Country / City	**Switzerland**
University / School	**Accademia di Architettura di Mendrisio**
Academic year	**2019**
Title of the project	**The Landscape at the Level of Climate Change | Sediments Manipulation in the Loire Estuary**
Authors	**Giovanni Perazzi**

TECHNICAL DOSSIER

Title of the project	**The Landscape at the Level of Climate Change | Sediments Manipulation in the Loire Estuary**
Authors	**Giovanni Perazzi**
Title of the course	**Waterscape: Leaving Altitude 0.00, the Case Study of the Loire Estuary**
Academic year	**2019**
Teaching Staff	**João Nunes, João Gomes da Silva, Teresa Rosas da Silva Figueiredo, Angela Palmitessa**
Department/Section/Program of belonging	**3rd Bachelor, Autumn Semester 2019/2020**
University/School	**Accademia di Architettura di Mendrisio**

Written statement, short description of the project in English, no more than 250 words

Faced with the challenge of rising sea level, we were asked to imagine the estuarine landscape of the Loire, in the territory between Nantes and Saint-Nazaire, from the perspective of present and past infrastructures and their possibility of abandonment and reinterpretation.

Over the last two centuries, the Loire estuary has undergone a series of important public works to maintain safe shipping conditions. However, this has led to an alteration of the hydro-sedimentological processes in the river, with a negative impact on the various users of the Loire. The research has shown that it is possible to restore hydro-sedimentological processes by modifying the morphology of the estuary while providing better conditions for its users.

The proposed restoration scheme is based on two main activities: the recreation of mudflats islands at the entrance of the estuary and the opening of a secondary natural channel. Both will reduce the Loire's tendency to trap fine sediment in its inland estuary while restoring key ecological functions and bringing new economical activities to the region.

This project finds its place in a negotiation between time and space; within an unfinished character. Together with the opening of the channel, a palafitic system is planned to protect and create new lands. The balance will be re-established when after 100 years the system of thousands of poles will be turned into mud and sand, leaving its place to a new ecosystem hosting new animal species and biotopes.

