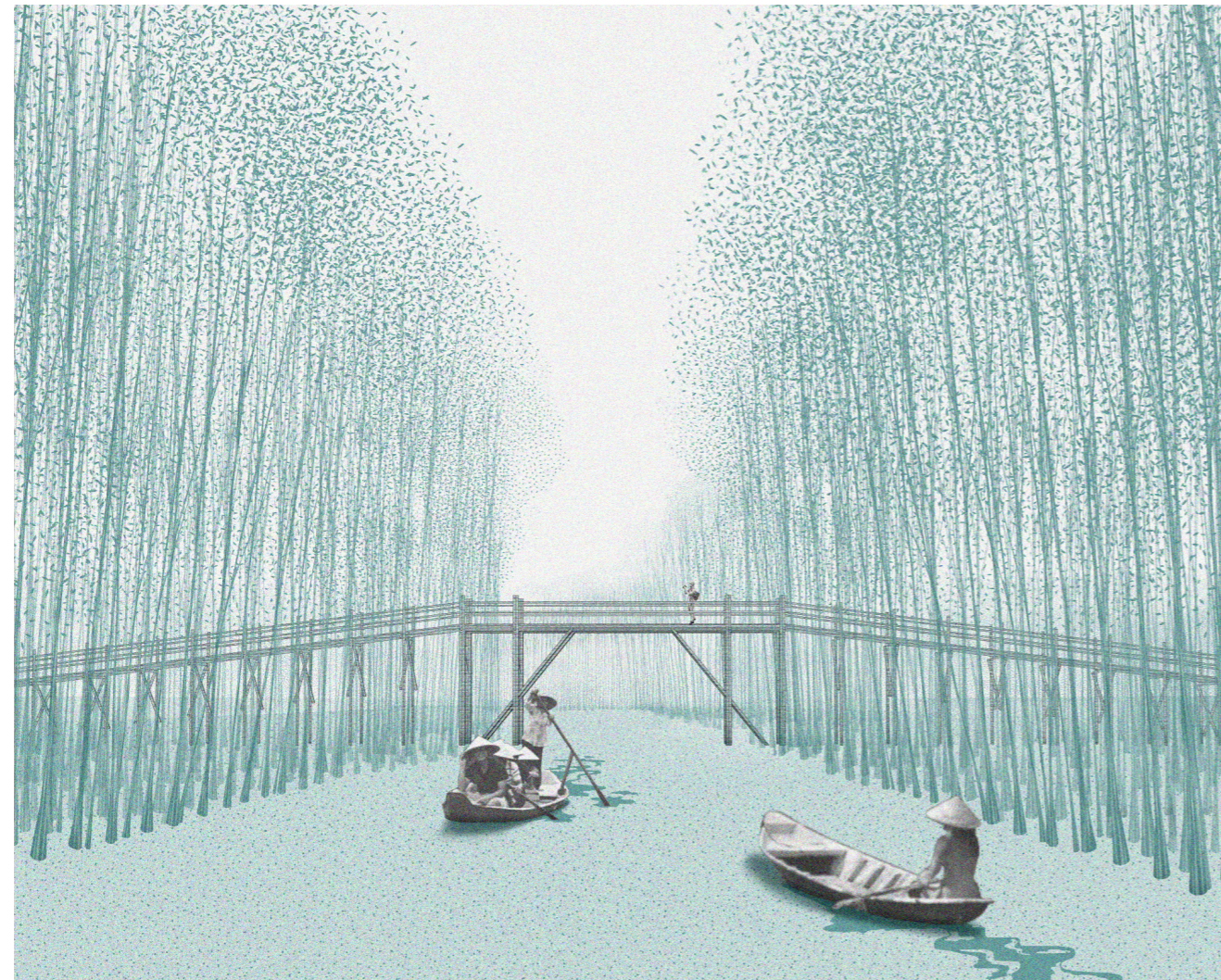




WATER KEEPER

Sustainable water storage system for Vietnam Mekong Delta



Bringing back the prosperous delta

Country / City Milan, Italy
University / School Politecnico di Milano - School of Architecture Urban planning Construction Engineering
Academic year 2019/2020
Title of the project Water Keeper - Sustainable water storage system for Vietnam Mekong Delta
Author Cong Dinh Huynh

TECHNICAL DOSSIER

Title of the project	Water Keeper - Sustainable water storage system for Vietnam Mekong Delta
Author	Cong Dinh Huynh
Title of the course	Master thesis
Academic year	2019/2020
Teaching Staff	Matteo Umberto Poli
Department/Section/Program of belonging	Msc. - Landscape Architecture. Land Landscape Heritage
University/School	Politecnico di Milano - School of Architecture Urban planning Construction Engineering

