



FLOOD THE DROUGHT SEASON

—Treatment of the desertification caused by the imbalance of water supply and demand



Country / City	China/Harbin
University / School	Harbin Institute of Technology
Academic year	2019-2020
Title of the project	Flood the drought season--Treatment of the desertification caused by the imbalance of water supply and demand
Authors	Cai Meng,Zhong Yunhao

TECHNICAL DOSSIER

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Authors	Cai Meng,Zhong Yunhao	
Title of the course	Research Design Studio	
Academic year	2019-2020	
Teaching Staff	Zhuxun,Zhao wei	
Department/Section/Program of belonging	Landscape Architecture	
University/School	Harbin Institute of Technology	



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

The study area is located in the Yulongkashi River Basin in Hotan region of China. The lower reaches of Yulongkashi River crosses the Taklimakan Desert, which is the guarantee of desert ecosystem. However, a large amount of water consumption in oasis city leads to the decrease of river water quantity. In dry season, the water supply of downstream river is less than the demand, which eventually leads to desertification. We hope to form a water storage structure symbiotic with nature on the flood plain. We use the existing urban dams to store the river water in the wet season and the stored water for the oasis city in the dry season to change the current unsustainable strategy. The system consists of three parts: the water storage module on the floodplain, the water distribution network in the city and the sustainable ecological service. Through the study of river water dynamics, we build a water storage system between the flood plain and the city, transforming the isolated flood plain into a compound system of storing water, alleviating the contradiction of water use, supplementing water resources, and serving various industries in the dry season. A comprehensive water regulation system is established and the oasis city can maintain the balance of its own supply and downstream water delivery. Through these strategies, the future city will form a sustainable water use and circulation, and the ecological value of this oasis area will gradually increase, injecting new vitality into the city, oasis and desert.

For further information

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CLIMATE CHANGE AGAIN

11th International Biennial Landscape Barcelona

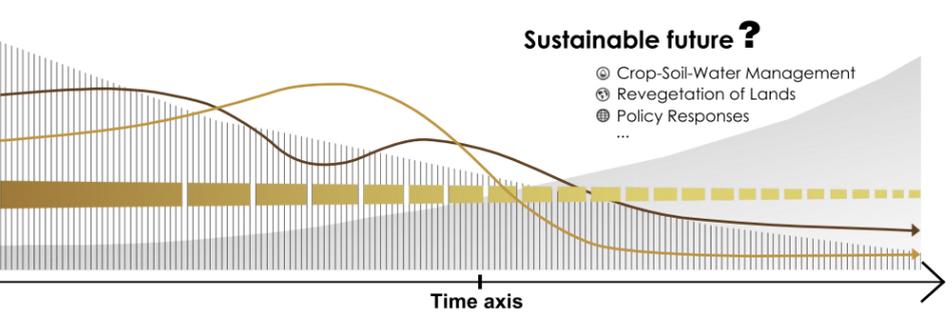
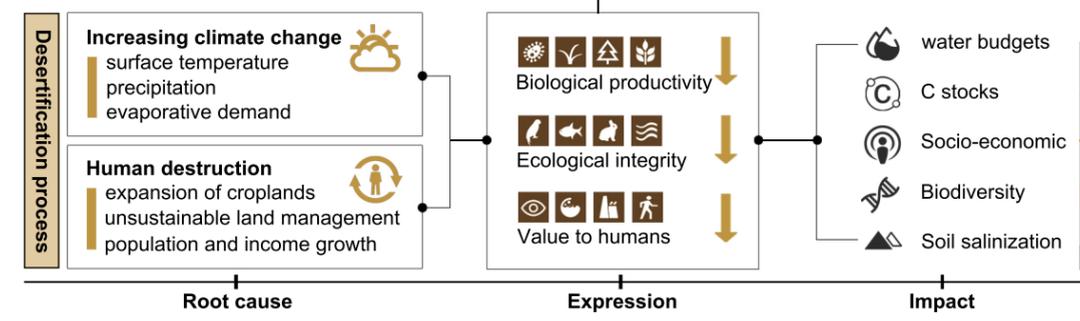
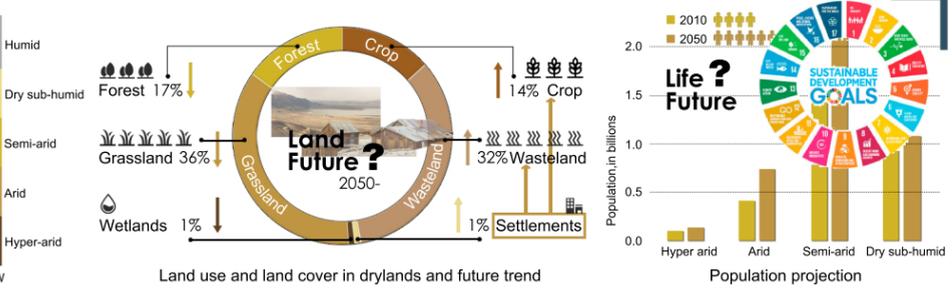
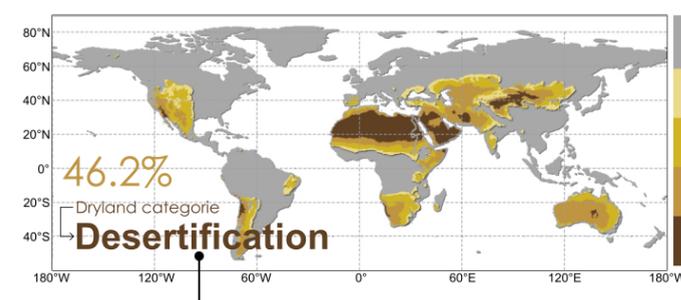
Barcelona September 2020