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CLIMATE CHANGE AGAIN

11th International Biennial Landscape Barcelona

Barcelona September 2020

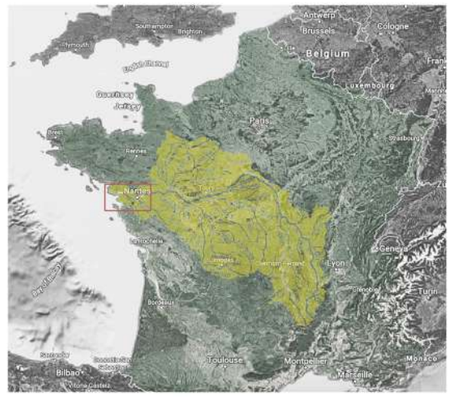
SCHOOL PRIZE

THE LANDSCAPE AT THE LEVEL OF CLIMATE CHANGE
SEDIMENTS MANIPULATION IN THE LOIRE ESTUARY

CASE STUDY | LOIRE ESTUARY

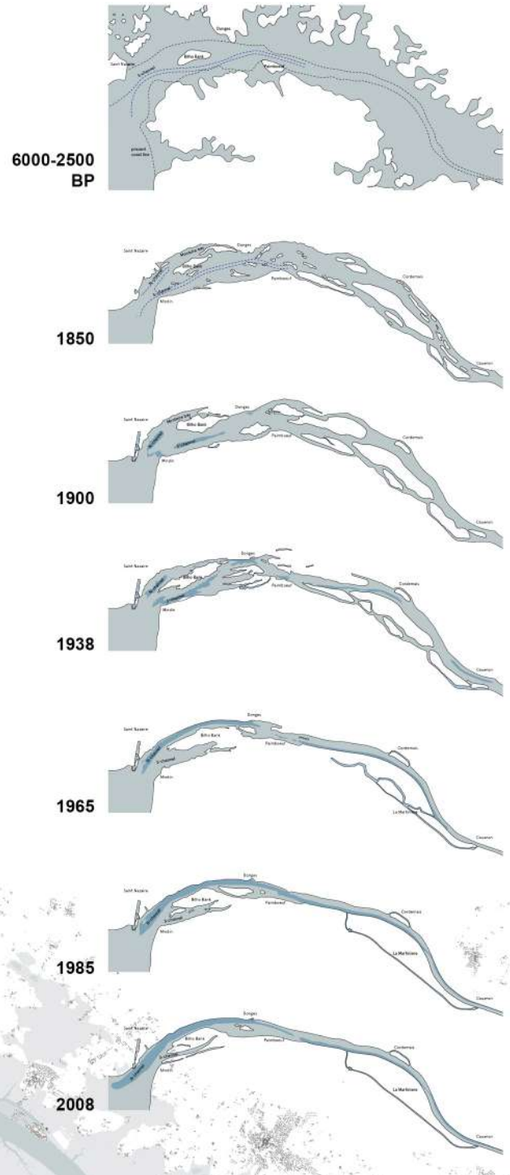
The construction of this scenario is based on a good understanding of the current physical functioning of the estuary.
Among the key features of this operation, it is necessary to underline the predominance of flow currents over low tide, which contributes to trapping fine sediments in the Main channel.
This tidal asymmetry is explained by the convergent shape of the estuary resulting from developments in the twentieth century.
The dozens of islands and peninsulas that characterized the river have disappeared in favour of a single river, channeled and dug to speed up trades. Therefore the flow of waters has fewer opportunities than in the past to extend and slow down in contact with mudflats and reeds, but it rises and falls faster.
The Loire estuary no longer serves as a buffer, but rather as a magnification factor for the effects of climate change.
The intervention scenario mainly aims to reduce this imbalance between flow and reflux currents by modifying the geometry or morphology of the estuary and establishing a new ecosystem at the entrance of the river Loire.
The process of natural sedimentation within the river mouth will be studied in order to understand its dynamics and restore its natural ecosystem.

GEOGRAPHICAL CONTEXT | LOIRE REGION

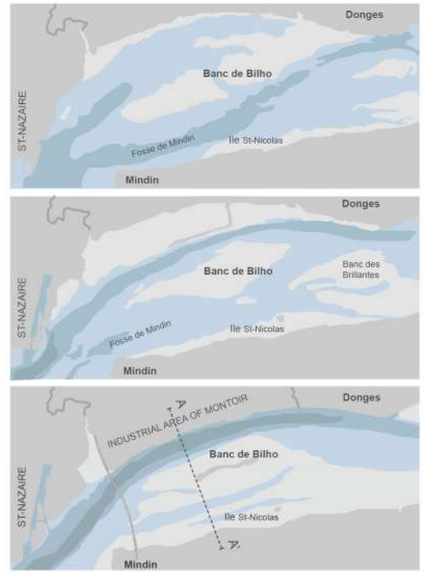


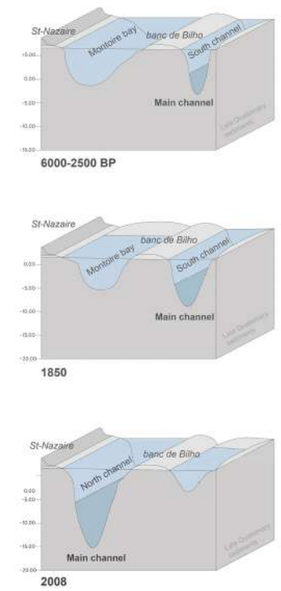
The economic life of the Loire region has always been dependent on the river's hydrography and since the late XIX century the Loire estuary has been subjected to significative modifications and human interventions.
Within its estuary tides reach a difference up to 6m between low and ebb tide, unfolding a landscape in a constant negotiation between water and land.

