

PROJECT BINDER

CITY VALLEY

A VALUABLE HABITAT FOR PLANTS AND ANIMALS
IN THE PARK, WHICH COULD REDUCE THE RISK OF
WATERLOGGING

IFLA-APR LA Awards 2023

BUILT Category — — Green Infrastructure

PROJECT NAME

CITY VALLEY—A valuable habitat for plants and animals in the park, which could reduce the risk of waterlogging

PROJECT LOCATION

FENGTAI DISTRICT, BEIJING

CITY & COUNTRY

BEIJING&CHINA

YEAR OF COMPLETION

BUILT IN THE YEAR OF 2020

LANDSCAPE AREA

16800 M²

Project Statement

The project is located in Fengtai District, Beijing. The third ring road adjacent to the land has been plagued by waterlogging for many times in recent years. After the "July 20" extremely heavy rainstorm, an emergency storage facility was built here. The project is an attempt to green the urban gray storage facilities, which can meet the requirements of 36000m³. Under the premise of regulating storage capacity demand and ensuring water safety, gray infrastructure is endowed with leisure and ecological conservation functions.

The project fully respects the current terrain, conducts detailed research on the rationality of water storage and drainage, the economy of implementation, the durability of facilities, etc., and achieves the goal of regulation and storage with peak control as the main and total control as the auxiliary, which alleviates the ponding problem of West 3rd Ring South Road in rainstorm weather; At the same time, the project also considers from the perspective of regional culture and ecological benefits. Through water collection and water-saving measures, application of environmental protection materials, construction of plant community, expression of regional culture and other means, it provides a public green space for urban residents to inherit culture, get close to nature, and popularize ecological science, as well as urban habitat for a variety of animals and plants.

Project Statement

The project is located at the southwest corner of Lize Financial Business District, Fengtai District, Beijing, adjacent to Southwest Third Road, with a total area of approximately 28,000m².

In the current era of increasingly frequent extreme weather phenomena, the problem of urban waterlogging is becoming increasingly prominent, posing a huge threat to urban safety, and with it, the construction of various regulation and storage facilities has emerged. This project is a new attempt to greenize urban grey storage facilities, meeting the requirements of 36000 m³ under the premise of regulating storage capacity demand and ensuring water safety, gray infrastructure will be endowed with recreational and ecological conservation functions in the park.

On July 20th, 2016, the ponding depth caused by the heavy rainfall was 0.5 meters on the road between Lize Bridge and Fengyi Bridge in Southwest Third Road posing a serious threat to the traffic safety. To alleviate the waterlogging pressure, the city administrative department borrowed the surrounding vacant land to construct flood diversion and storage facilities for temporary and emergent use, with a total storage volume of 30,000 m³. According to upper-level plan of Beijing and the surrounding constructions, the storage area should be transform into a city park so that the diversion and storage area, on the condition that the total volume of water storage is not reduced and the storage efficiency is not lowered, needed to be in accordance with the overall plan of the park to build a flood diversion and storage project for emergent use to reduce the effects of disasters and provide recreation and ecological benefits.

The emergent flood diversion and storage facilities are designed for 100-year flood protection standard. When it rains normally, ponding water in West Third Road will be discharged directly into the municipal water network through roadside rainwater outlets and will not enter the emergency diversion and storage space in the green area. When the ponding depth caused by the heavy rainfall exceeds 15cm, water will be discharged into the emergency diversion and storage space to avoid the traffic gridlock. Three flooding inlets have been set up in the project according to the topography. West Third Road is connected to the flood storage area by pipes. Water in the road is channelled into the flood storage area by overflowing. Water injected into the emergency diversion and storage area will be discharged to the municipal stormwater network within 24 hours by staggered pumping, controlling the peak accumulation as the main objective and the total accumulation as the supplementary objective.

The site is located at the northwest of the ancient Chinese capital city wall relics of Jin dynasty. During the Yuan, Ming, and Qing dynasties, this area was rich in water resources, fertile land, and lush flowers. The design aims to recreate the historical landscape, selecting characteristic plants recorded in Chinese historical literature such as thistles, reeds, and various perennial flowers. The park is designed with the element of traditional Chinese intellectual toy "Dieji Diagram" (蝶几图), with natural materials such as steel, wood and stone to create wooden stacks and viewing platforms within the storage pits. Gabion walls and other structures are combined with green plants to integrate the “grey” water storage space of traditional water conservation projects, meeting the need for the rainwater storage while creating a vibrant urban space to exhibit the scientific and ecological functions of the comprehensive park.

Considering that the emergency rainwater pumping into the flood storage area will scour the green plants, and the poor quality of rainwater in the road is not conducive to the growth of plants, an S-shaped gabion wall is set up near the water injection outlet as a buffer zone to reduce the flow rate of the incoming rainwater, avoiding the scouring of plants and planting layers. The gabion is filled with irregular stones to provide initial filtration of ponding water and to remove

larger debris such as plastics and tree branches brought about by internal flooding while ensuring drainage rates.

The sunken green space has an edge elevation of 43.7m, a bottom elevation of 39.50m, a side slope of 16%-25%, a depth of 4.2m, a total area of 16,800m² and a total water storage volume of approximately 36,000m³. The two storage pits are connected by an overflow pipe to achieve a dynamic balance of water storage. At the bottom of the sunken green space, a dry creek and a number of scattered rain gardens are set up, with a total rain garden area of 1510m², a depth of 0.2m, and a side slope of 3%-14%. The planting soil layer thickness of the bottom refilled is 50cm, with a porosity of 50%, and the total water storage capacity is about 250m³. The rainwater enters the dry creek after the gabions have reduced the flow rate. Pebbles with a diameter of 1-6cm are scattered in the dry creek to further filter the leaves, cigarette butts and other fine impurities in the stagnant water.

Rainwater finally reaches the rain gardens and reduces pollution through the process of adsorption, degradation, ion exchange and volatilisation of pollutants by plants. Wooden walkways are also set up between rain gardens to provide a pleasant science and travel experience.