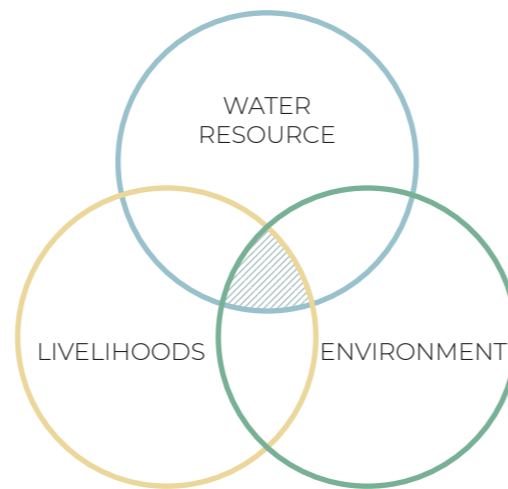


Written statement, short description of the project in English, no more than 250 words

Vietnam Mekong Delta (VMD), located in the south of Vietnam, is the ending point of Mekong's long journey, where the river creates a prosperous delta before pouring into the sea. Thank to the fertile land and abundant of water resources, VMD has long been the largest agricultural production area in Vietnam. But the situation has been changing during the last decades, climate change, hydropower plants on Mekong's main stream and the intensive agricultural practice are degrading water and soil quality, increasing the vulnerability of the whole delta and putting "the region of water" into serious water stress.

The thesis focuses on seeking a sustainable water storage system to create the initiative in water resource and increase the delta's capacity to adapt to changes, with an affordable solution coming from existing landscape elements of the delta such as the excavated canal system, submerged cajuput forest and the annual flood.

In Vietnamese, "water" also means "Nation", the system will work as a Water Keeper not only dealing with the problem of water resources but also protecting people livelihoods, bringing a new image to the delta and improving environmental quality and biodiversity.



CLIMATE CHANGE AGAIN

11th International Biennial Landscape Barcelona

Barcelona September 2020
SCHOOL PRIZE

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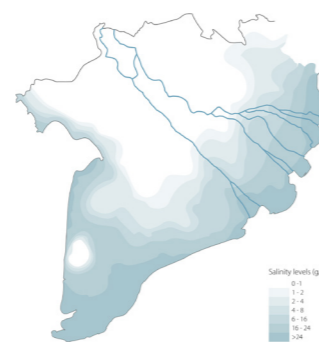