MORPHOLOGICAL EVOLUTION

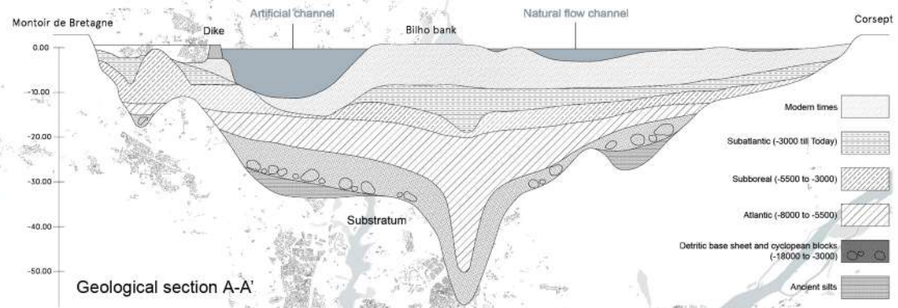


STUDY AREA | SEDIMENTS DYNAMICS





Man's actions on the estuary such as the creation of dams, canalization and dredging have influenced sediment's transport. In the late ninetheenth century the natural south channel was filled in and a new Navigation channel on the north side was created to speed up trade.
The new morphology is the cause of the predominance of flow currents over reflux currents that create an imbalance in the sedimentation process generating a progressive trapping of fine sediments in the navigation channel. Moreover, due to this progressive erosion, intertidal mud deposits are decreasing while inland floods increase.



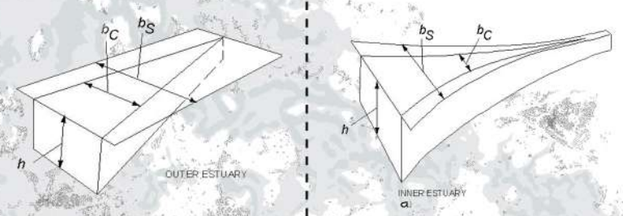
Geological section A-A'