There is no natural river, municipal water supply, or other water sources, and it relies entirely on the collection of rainwater and surrounding irrigation water. Except in winter, the park is in a water storage state and continuously provides water sources for various animals, thus achieving ecological benefits.

Sustainable materials are used including recycled wood-plastic composites and recycled aggregate from construction waste. The crushed stones and tiles left by the original building demolition are filled inside the stone cage landscape wall, and the recycled aggregate serves as a cushion layer at the bottom of the dry creek. These materials can continue to be recycled in the future, forming a sustainable landscape.

The planting design attempts a “naturalistic” and low intervention way, without any pruning of the plants nor removing a single wild plant or tree. Instead, it builds an ecosystem regulated by “natural forces”. Plants are grown based on the extent to which the plant site is affected by rainfall and what the landscape needs. The selection of plants in slope areas considers varieties that can tolerate short-term flooding within 24 hours, and are resistant to drought and erosion; The overflow outlet is located inside the stone cage landscape wall, where a large area of land needs to be planted as a vegetation buffer zone, such as Qianqu Cai, Huangchang Pu, etc., combined with the preliminary purification of dry stream gravel; The catchment area is mainly composed of plants that are resistant to water and humidity, while also considering the degradation and removal of pollutants in rainwater by plants; The drought creek and rain garden are partially sown with moisture resistant grass seeds to reserve a ecological niche for the natural reproduction of wild plants, forming an ecosystem of both artificial and natural restoration.

Since the completion of the project for more than two years, the accumulated water collection in the storage area has exceeded 40000m³. The West Third Ring South Road has not experienced the problem of water accumulation and circuit breaker again, and more and more citizens are coming here to relax, stroll, and admire plants. The project has received widespread praise.

The project offers a new possibility of how Beijing could cope with the possible threat of flooding in the future.

CITY VALLEY

Project Background

Location

Beijing

Shanghai


Beijing

Fengtai District

Lize Area

History

The storage area where the diversion and storage facilities were set up, according to planning requirements from the superior department and the surrounding constructions, was designed to be built as a comprehensive urban park so that the diversion and storage area, on the condition that the total volume of water storage is not reduced and the storage efficiency is not lowered, needed to be in accordance with the overall plan of the park to build a flood diversion and storage project for emergent use to reduce the effects of disasters and provide recreation and ecological benefits.



July 20th

20On July 20th, 2016, the ponding depth caused by the heavy rainfall was 0.5 meters on the road between Lize Bridge and Fengyi Bridge in Southwest Third Road posing a serious threat to the traffic safety.

To alleviate the waterlogging pressure, the city administrative department borrowed the surrounding vacant land to construct flood diversion and storage facilities for temporary and emergent use.

SUBMERGED

GREEN PARK

VS

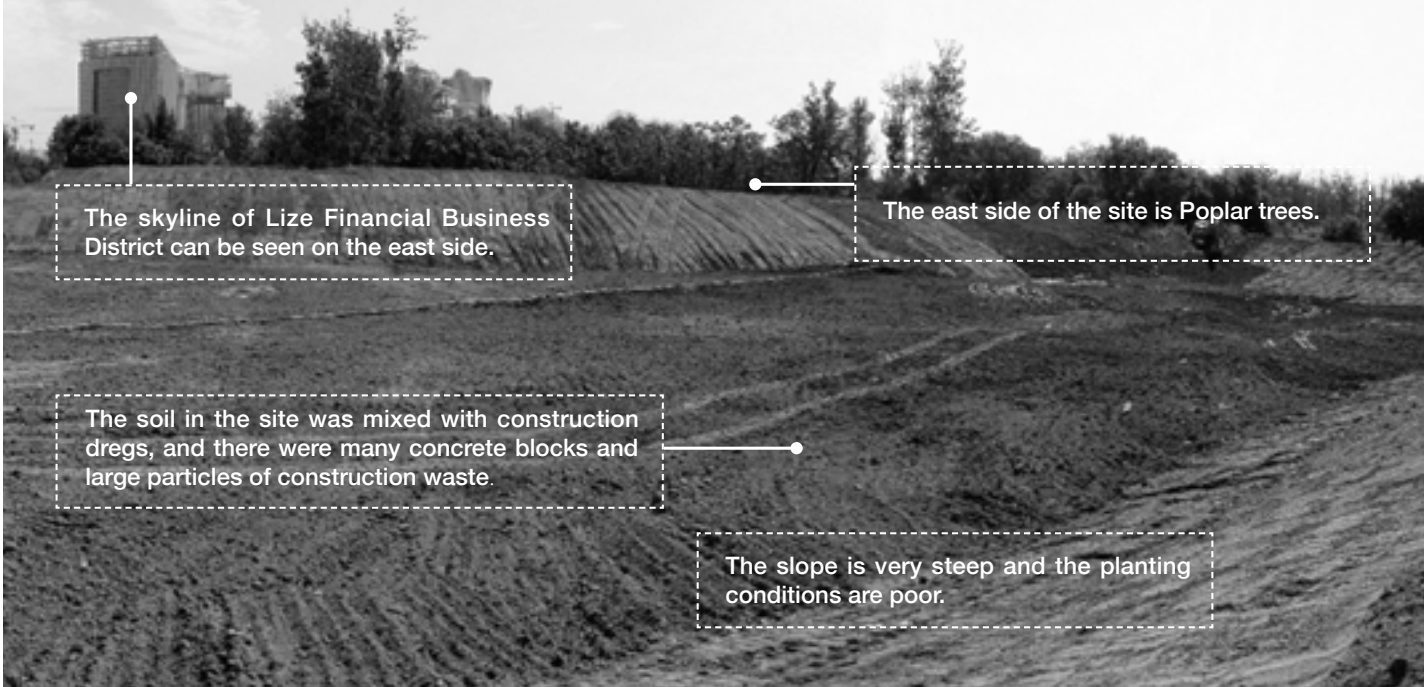
RETAIN WATER

?

SITE 0.0 The venue, originally an urban village, was vacated and made part of a land for park use, which had not yet been constructed.