SCHOOL PRIZE



PROBLEM POSING

Desertification is land degradation in arid, semi-arid, and dry sub-humid areas, collectively known as drylands, resulting from many factors, including human activities and climatic variations. The range and intensity of desertification have increased in some dryland areas over the past several decades.

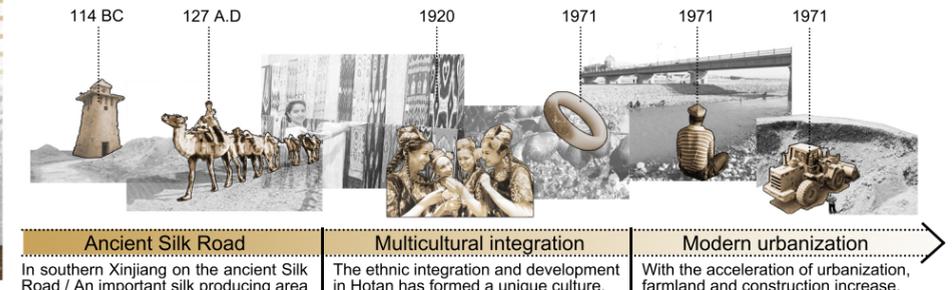


LOCATION

The site is located in Hotan, at the edge of Taklimakan Desert, it is the upstream section of Hotan River, the life line of desert. The water resources are abundant in rainy season and deficient in dry season.



HISTORY



PROBLEM AND STRATEGY

Unsustainable water use

The runoff increases year by year, but the time distribution of water volume is seriously uneven.

The water volume is insufficient in the dry season, exceeds the demand in the wet season, and the supply and demand are unbalanced.

PHASE 1 FLOODPLAIN WATER STORAGE

Add water storage module on the flood plain by using the current urban embankment, and carry out primary water storage and inward transmission in the wet season.

Unbalanced human and nature

Population growth leads to the continuous expansion of water demand of oasis city and surrounding farmland.

With the expansion of cities and the increase of industries, the traditional way of water use leads to the increasingly poor adaptability of human and nature.

PHASE 2 HYDROPHILIC INTERACTIVE ENVIRONMENT

The footpath can adapt to the change of water volume, provide dynamic hydrophilic experience, integrate local cultural characteristics and adapt to the surrounding areas.

Invaded natural environment

A large amount of water from rivers in cities destroys the ecology of oases and deserts in the dry season.

The lack of water resources and the destruction of habitat lead to the decrease of native species habitat. Oasis is destroyed and desertification is intensified.