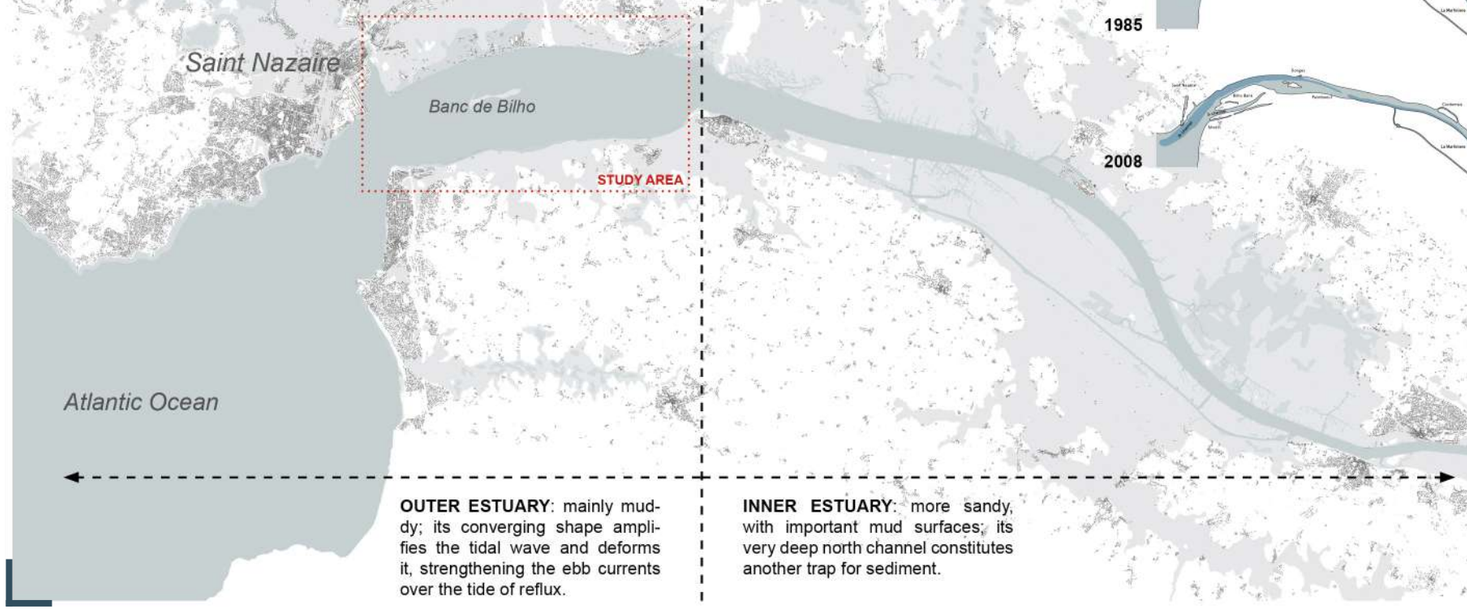
FUTURE SCENARIO | RISING SEA LEVEL

2019
+0.00m

2100
+1.5m m.a.s.l.

The morphology of the estuary amplifies tidal asymmetry





OUTER ESTUARY: mainly muddy; its converging shape amplifies the tidal wave and deforms it, strengthening the ebb currents over the tide of reflux.

INNER ESTUARY: more sandy, with important mud surfaces; its very deep north channel constitutes another trap for sediment.

THE LANDSCAPE AT THE LEVEL OF CLIMATE CHANGE
SEDIMENTS MANIPULATION IN THE LOIRE ESTUARY

PROPOSAL | SEDIMENTS MANIPULATION

The aim of the proposal is to act on the functioning of the estuary through the creation of new buffer zones and the reopening of the old natural southern channel.
In order to set a new ecosystem, a structure of sediments accumulation is planned to let the river transform exhisting mudflats into new islands that will have a fundamental role for the ecosystem and will act as storage areas for big water masses.

THE SITE | STUDY OF A SYSTEM

At the entrance of the Loire estuary is the *banc de Bilho*, a small protected mudflat where many bird's species find rest after their migration period. Around *Bilho*, many more semi-submerged mudflats struggle against tidal erosion.
In order to let time transform these mud lands into proper lands, a palafitic structure is planned.
Wooden lines of poles are set against the water fighting their place in the land and waiting for time to unfold a new landscape and a new island to be born. A rule is created and the space is fragmented with a repetitive element that calibrates and scales this giant portions of land. The system of wooden poles measures the landscape and reinterprets the genius of existing coastal protection infrastructures.

This project is designed to read and feel the land in order to be transformed into an efficient coastal protection system. The balance will be established when, in one hundred years, this wood will be buried and turned again into dust, sand and water.

Date of construction | mudflat

+40 years from construction

+80 years | new land

Detail model: double raw of wooden poles filled with branches lets the water pass and traps the sediments. Opposite to a normal groyne, its permeability allows for uniformity of sedimentation.

Study model: T-shaped permeable groynes system will accumulate mud along the banks of the *Banc de Bilho*.