Hydropower plants along Mekong and location of VMD

ISSUES



Sea level rise



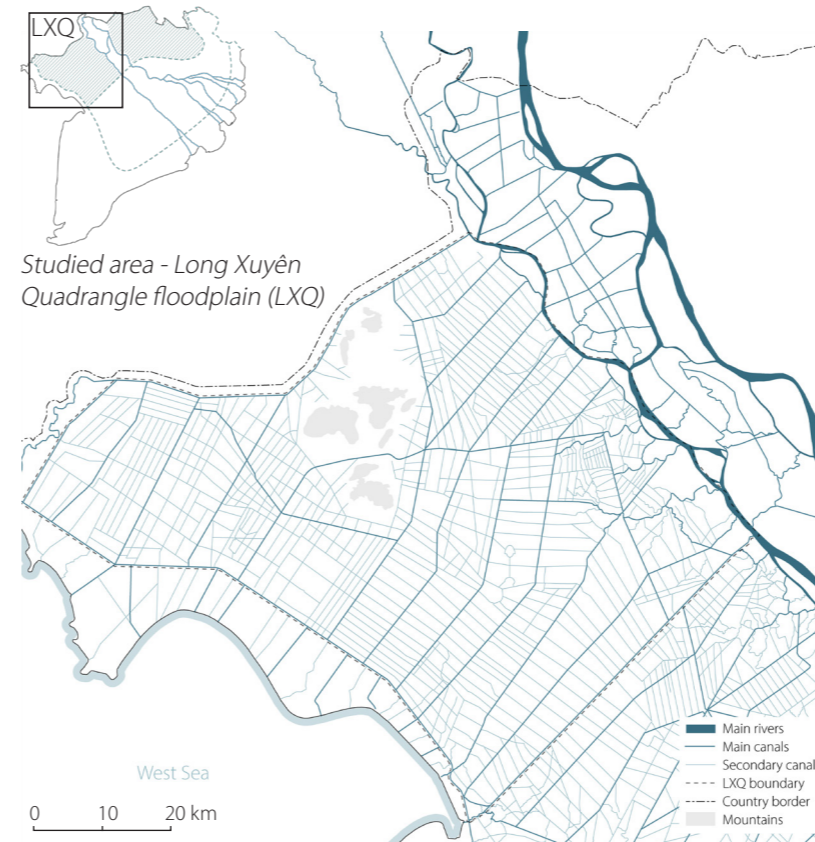
Salinity intrusion



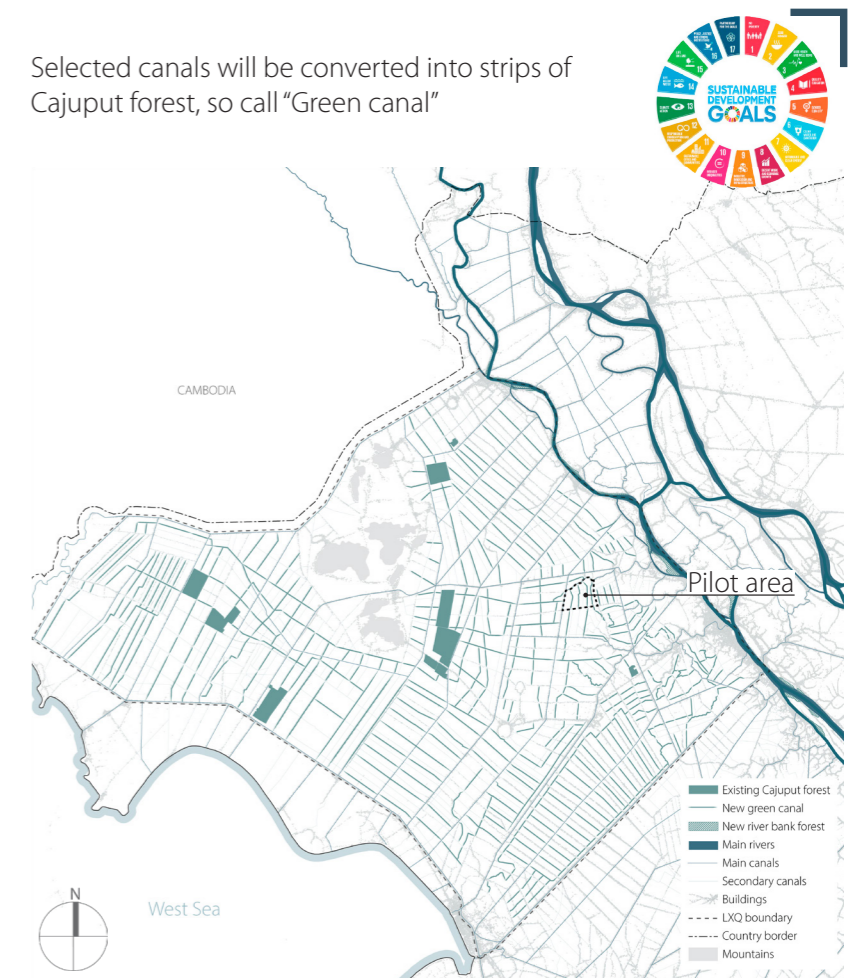
Serious drought causing by climate change and hydropower dams upstream

GREEN CANAL SYSTEM

Taking the advantages of existing factors: enormous excavated canal system, annual flood, characteristic flooded forest of Cajuput.