RETENTION POND 1.0 After the July 20 incident, the government excavated 36,000 m³ in this emergency area. Reservoir to prevent the impact of heavy rainfall in the short term. However, due to time urgency, the project has not been carefully designed and vegetation has been damaged.



RETENTION POND 2.0 Since the urgently excavated storage pool was located in a high-population density area, it had a great impact on the local environment, and it is located in the park land, so it needs to be landscaped. After the rainy season, the project took measures such as gentle slopes and simple greening, but the problem of exposed topsoil and conflicts with the park's recreational functions has not been resolved.

Master Plan



This project is a new attempt to greenize urban grey storage facilities, meeting the requirements of 36000 m³ under the premise of regulating storage capacity demand and ensuring water safety, gray infrastructure will be endowed with recreational and ecological conservation functions in the park.

36000m³
RETENTION CAPACITY

1 GABION TERRACES

1



4 RIAN GARDENS

2

3

4

5



4 EDUCATIONAL WALKWAY

6

7

8

9



2 SUNKEN GREEN SPACE

10

11



CITY VALLEY



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Habitat Creation Strategies

Auxiliary habitat facilities

·Set up auxiliary bird nests, bird feeding devices, and insect butterfly feeding devices;
Using local natural soil to cultivate suitable soil microbial communities;
Do not use pesticides, balance pests and diseases through natural beneficial insects and birds.



Create hidden micro terrains for biological habitats such as slopes and small caves;
Place natural materials suitable for insect and fungal reproduction, such as dead wood, stone piles, and vines;
Select fruit and honey plants that can attract consumers;
Balance the proportion of tree, shrub, and grass layers, the proportion of coniferous and broad-leaved leaves, and the proportion of new and old tree ages;



Reduce artificial lighting interference

The design of lighting fixtures with a full face shield does indeed limit the projection of light within the building base or on the surface of lighting targets, as well as the use of night lighting coatings for floor paving low illumination lighting.



Biological migration pathway

In areas with large distances obstructed by roads and artificial facilities, safe pathways for biological migration can be created through measures such as flying islands, animal passages, and guiding guardrails.

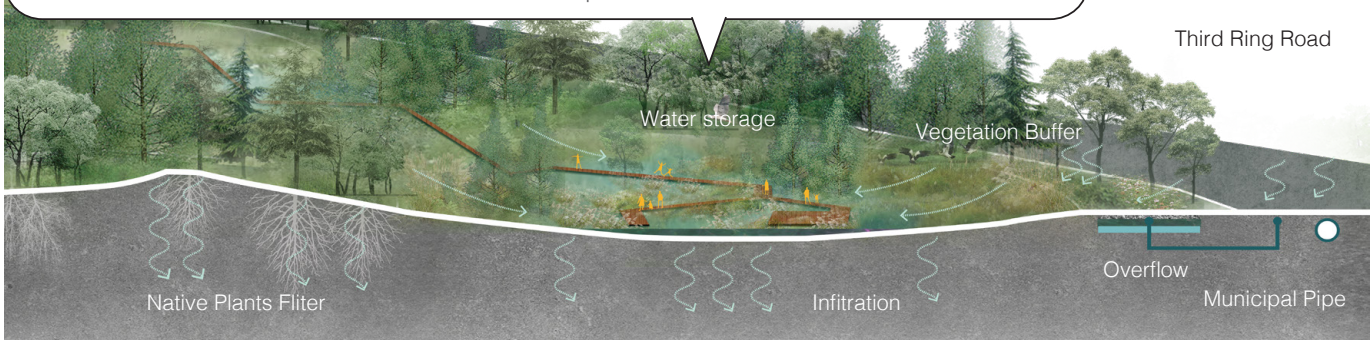


Stormwater Management Strategies

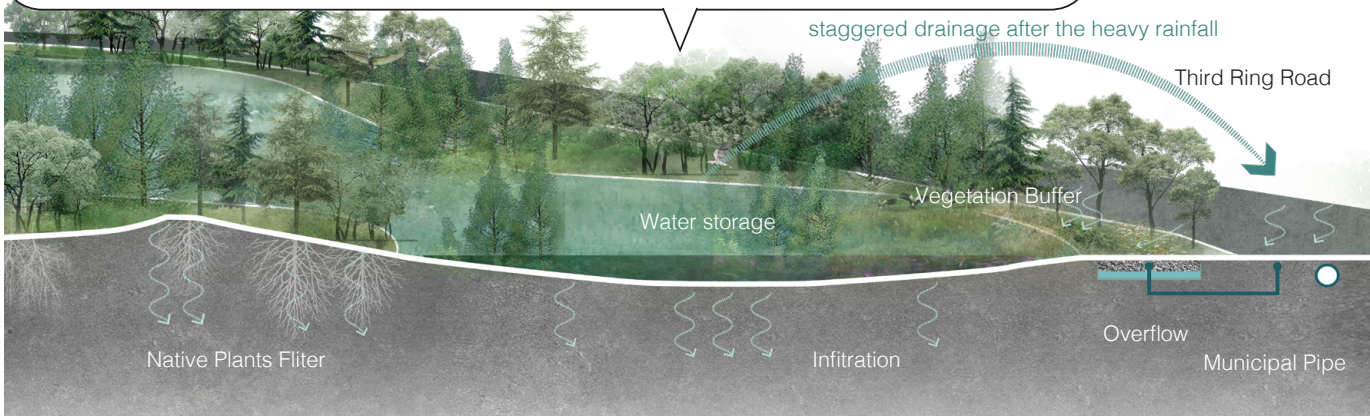
No Rainfall
When there is no rainfall, visitors could stroll through the sunken green space and rain gardens.



Normal Rainfall <15cm
When the depth of rainwater accumulation is less than 15cm, the water flows into in Third Ring Road rainwater pipe network rather than the green space. The rainwater within the park flows into the rain gardens in the sunken green space, where visitors can walk through them via wooden stacks for excursions and science experiences.

