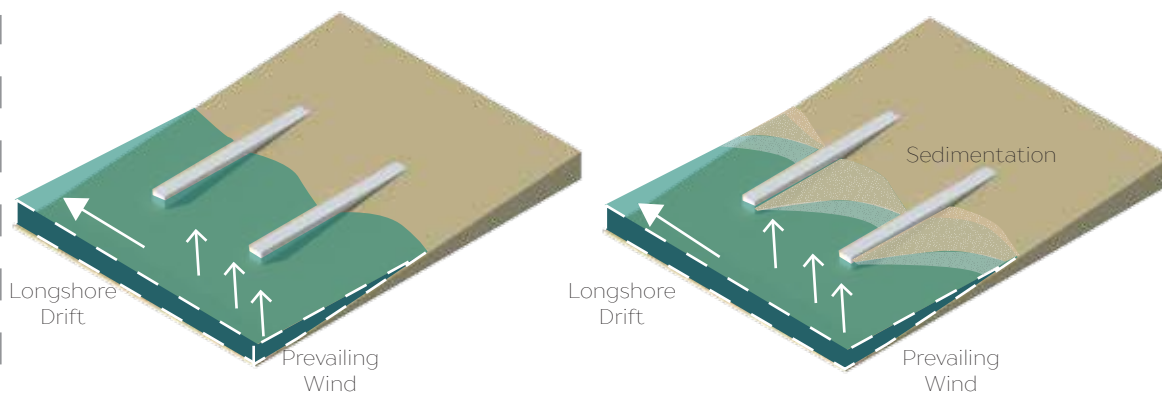


Spinifex

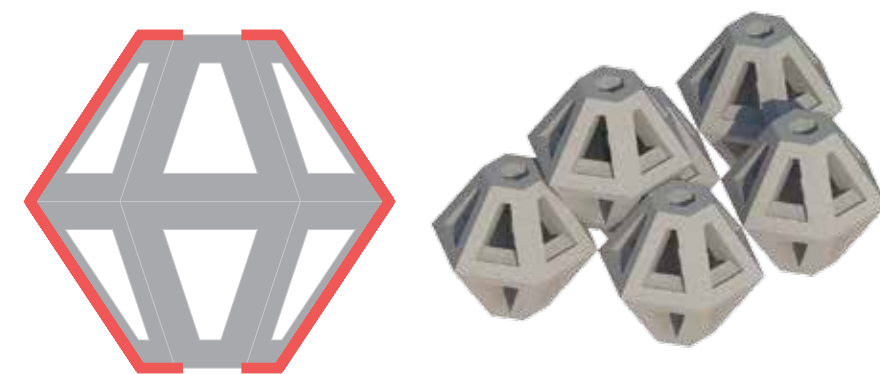
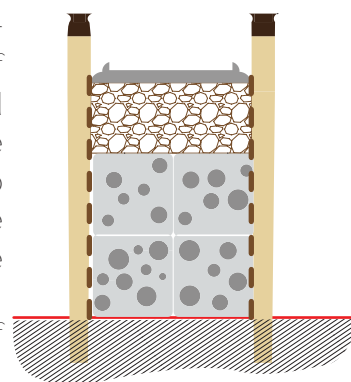


Sedge Pingao

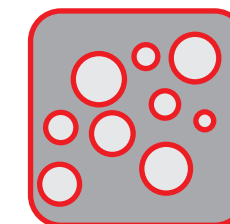
The design was conceived to mimic the natural function of coastal landscapes. The sand from wind was captured through a weave of mesh created with native coconut coir it gets reinforced by grass and its supported at desired heights and profiles to suit the need. This works similar to that of the native coastal vegetation which collects and stabilize sand that are being transported by oceanic storm energy.



The space that encounters continuous LAND-WATER interaction was intervened with GROYNES of random rubble masonry covered by steel mesh and reinforced with coconut trunks. Their profiles were altered based with wind direction and were paved to allow human movement. These structures along the shoreline were made permeable to not disturb the water flow but encourage sedimentation and control erosion. The groynes were structured to be part of the eco-system with artificial corals & mangroves.