Enormous excavated canal system has been formed for centuries



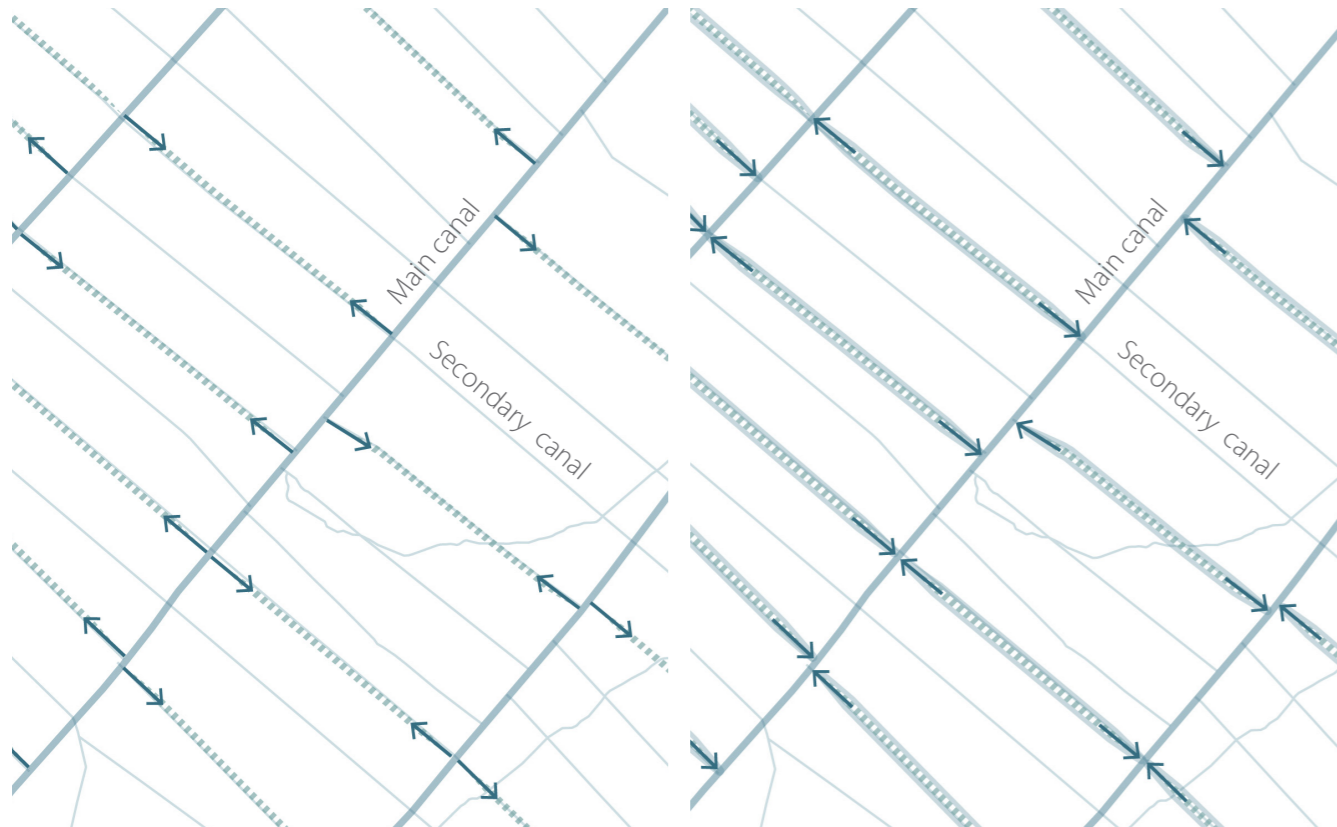
Green canal system



Selected canals will be converted into strips of Cajuput forest, so call "Green canal"

THE WATER BAG

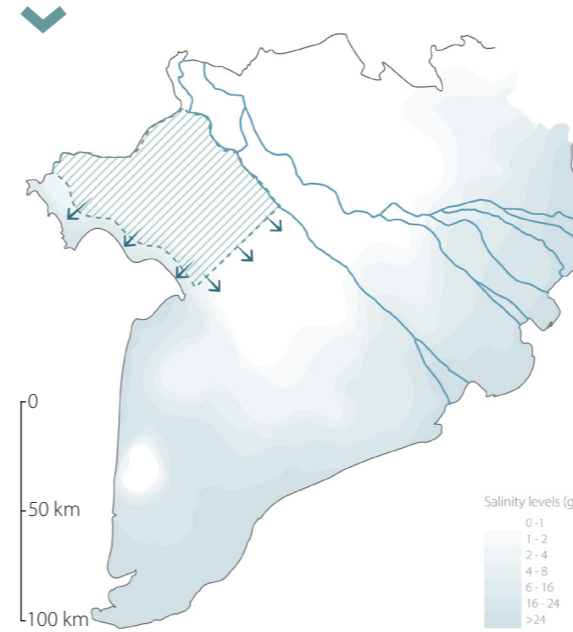
Green canals will work as "water bags", accumulating water during flood season and releasing during dry season for irrigation and flushing away salinity in coastal area.



Flood season (From August to November)
Absorb water

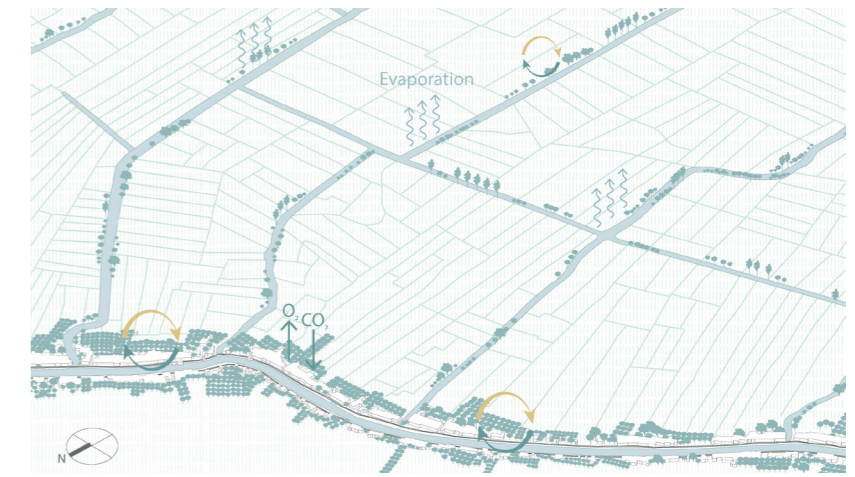
Dry season (Drought peak from March to May)
Release water

As shown on the figure below, the water reserved in LXQ's Green canals can flushes away salt water on the west coast and contribute water for the lower region in dry season.