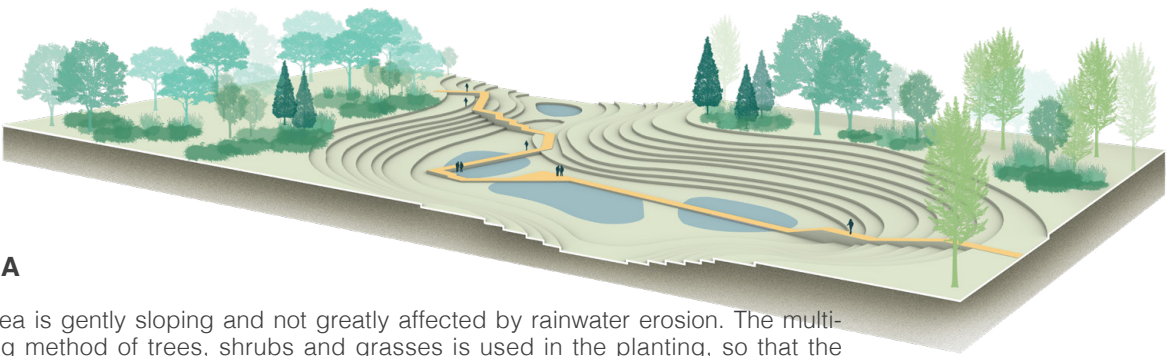


Heavy Rainfall >15cm
When the depth of rainwater accumulation caused by the heavy rainfall is higher than 15cm in Third Ring Road, the water will overflow into the large sunken green space and then infiltrate into the ground, with staggered drainage after the heavy rainfall.



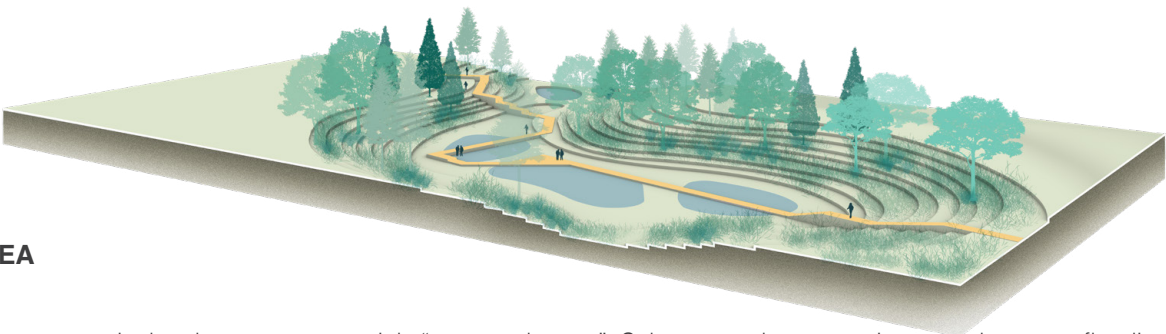
The project construction is based on water as the main line, rainfall management as the ecological base, and the concept of “sponge city” is fully integrated into the wetland design and construction.

Terrain-based Planting Design



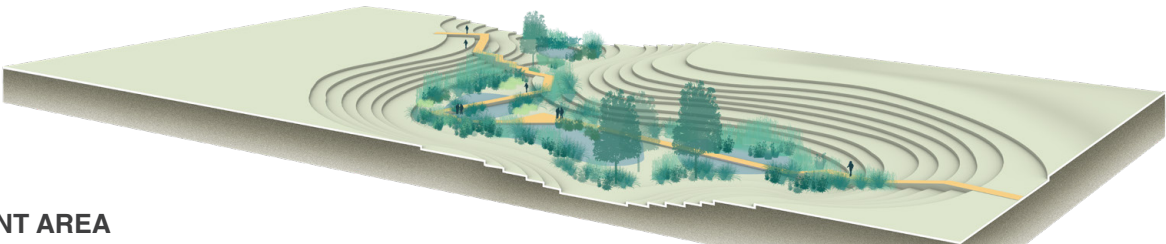
EDGE AREA

The edge area is gently sloping and not greatly affected by rainwater erosion. The multi-layer planting method of trees, shrubs and grasses is used in the planting, so that the plants can grow beautifully and form the main landscape of the park.