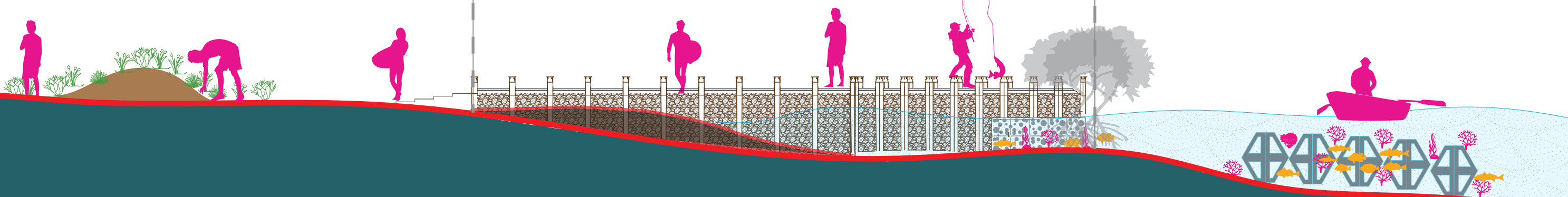


Econcrete blocks in Front of Groynes



Econcrete blocks under the Groynes

The first belt of ocean is the most affected zone with climate change and sea level rise. The groynes implanted require fertile ecosystem to enhance the sedimentation of soil. The corals ecosystem plays a great role in making this zone productive with high fish yield, intense mineral supply and also controls soil erosion and salt water intrusion. E-CONCRETE blocks were introduced in this area to strengthen the coral growth and support the role of groynes. This system could bring about a greater ecological and economical stability to the context.



HARVESTING SAND

DEFINING THE GAP

BOLSTERING WITH CORALS

DEVISING SHORELINE

REFINING SHORES

The portion of the island which offers a long stretch of beach was planned to support diverse activities and elevate sea shore usage. The intervention was made in all the three stages to encourage maximum human interaction. The sand berms were molded to form varying undulations widening the possibility for new functions. The groynes and e-concrete blocks were also spread across longer stretch balancing the sea level rise.

REINFORCING THROUGH FUNCTIONAL ENGAGEMENT.