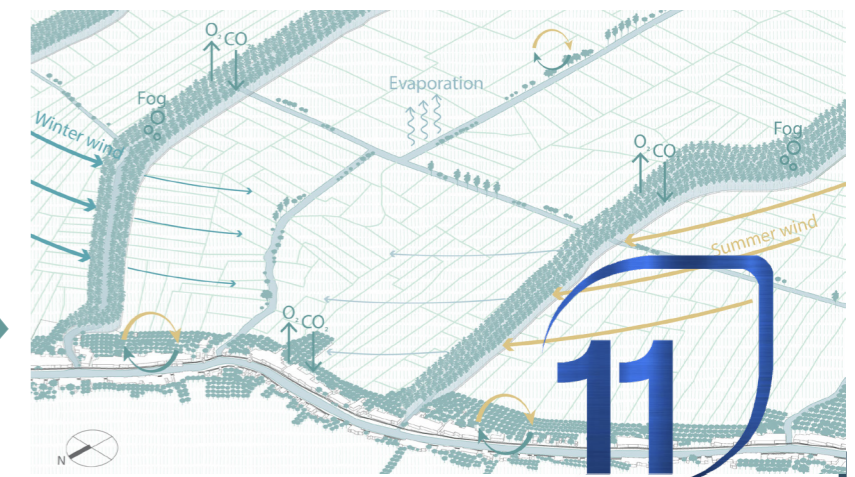


The establishment of new forests along the canals will add more layers of vegetation, which will not only change the landscape but also improve the local microclimate.

- Reducing the evaporation of reservoirs.
- Creating green "fences" for villages, cooling summer winds and reducing the intensity of winter winds.



Current landscape

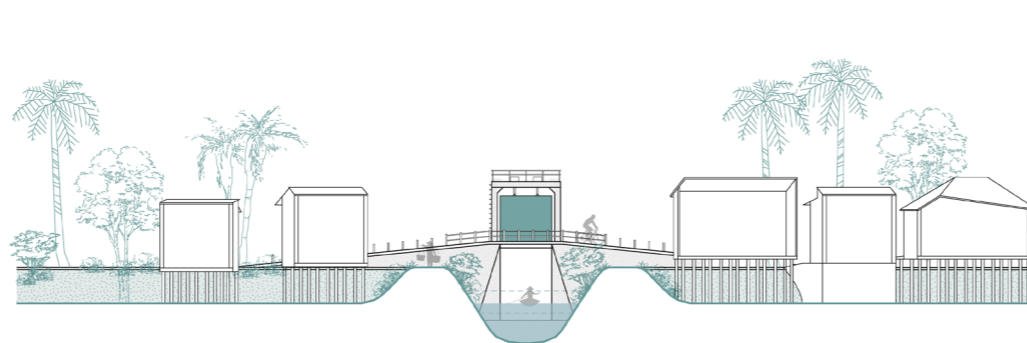


New landscape

DETAILS OF THE GREEN CANAL - In the pilot area - a model to demonstrate the feasibility and persuade the locals before applying on larger scale

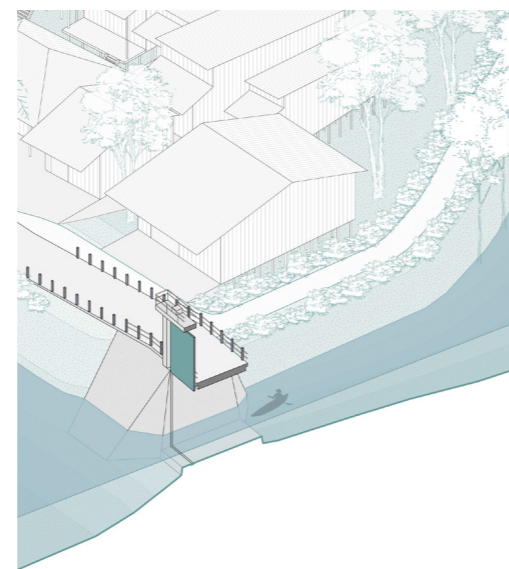


Detail plan: Forest gate

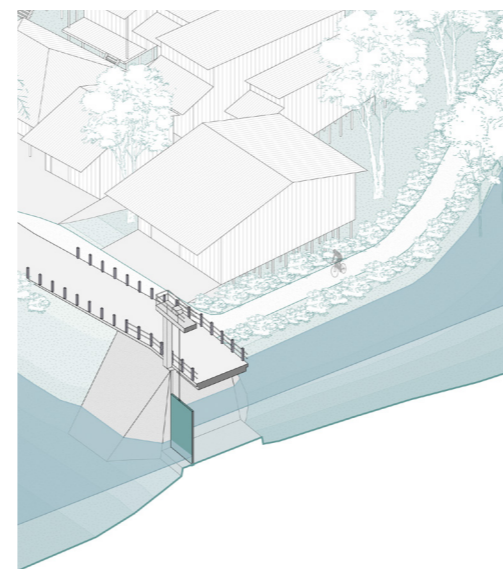


Section 1: Existing sluice gates used to control flood water will work as forest gates to control the actions of water reservation and contribution.