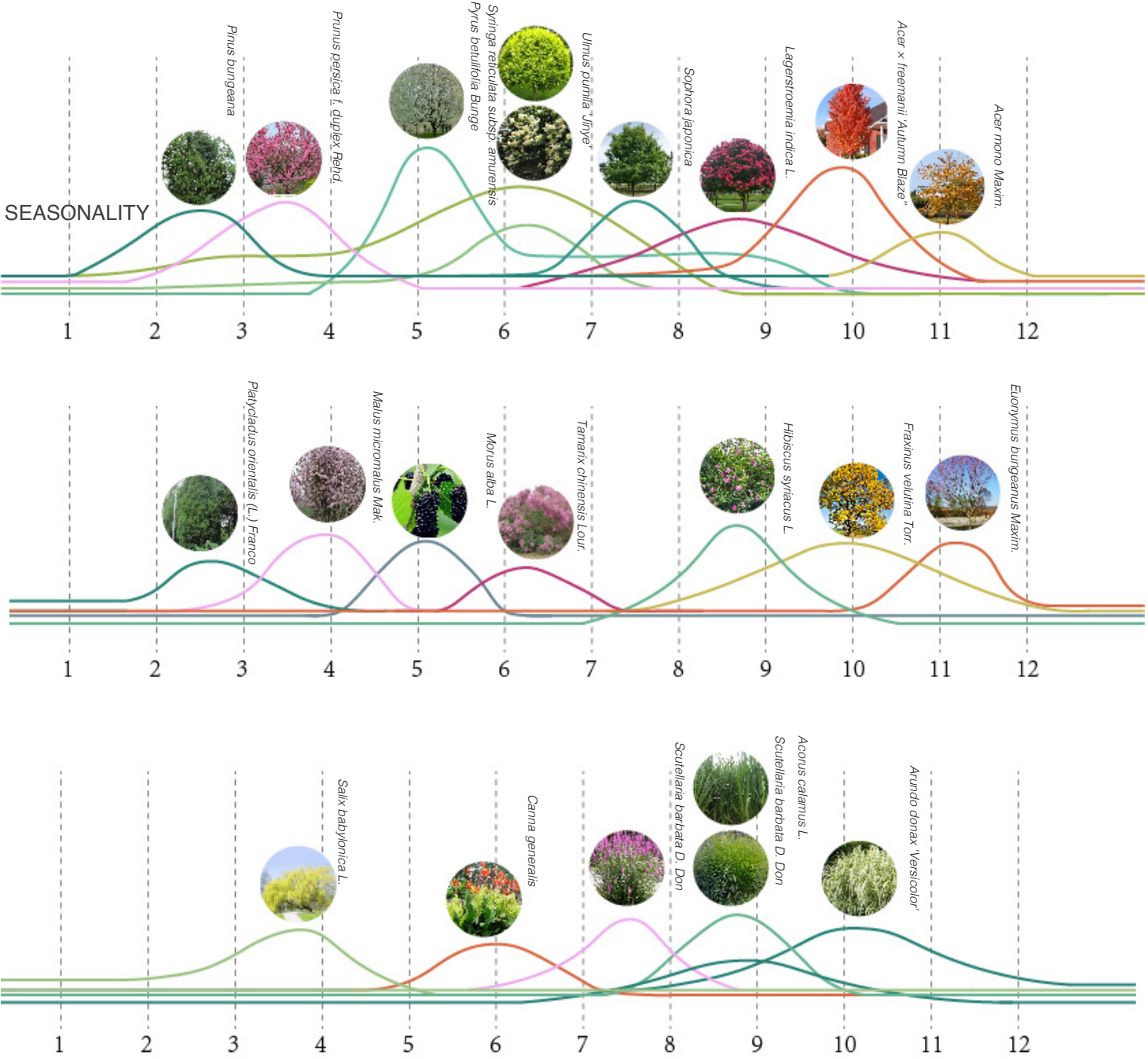
SLOPE AREA

The planting structures in the slope area are mainly “trees and grass”, Select trees that are resistant to short-term flooding (24 hours), drought and erosion, and the upper layer is mainly composed of fluffy white wax, weeping willow, diamond poplar, mulberry, silk cotton, and other trees. Herbaceous plants with lush branches and leaves are chosen to retain the sediment in the lower layer.



CATCHMENT AREA

The planting of the catchment area is mainly “single layer of herbaceous plants”, with a minimum planting width of 1.5m. This area is mainly composed of plants that are resistant to water and humidity, and it is necessary to consider the degradation and removal of pollutants in rainwater by plants. Phragmites australis, asparagus officinalis, Lysimachia, Iris officinalis, Puccinella grandiflora, and Pennisetum should be selected; Some moisture resistant sedge seeds are sown in the dry stream and rain garden to reserve a ecological niche for the natural reproduction of wild plants. The sedge and the wild Erigeron, Humulus scandens, and partially planted Arundinaceus form an ecological system of both artificial and natural restoration.



The planting design attempts a “naturalistic” and low intervention way, without any pruning of the plants nor removing a single wild plant or tree. Instead, it builds an ecosystem regulated by “natural forces”. Plants are grown based on the extent to which the plant site is affected by rainfall and what the landscape needs.

Sustainability Consideration

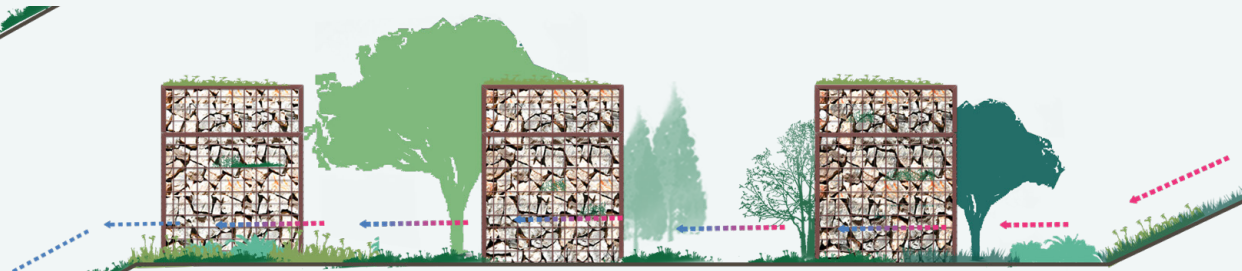
Without gabion retaining wall

- 1. Scouring the ground surface and leading to the soil erosion
- 2. Inadequate vegetation cover and exposed ground surface
- 3. More debris in the road and poor water quality



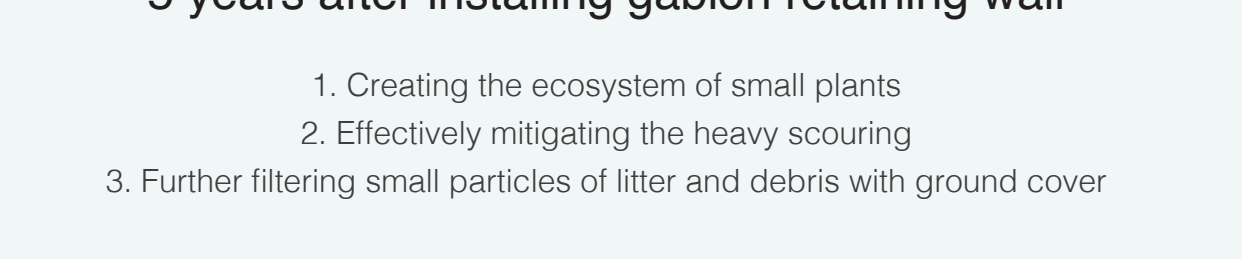
Initial stage
after installing gabion retaining wall

- 1. Alleviating the scouring of surface runoff on the slope
- 2. Increasing vegetation cover
- 3. Initial physical filtration by gabion retaining walls with large pore space