Existing Shore line

Extended Shore line

Berms for various activities

Sedimentation

Groynes

Artificial Coral Reef

Land

High Tide

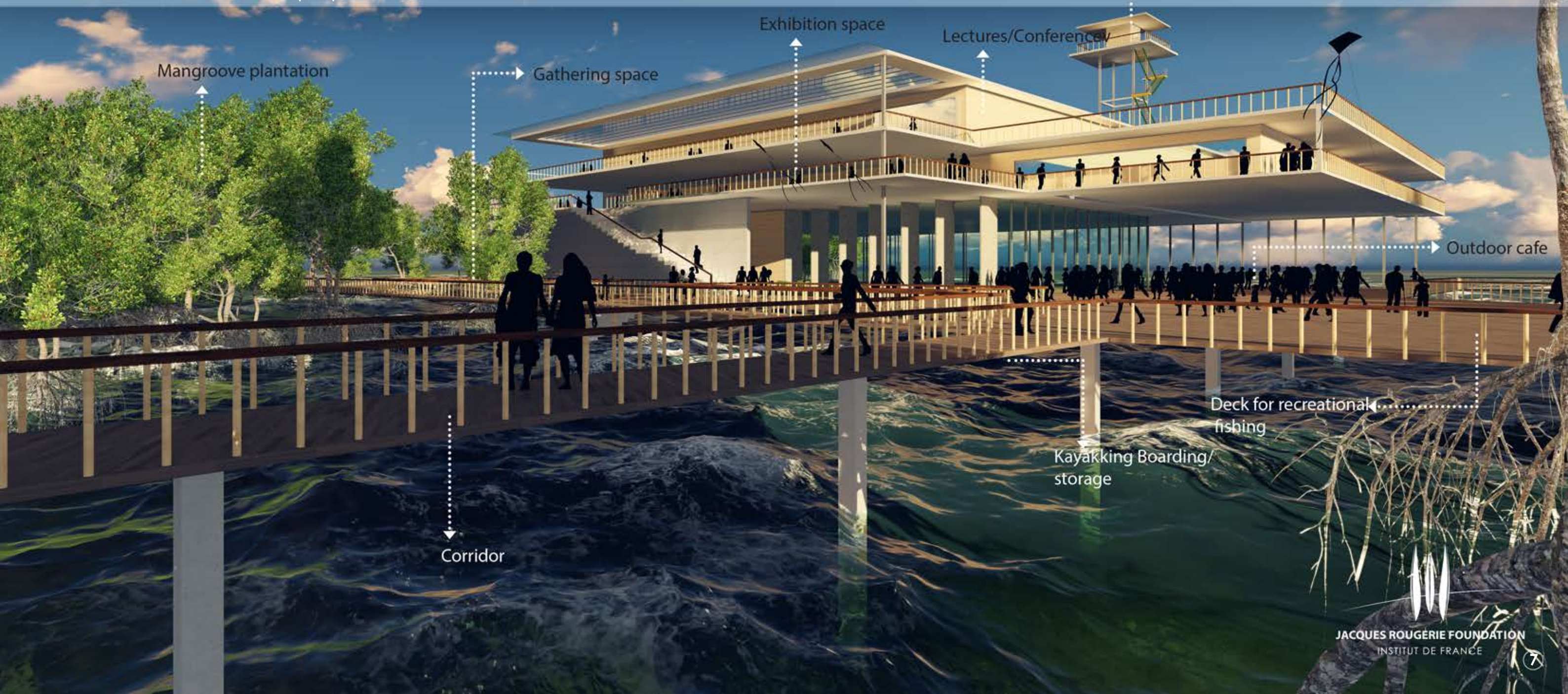
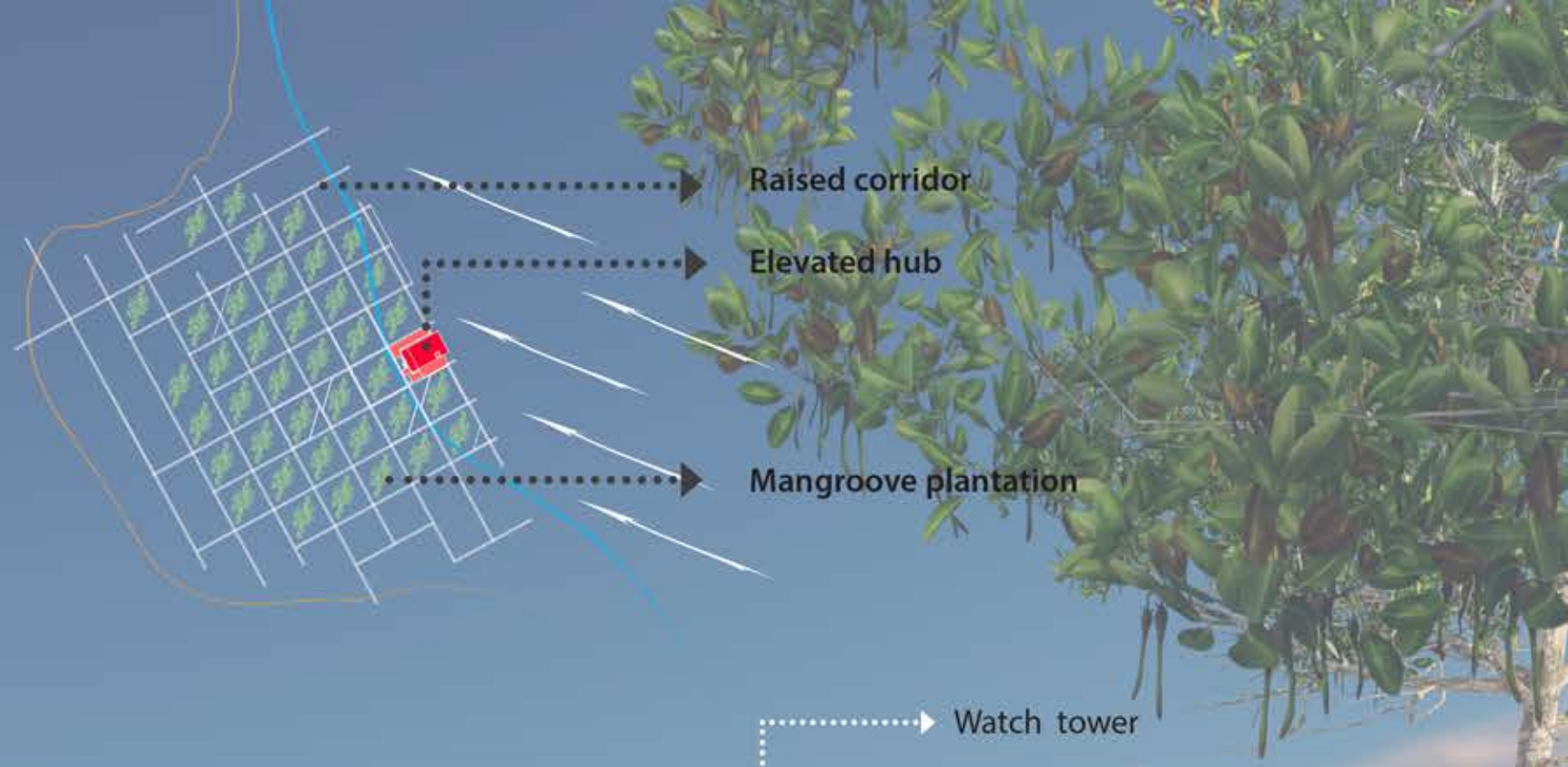
Low Tide