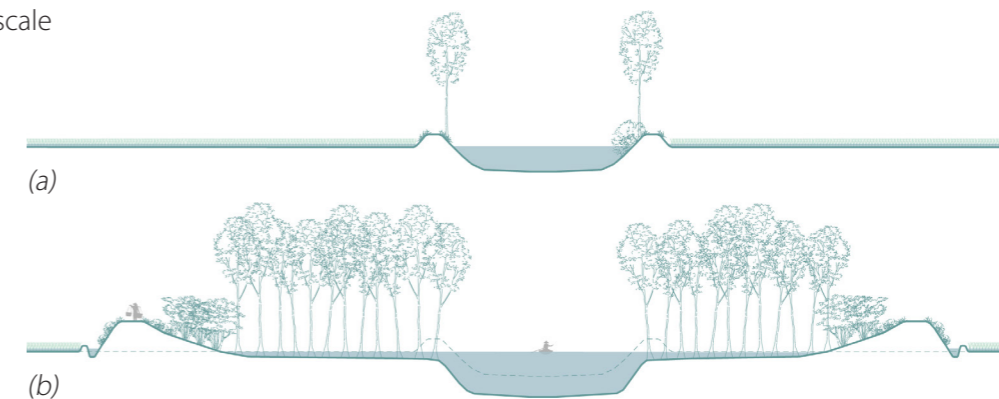
INUNDATION CIRCULATION



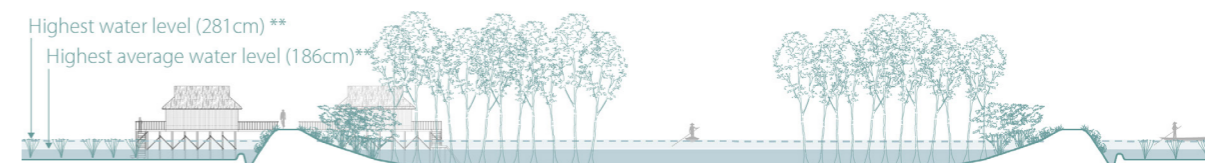
Sluice gate open
Throughout the year, except storage period



Sluice gate closed
From flood peak to dry season (October - March)



Section 2: Existing canal (a) and new Green canal (b)



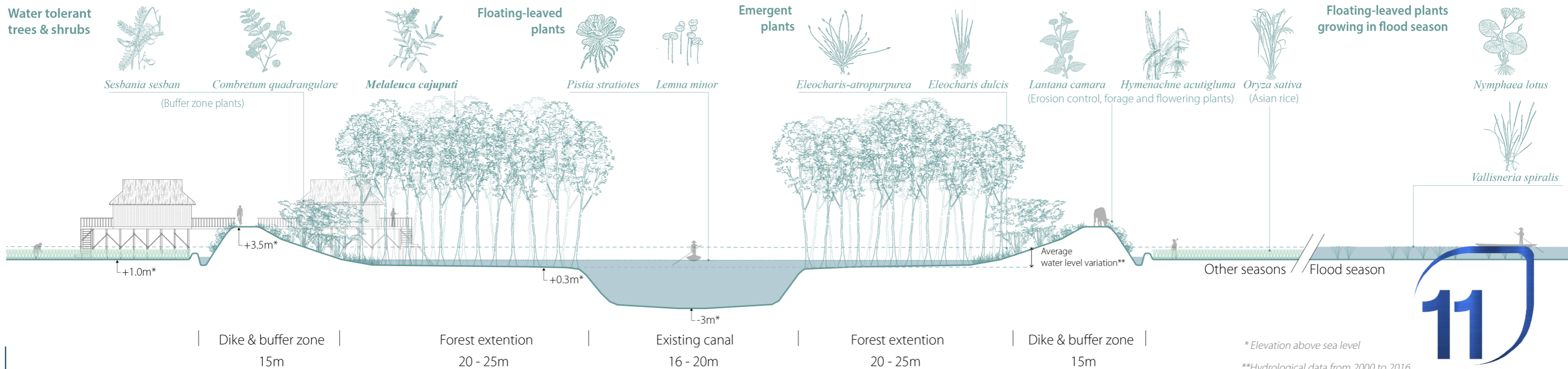
August - November (Flooding)



December - February (Storage)



March - May (Release)