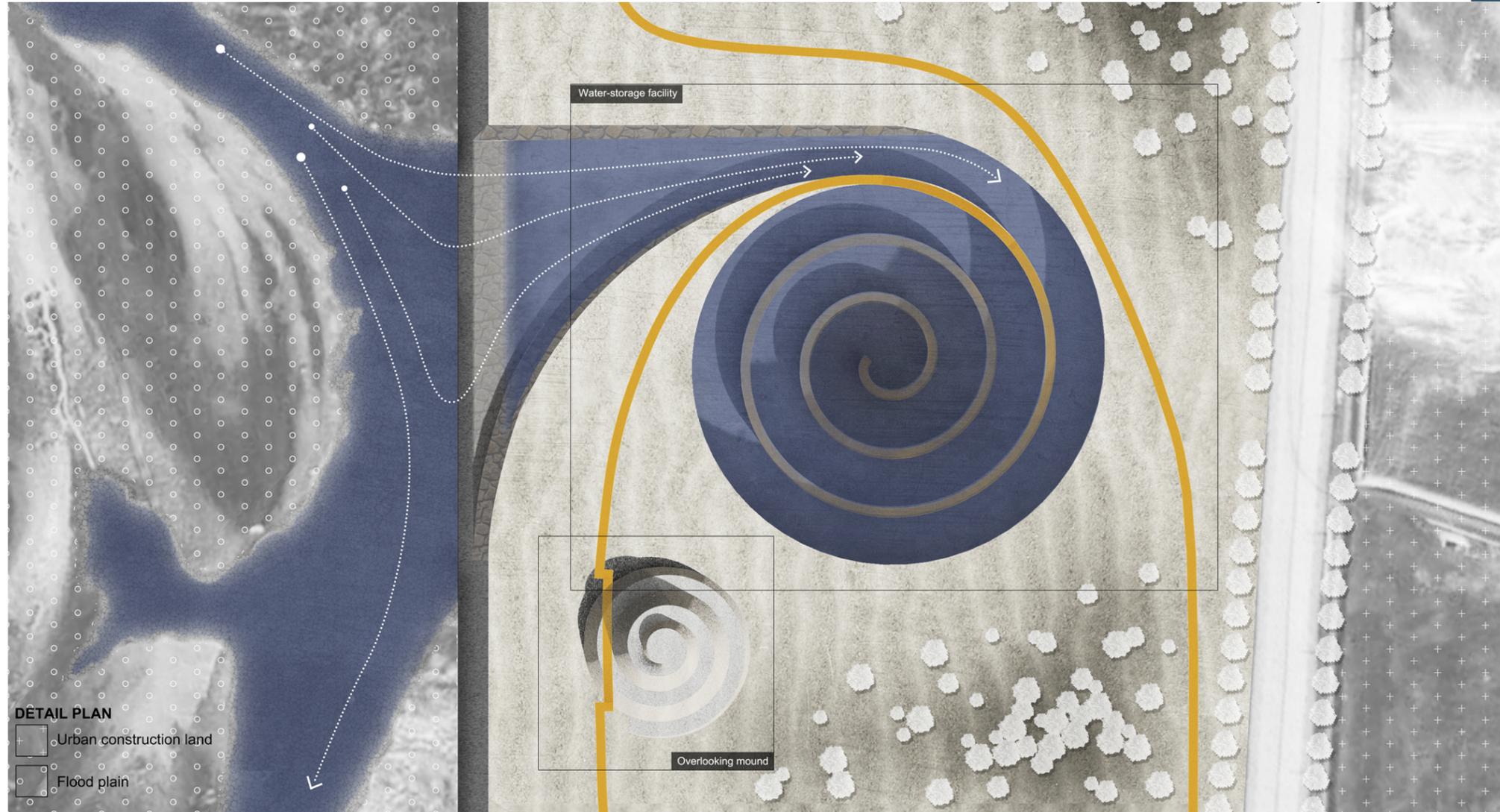
PHASE 3 HABITAT FOR NATIVE SPECIES

The structure provides a variety of living environment for the typical local species such as insects, reptiles and amphibians to provide a suitable foothold and food source.

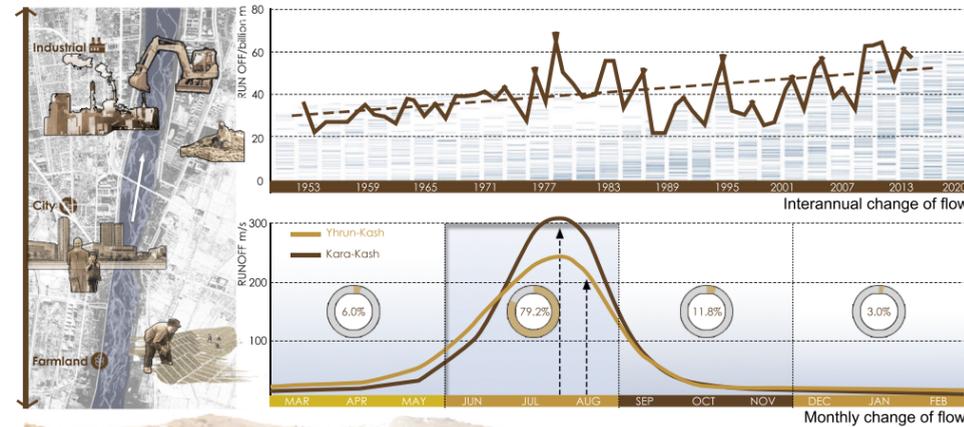
WATER CHANNEL



INTERIOR SIDEWALK



WATER FLUCTUATION



STRATEGY AND EFFECTIVENESS

Waiting period

Jun-Sep: 4078094m³ (Full capacity)