Sea

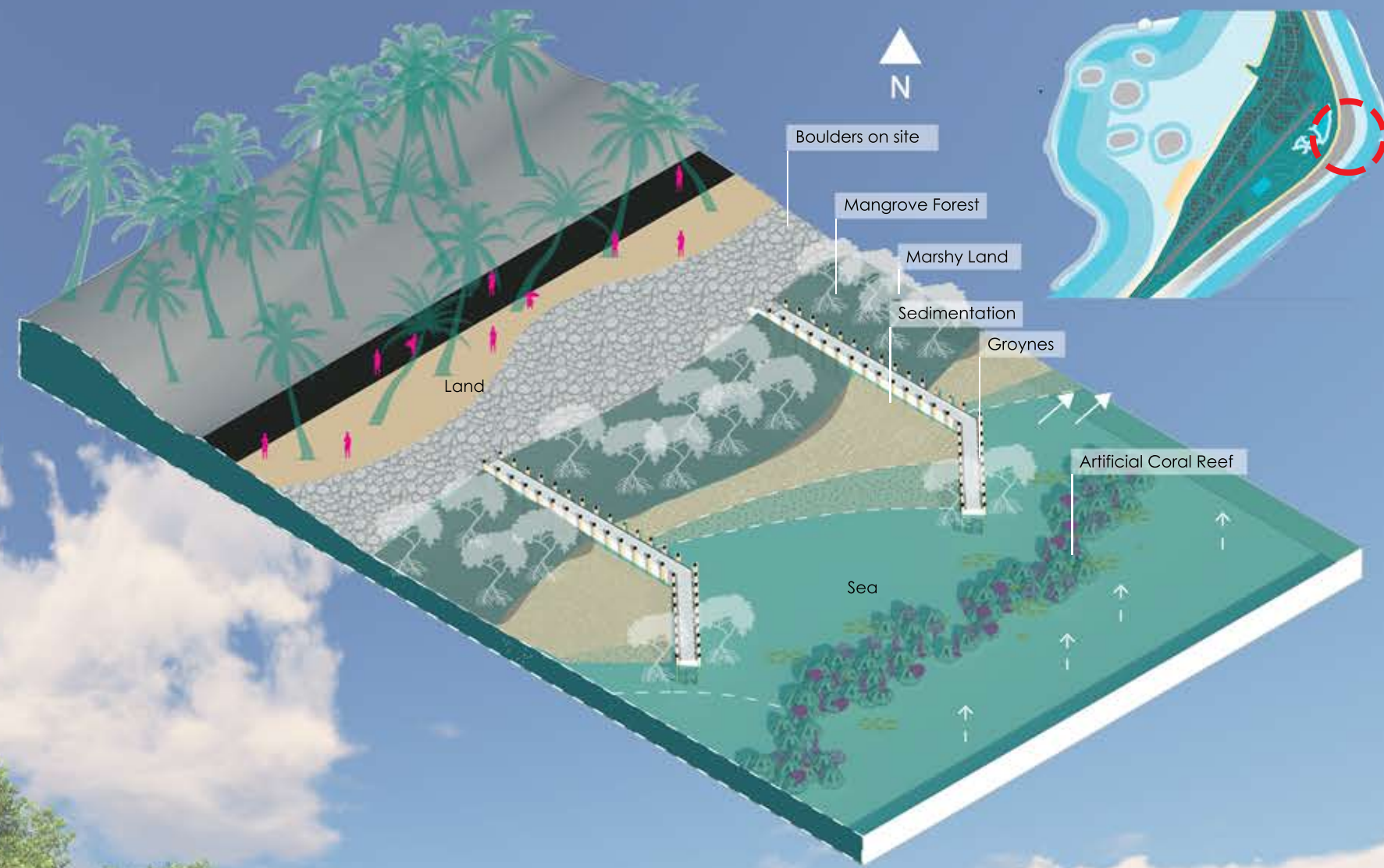


The large parcel of land between the lagoon and the sea has been transformed as the crux of the island.