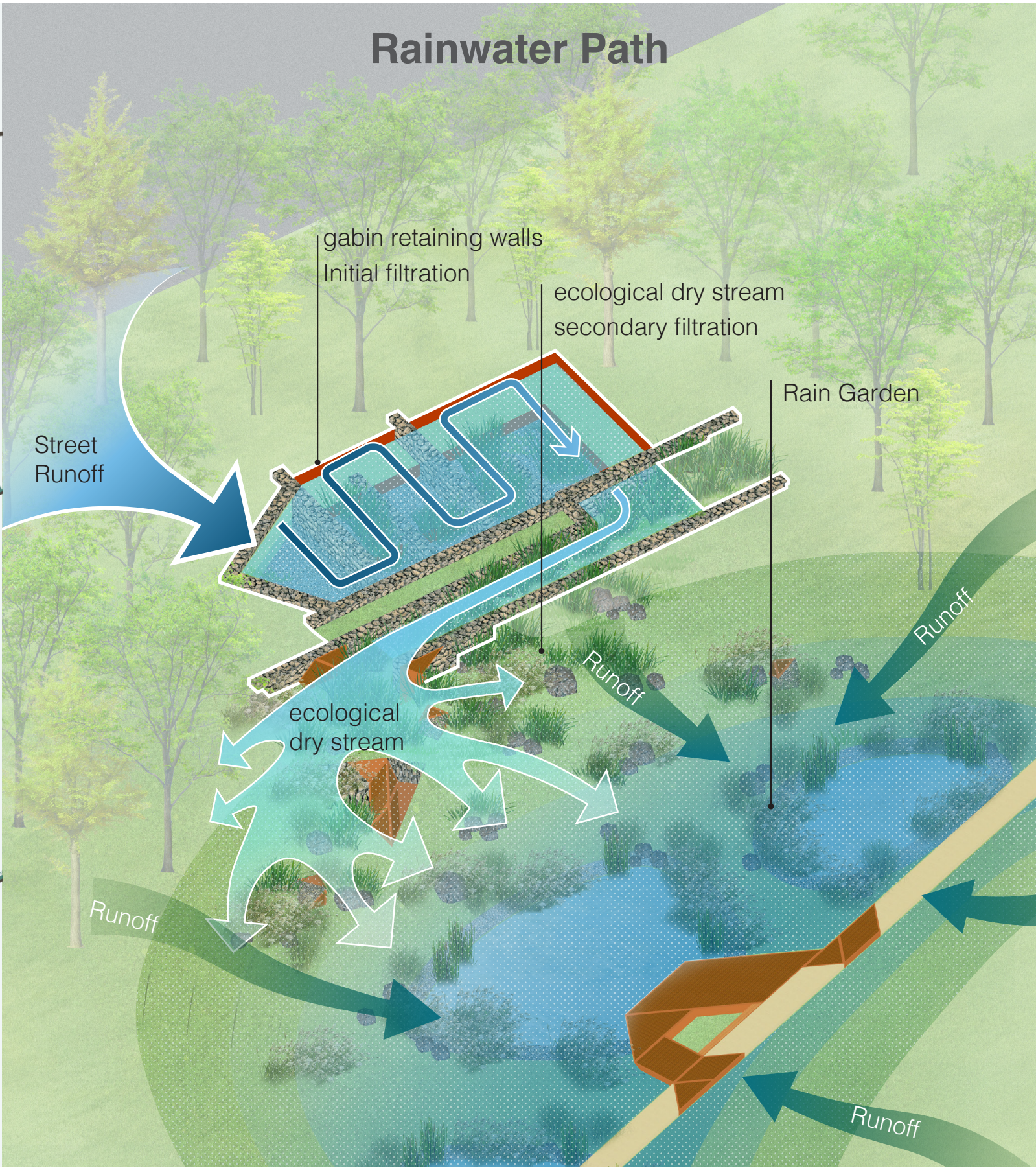


5 years after installing gabion retaining wall

- 1. Creating the ecosystem of small plants
- 2. Effectively mitigating the heavy scouring
- 3. Further filtering small particles of litter and debris with ground cover