REFERENCES | COASTAL PROTECTION SYSTEMS

Permeable groyne

Brushwood groyne

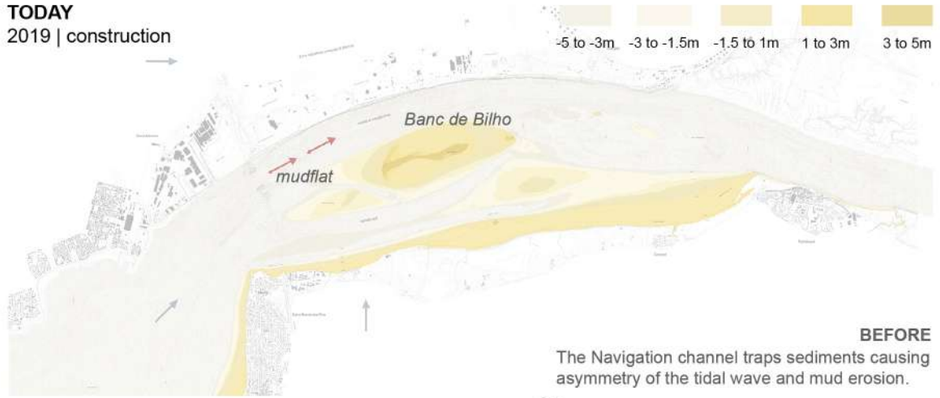
groyne

Sand fence

Seed collection system of vime sticks

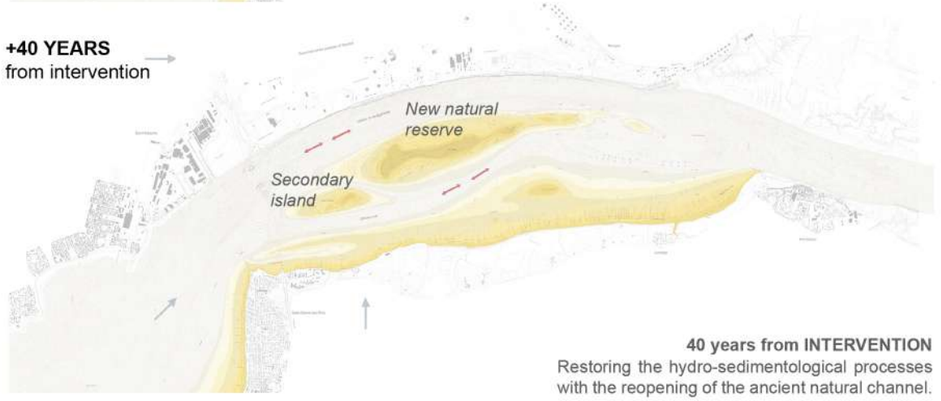
GENERAL PROPOSAL | NEW ISLANDS AND A NEW CHANNEL

TODAY
2019 | construction



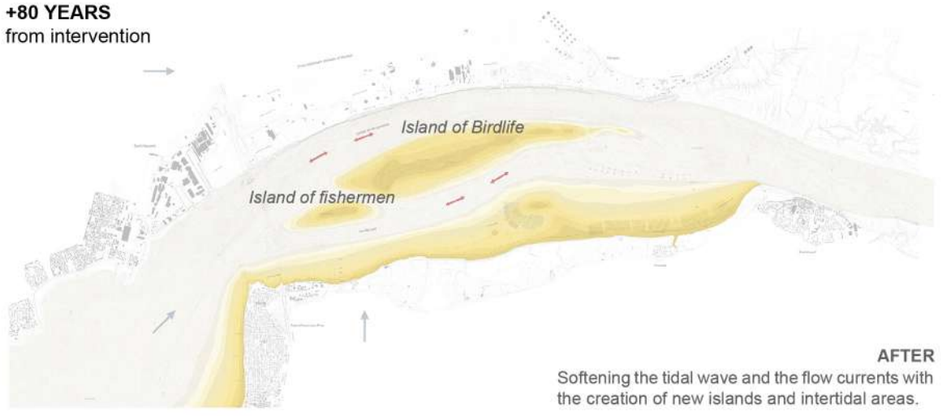
BEFORE
The Navigation channel traps sediments causing asymmetry of the tidal wave and mud erosion.

+40 YEARS
from intervention



40 years from INTERVENTION
Restoring the hydro-sedimentological processes with the reopening of the ancient natural channel.