The programs were crafted to cater the need and bring in new dimensions and is shaped by its particular location, context, and the community needs. Mangroove plantation has been created as per prevailing wind direction and floating corridors are designed running inbetween the plantation for recreation purpose. The purpose of the Hub is to connect people to the water, encourage water-based activities, provide infrastructure for recreation and education, and create a platform for the community to meet and learn. The built structure in whole will also form as an identity for the landscape and its people.



The part of the site where the shoreline intersects with forest was further reinforced with the introduction of Mangrove plantation. The root structure of mangroves will with-hold the soil tight, leave less room for soil erosion and provides stand protection from waves and water movement. It also can nourish coastal eco-system. Human interaction was limited along this stretch thus the stage one intervention was excluded. **REINFORCING THROUGH AN ECOLOGICAL LOOP.**



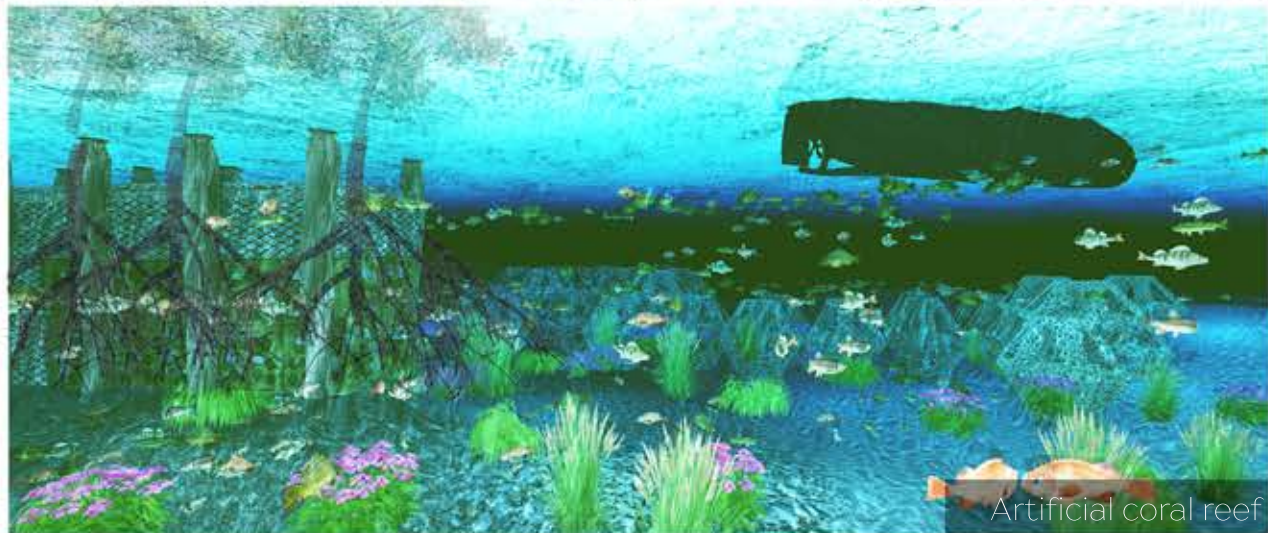
The settlement, beach and the rich coastal eco-system comes parallel along this line of the island. The intervention was made simple to not hinder the familiarity of the user and gain utmost land area possible. The creation of the berms are of participatory design and maintained by the natives. The presence of rich coral reefs along this stretch nullifies the need for artificial introduction and encourages natural plantation. The mud flats were yet created to increase the land area and strengthen the shoreline.

REINFORCING THROUGH LAND RECOVERY.





The New beach



Artificial coral reef



View of Groynes



Active berm street

“**THE GAP in-between** was strategically defined to reinforce the livelihood along the shoreline. The diverse characters of the landscape were intervened to unify the eco-system with varied environmental combinations for survival. The LAND as the most valued commodity, was saved, recovered and strengthened through optimization of natural forces. The threats were turned to be the new opportunities. The GAP was refined to make the LAND grow with the WATER. Every rise in the sea level will raise the land too. Of course, every inch matters. While dealing with NATURE, the sources can't be altered but its actions could be optimized. THE SOCIETY and its SURVIVAL WITH TIME has become the prime concern in developing the system for sustainability.

The design is not about *filling the gap, but fixing it*”



TIME



SUSTAINABILITY



COMMUNITY