Nov-Feb: Waiting period (Water maintained until drought season)

Mar-May: Supply through certain method

- Living water use: 577902m³
- Industrial water use: 1256179m³
- Agricultural water use: 2244013m³

Proportion of each part: 14.2%, 30.8%, 55.0%

Waiting period

Diving experience, Migratory bird, Desert plant scenery, Mound scenery

Tourism planning

+1 Possible 4A / 5A scenic spot

+500000 tourist person-time

Living water use

577902m³

100% Living water use

5720000 m³ Reduction of water pumped

Industrial water use

1256179m³

26.1% Industrial water use

2219800 m³ Reduction of water pumped

Agricultural water use

2244013m³

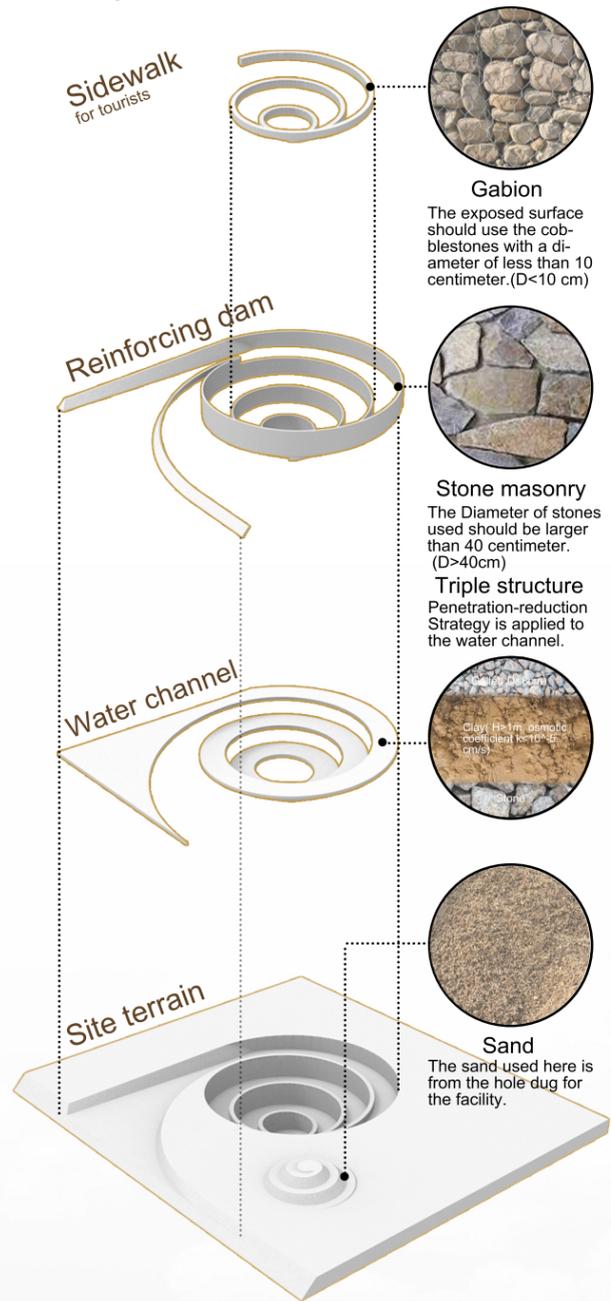
167 hm² Irrigation area

7500000 m³ (7.2%) Reduction of water pumped



DISMANTLING

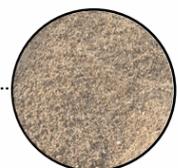
Four-layer structure



Gabion
The exposed surface should use the cobblestones with a diameter of less than 10 centimeter. (D<10 cm)



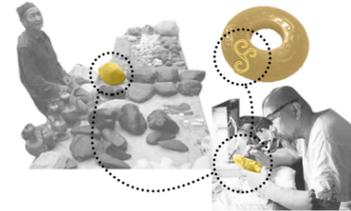
Stone masonry
The Diameter of stones used should be larger than 40 centimeter. (D>40cm)
Triple structure
Penetration-reduction Strategy is applied to the water channel.



Sand
The sand used here is from the hole dug for the facility.