+80 YEARS
from intervention



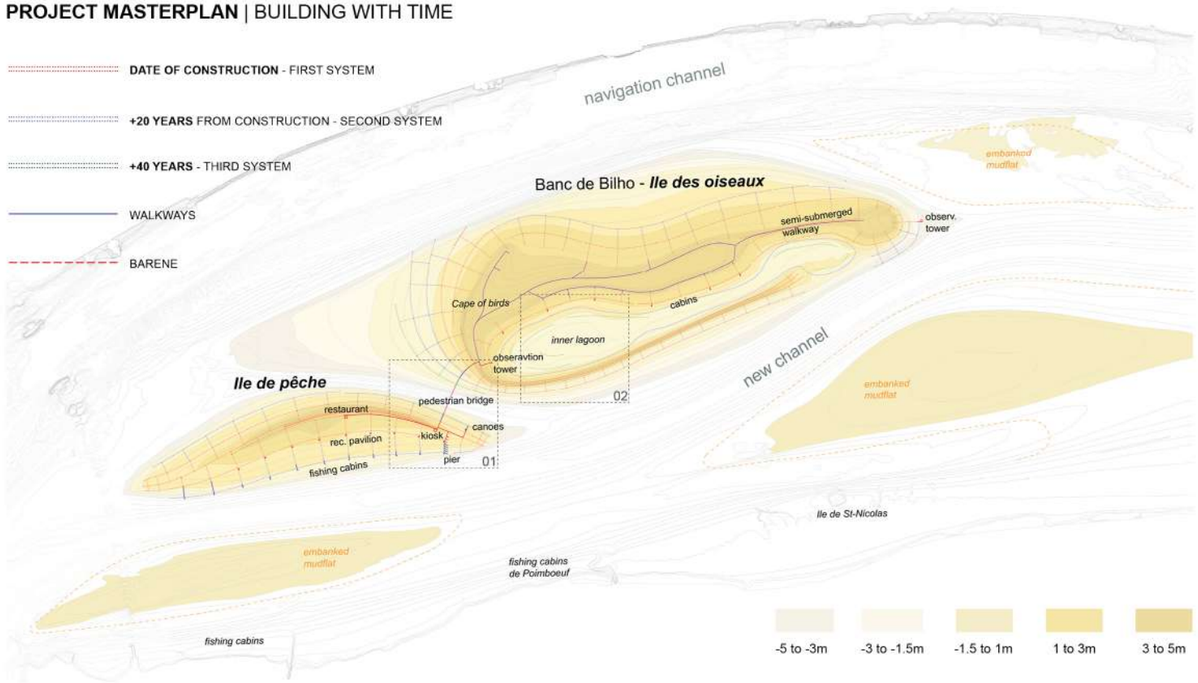
AFTER
Softening the tidal wave and the flow currents with the creation of new islands and intertidal areas.

A NEW ECOSYSTEM FOR THE LOIRE ESTUARY

The new islands will work both as fundamental ecosystem and as a barrier, becoming a storage area for big water masses during high tide and inundation periods.
The first island, the former *Bilho bank*, is transformed into a new *natural reserve*: the palafitic structure will be set in order to unfold a morphology suited to protect and host many bird species. The Bilho bank will become the *Island of birdlife*.
By means of the same system, a second island is planned. This second island protects the first one from strong winds and currents, as well as managing its accesses and transforms into an important livelihood area for local fishermen's activities.

THE LANDSCAPE AT THE LEVEL OF CLIMATE CHANGE
SEDIMENTS MANIPULATION IN THE LOIRE ESTUARY

PROJECT MASTERPLAN | BUILDING WITH TIME



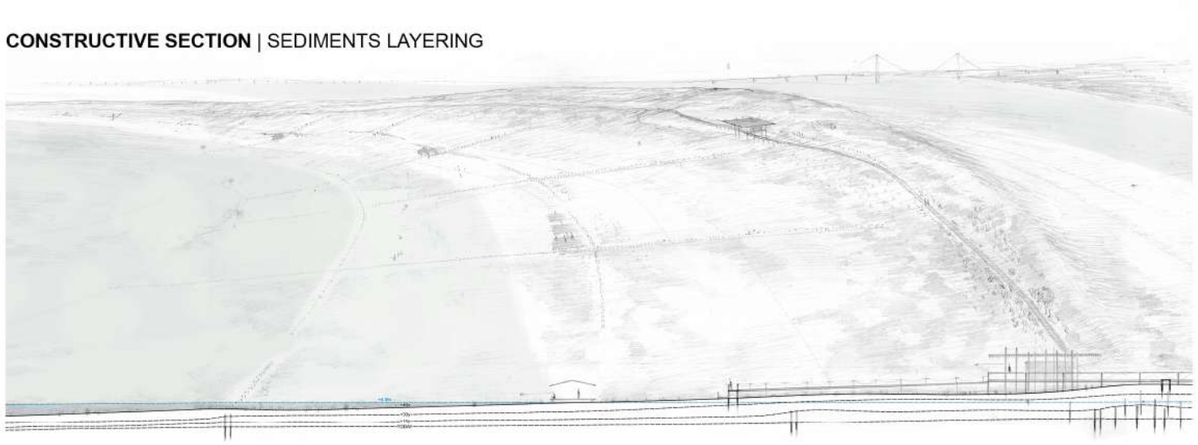
DETAIL 01 | CONNECTION BETWEEN THE ISLANDS