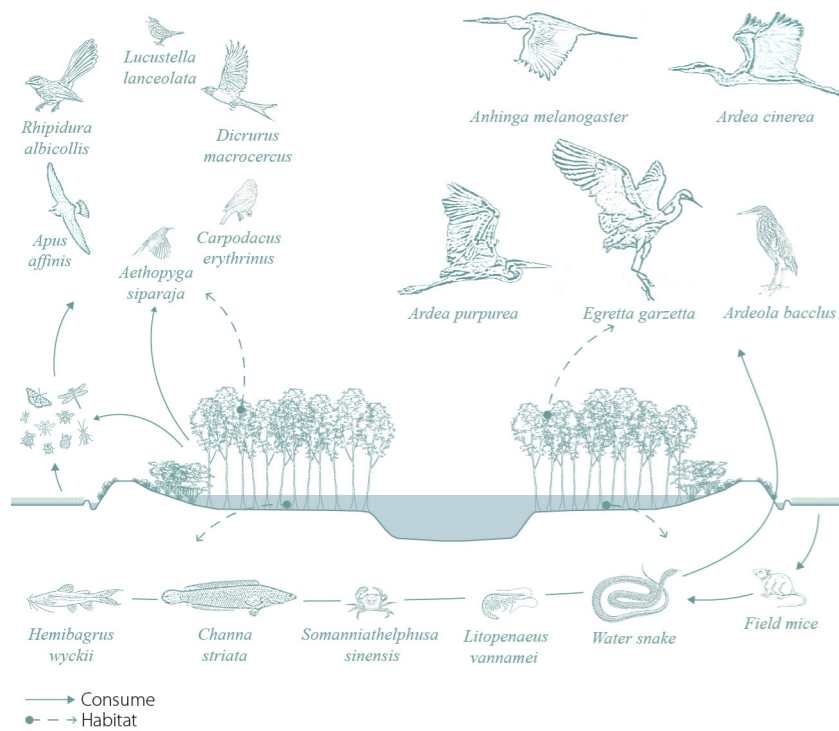
* Elevation above sea level

**Hydrological data from 2000 to 2016

OTHER BENEFITS OF THE SYSTEM

Beside the main function of water resource, Green canal system will bring much more ecological, economic and cultural values.

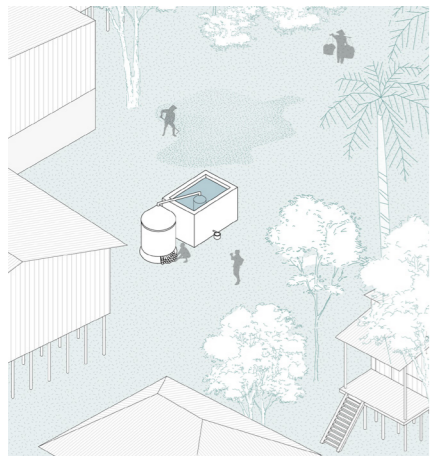
Ecological and environmental benefits



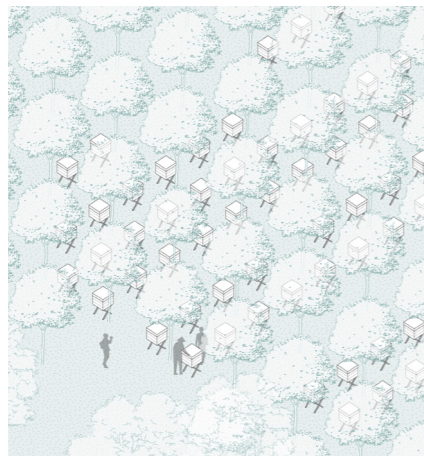
- Creating natural habitat for plenty types of aquatic creature and attracts birds come here for foraging and nesting.
- The food chain can naturally control the pests for the rice field, thus reduce pesticides usage.

Diverse landscape - diverse culture

- Turning the rice monoculture into a more diverse agricultural ecosystem.
- Apart from rice, farmers are able to earn more benefits from the forest such as essential oil, timber, fish-farming, honey with cajuput flavour, etc.
- A diverse landscape will create a community with diverse culture, thus attract tourists not only for the landscape but also for the cultural experiences.