STRUCTURE GENERATION

Cultural element



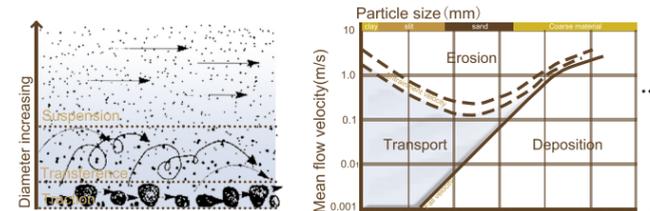
Jade sculpture has a long history in Hetian district. And cloud grain is one of the most important pattern used.

Water-saving strategy

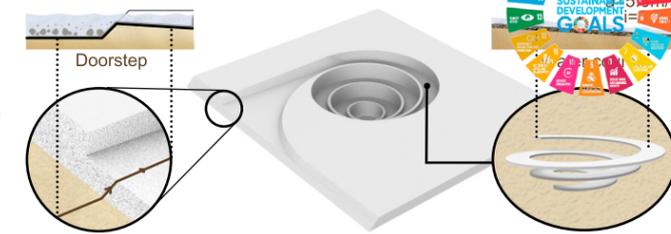


When the water volume of the cone V1 is equal to V2, the top superficial area S1 will always be smaller to S2.

Filtration theory and utilization



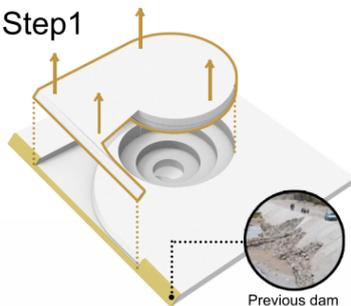
The movement of sediment in a river is called transport, and it can be subdivided into three types. And the maximum diameter of particles be transported is related to the velocity of the mean flow of the river.



In order to extend the service life of the facility, a doorstep and steep water course are devised to block out the particles of large size and transport almost all particles that enters the facility to the deep bottom.

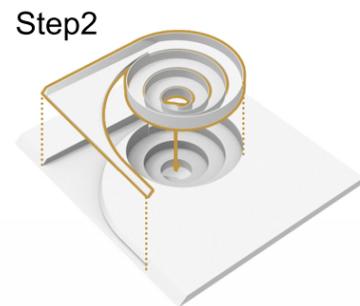
CONSTRUCTION PROCESS

Step1



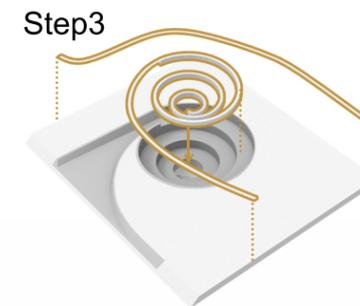
Dig a hole for the facility and a part of the previous dam will be removed.

Step2



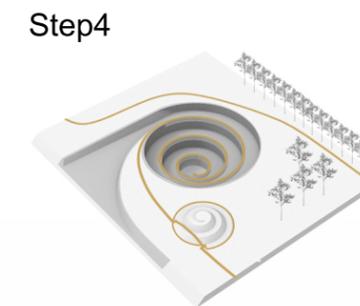
Construct the water channel and reinforcing dam with local materials.

Step3



Construct the sidewalks in construction zone and make connections.

Step4



Pile up the mound and plant the local plants in certain location.

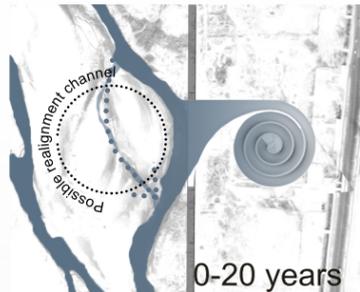
DEVELOPMENT

Phase 1



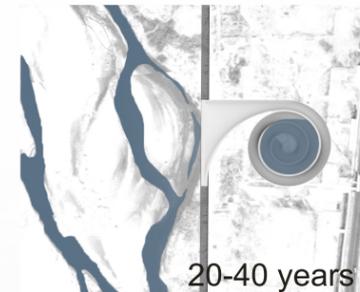
Before
No extra water is collected, the previous dam just block all water out.

Phase 2



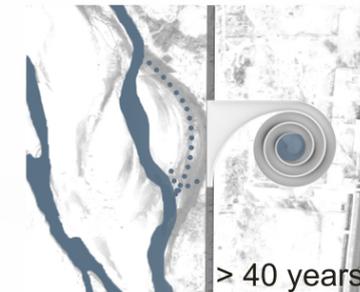
0-20 years
When the water level is higher than a certain number, the water is collected.

Phase 3



20-40 years
Due to river realignment, the mean flow is switched to another channel.

Phase 4



> 40 years
The previous water channel disappeared and this facility only works during big flood.