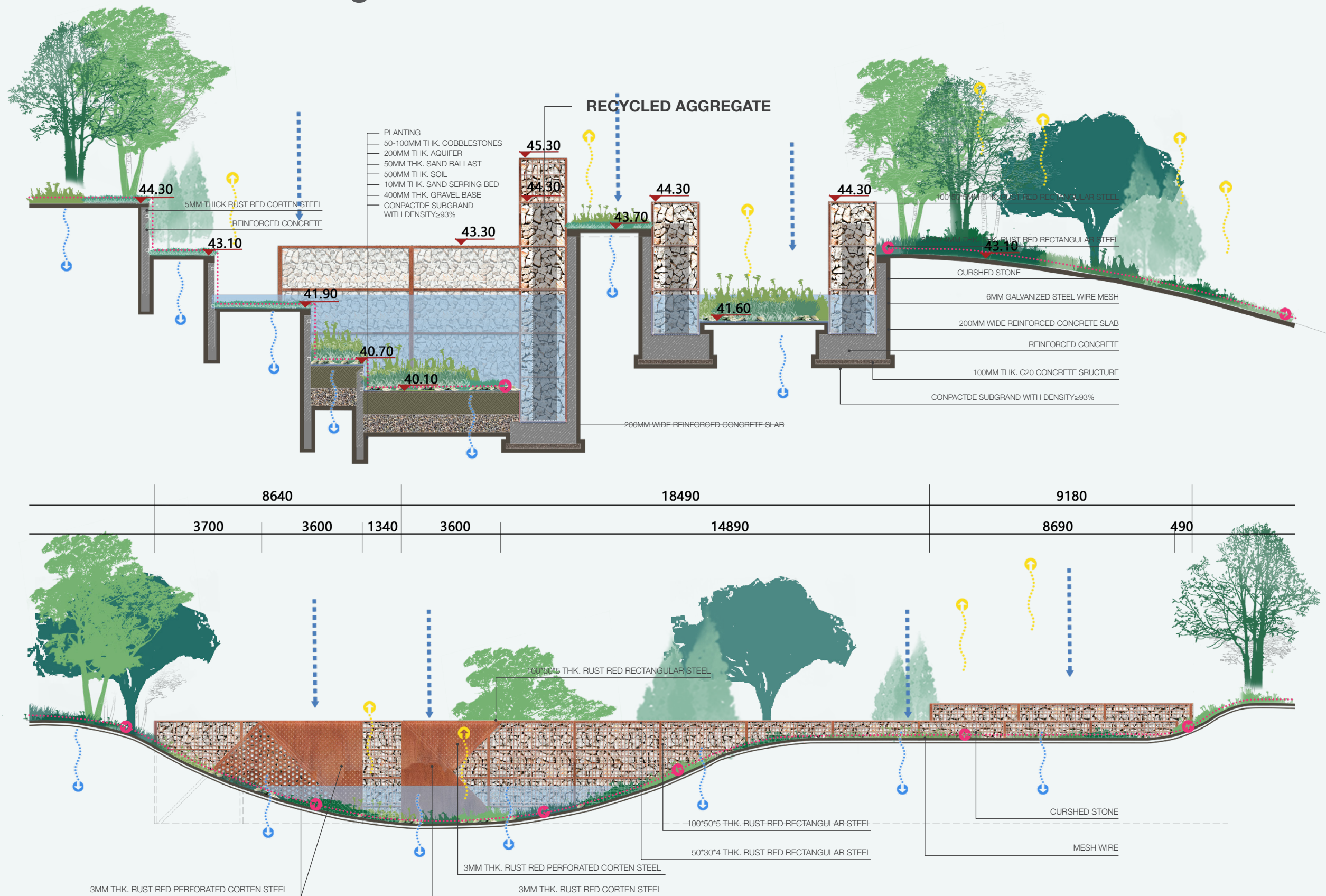


Rainwater Path

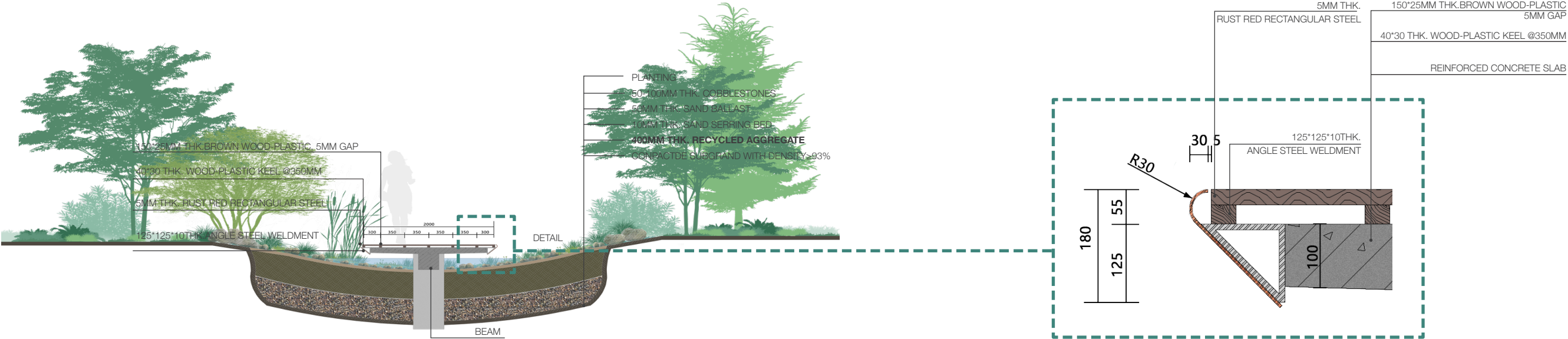


An S-shaped gabion wall is set up near the water injection outlet as a buffer zone to reduce the flow rate of the incoming rainwater, avoiding the scouring of plants and planting layers.