Essential oil extraction



Bee boxes garden



Atmosphere inside the forest

Economic benefits of Cajuput forest



Essential oil

€1240 - 2100 ha⁻¹ year⁻¹



Aquaculture

€600 - 1000 ha⁻¹ year⁻¹



Honey

€114 - 152 ha⁻¹ year⁻¹



Ecotourism

€200 - 500/household/month

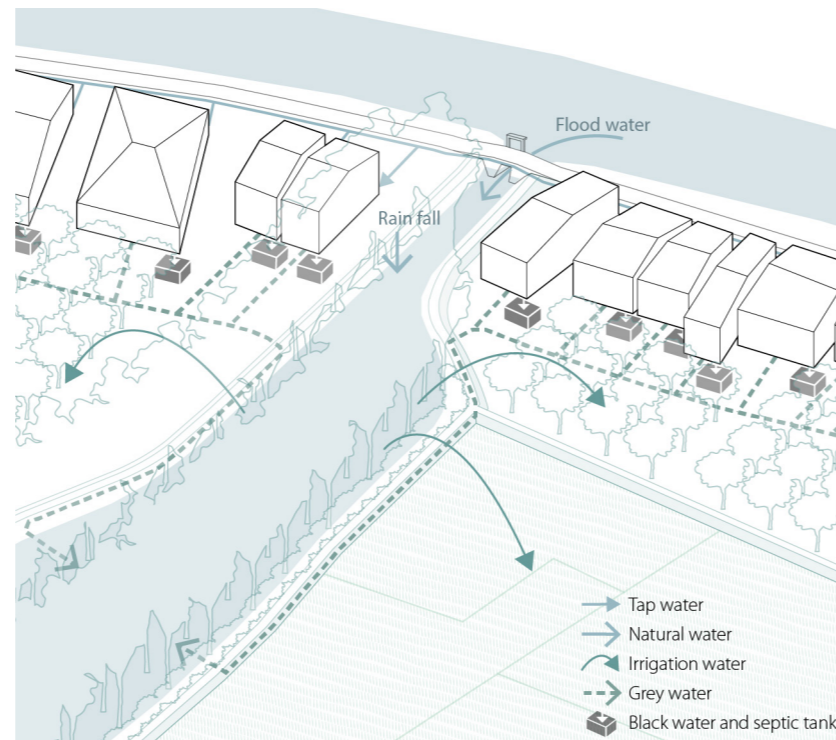


Timber

€760 - 900 ha⁻¹ year⁻¹

With lower production expense (around 20%), from these activities, farmer can earn a **Net income around €2900 - 4600 ha⁻¹ year⁻¹**, higher than rice cultivation (Net income around €2100 ha⁻¹ year⁻¹).

➤ Make it feasible to convert part of the rice field into cajuput forest.



- Natural water treatment plant of local domestic water, thus increase water quality of the area.
- Water accumulated and purified inside the forest then will be use for irrigation.

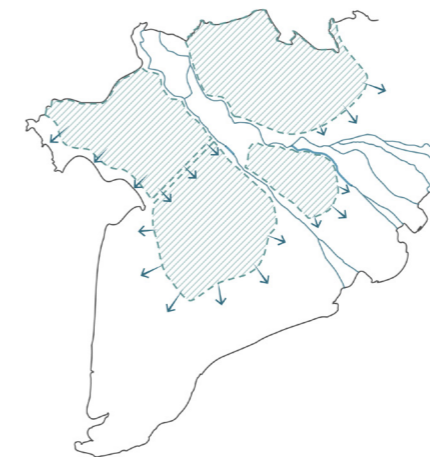
INITIATIVE WATER RESOURCE FOR THE WHOLE DELTA



Pilot area



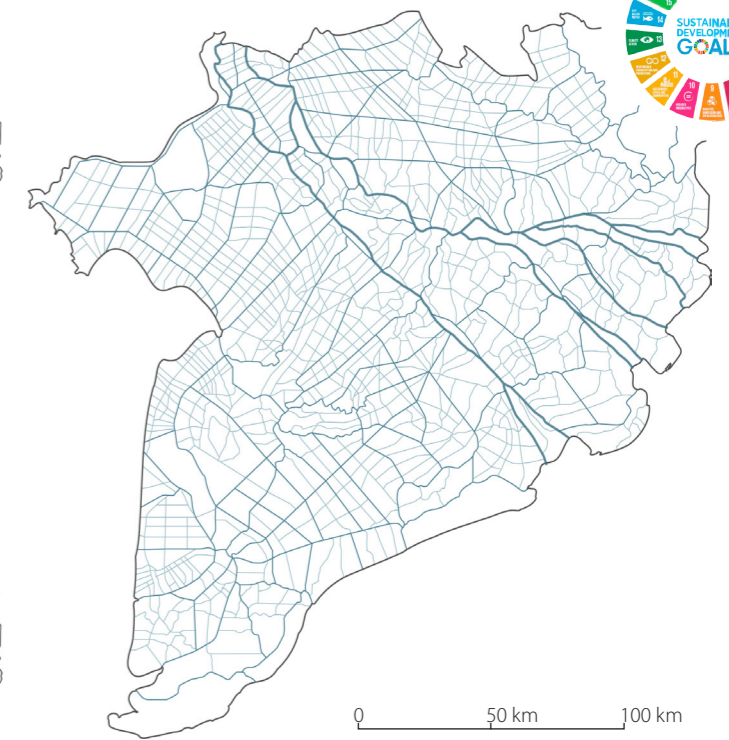
Long Xuyên Quadrangle floodplain



Low-lying areas of the delta



The whole delta



The current excavated canal system of VMD.

If the pilot model is successful, it can be replicated on the delta scale, base on the dense canal system on every square kilometer of the region.

For the whole delta:

-Total length of secondary and tertiary canal: 50.019 km

=> Estimate length of Green canal = 5500 km

- With average width of 60m and 3m deep

=> Up to **1 billion m³** of fresh water can be reserved.

-The remaining canals, about 44.567 km, averagely 7m wide and 2 m deep, can store up to **624 million m³**

-Approximately, the whole system can **store** a water amount of **1,62 billion m³**

In the Summer-Autumn crop of 2020, VMD have 1,539 million hectare of rice cultivation, which **need** approximately **6,1 billion m³** of fresh water for irrigation.

➤ The water amount reserved after flood season can meet up to **26,5%** of water demand for the rice fields during dry season.