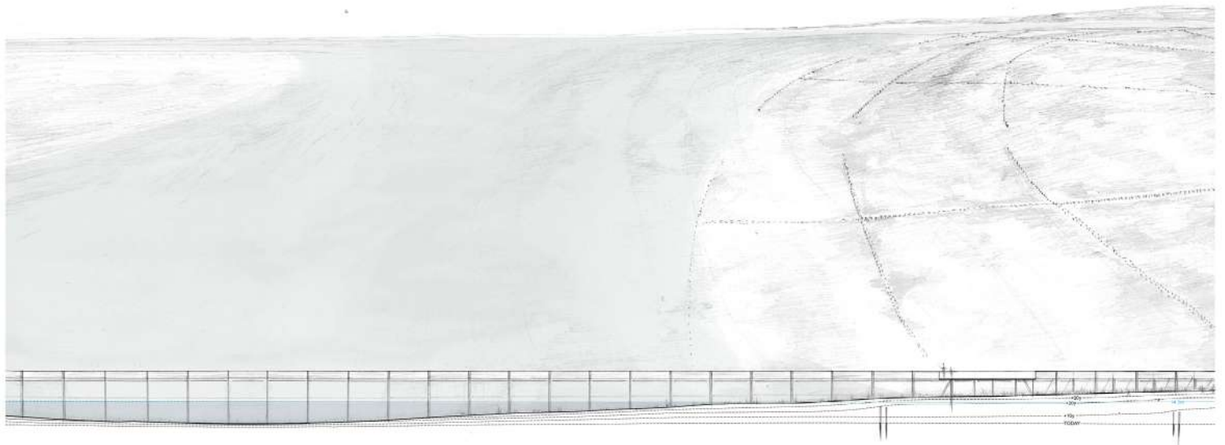
A. *watch tower* B. *footbridge* C. *main pavilion* D. *recreational pavilions* E. *pier* F. *fishing cabins*

DETAIL 01 | ÎLE AUX OISEAUX

G. *fixation of dunes* H. *sand fence* I. *cabins* L. *sediment trap* M. *inner lagoon* N. *protective headland* O. *permeable T-shaped system*

CONSTRUCTIVE SECTION | SEDIMENTS LAYERING





STRUCTURAL SYSTEM | PROGRAM

A wooden pole is arranged in lines, in groups of structures creating a matrix, a system that accumulates mud and sand.
A second protection layer works with the first one in order to accumulate sediments from the slowed down waters; it collects sediments brought by the tides like a wall, leaving a permeability to water flows and human movement.
A third level is intended as a protection of the dunes and for collection of sand brought by the winds in order to create a higher and a lower beach for tidal dissipation. Here the wooden poles work in lines but also in groups, with walkways of distribution and pavilions with recreational purposes. The last layer is constituted of mudflats for seed collection and other vegetation planting in order to fix the old dunes and the new born land.
Places to rest, sit and enjoy the banks are defined on all sides of the islands, leaving a perception of the space as a forest of rows of poles framing the views. A restaurant is positioned in the highest point of the land, particularly nice for excursions, beautiful views of the fluvial coast of Paimboeuf and the delicate curvature of the land. On the Fishermen's Island fresh fish is brought from the beach and relax is enjoyed with friends under delicate covers.

This project finds its place in a negotiation between time and space; within an unfinished character. After 100 years the beaches of thousands of poles are just mud and sand; the old banks that used to be underwater hosts new animal species and biotopes.
All that remain of the intervention, is the beautiful thin horizontal line of the footbridge and a few pavilions that rise - silent - on a small group of poles.

STUDY MODEL | VIEW ON THE INNER LAGOON

DETAIL MODEL | WOODEN FOOTBRIDGE