Gabion Walls Detail Drawing

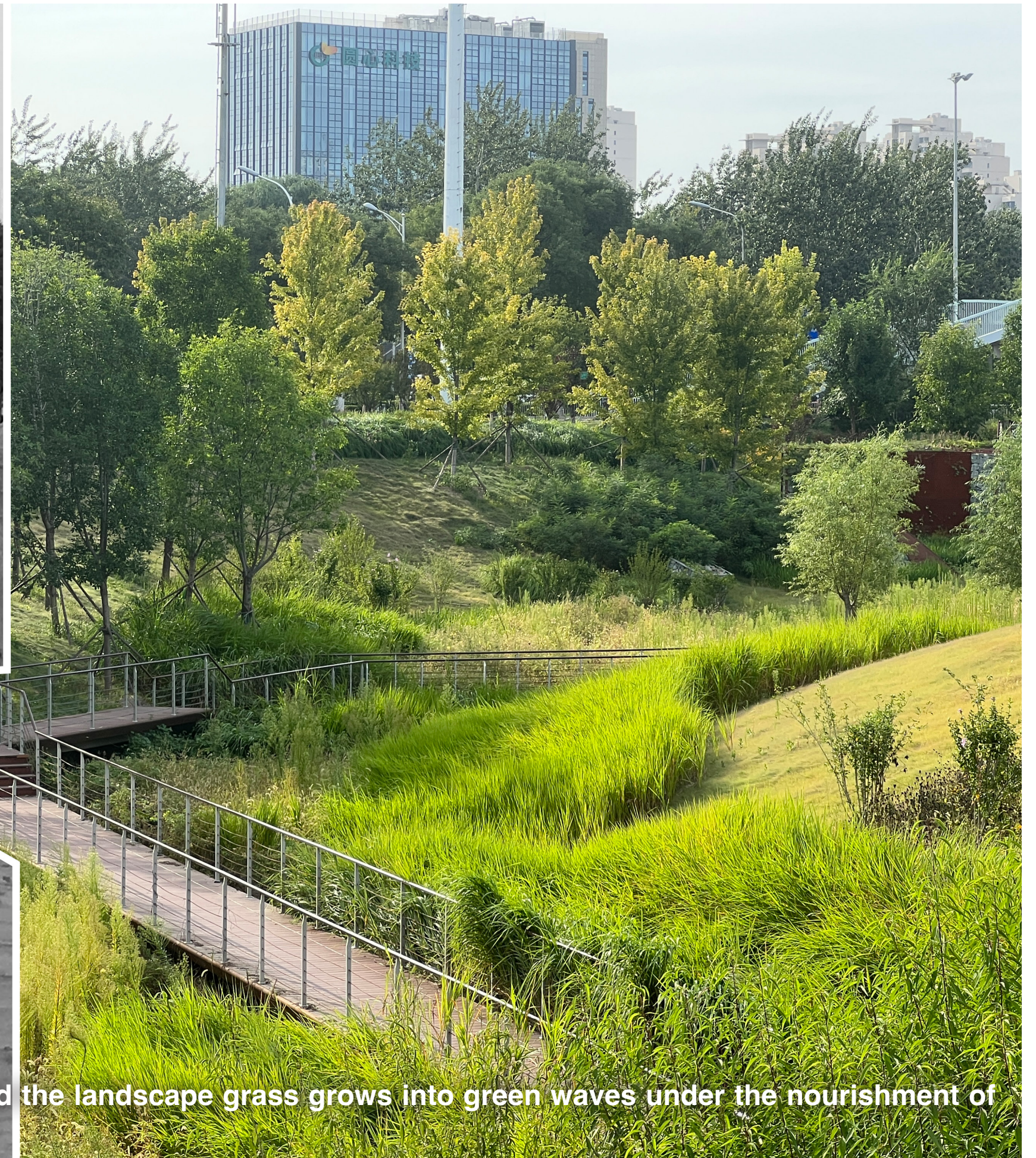
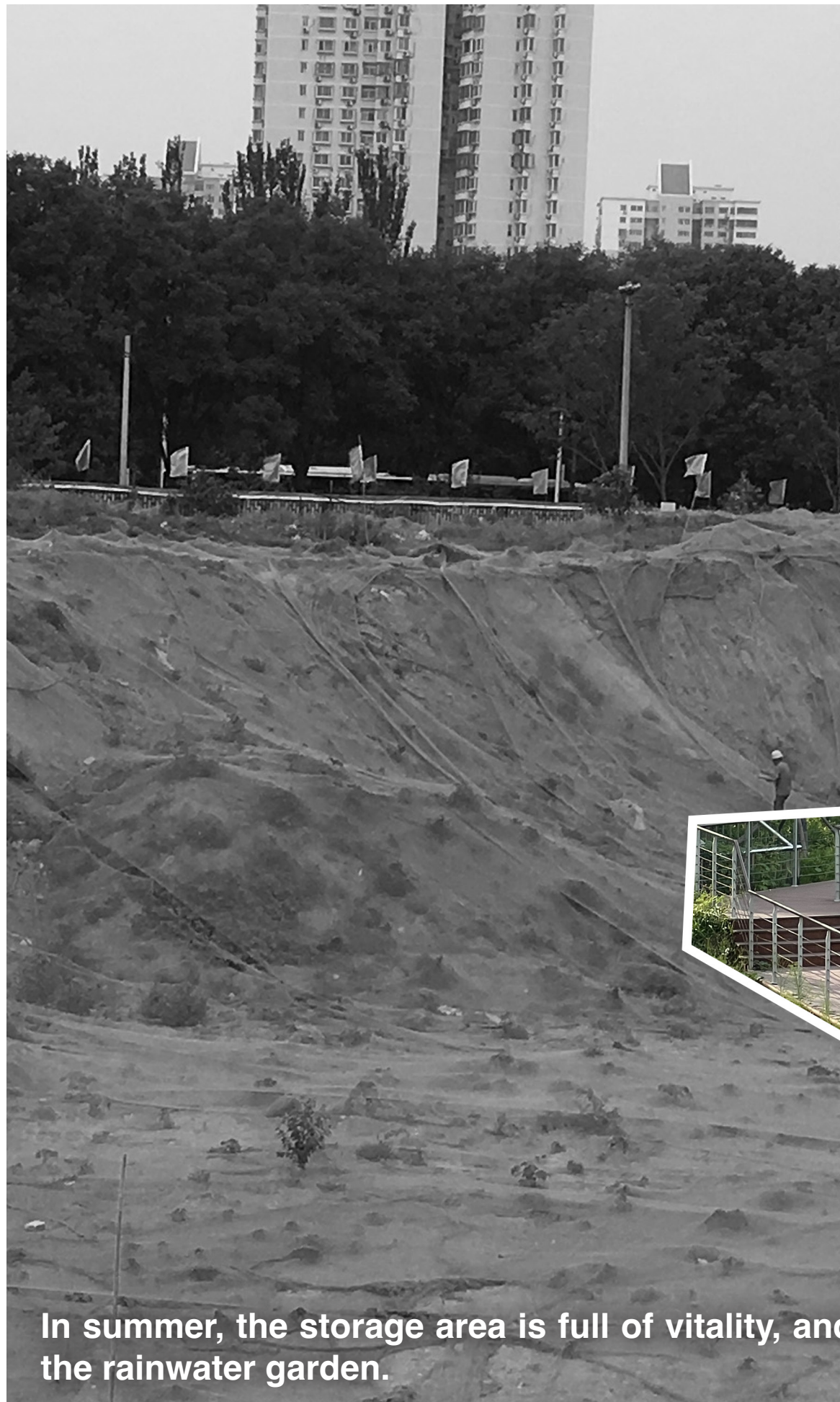


The gabion is filled with irregular stones to provide initial filtration of ponding water and to remove larger debris such as plastics and tree branches brought about by internal flooding while ensuring drainage rates.



The walking path allows visitors to come in direct contact with nature on a more passive route to leisurely stroll through swathes of wetland planting and provides restful areas to sit together, engaged in the natural beauty of the park.

CITY VALLEY



In summer, the storage area is full of vitality, and the landscape grass grows into green waves under the nourishment of the rainwater garden.

CITY VALLEY



The West Third Ring South Road has not experienced the problem of water accumulation and circuit breaker again, and more and more citizens are coming here to relax, stroll, and admire plants. The project has received widespread praise.