The 11th Jiangsu Province Horticultural Expo, the Overall Planning and Landscape Design Project
Exhibition Time: From April 20 to May 20, 2021, 30days.
Project Location: Tangshan district, Nanjing, China
Time period (from design to construction): January 2019 to April 2021
Project Area: 345ha

In pursuit of creating a better and sustainable living environment, the 11th Jiangsu Province Horticultural Exposition actively explored comprehensive brownfield remediation and revitalization. Themed "Splendid Jiangsu, Ecological Wisdom Valley," this exposition is built upon the current landscape foundation of the expo park, leveraging local resources such as mountainous vegetation, industrial relics, and quarry cliffs. Through comprehensive measures including ecological restoration, spatial integration, revival of traditional gardens, and revitalization of industrial remnants, it explores novel approaches to industrial transformation, ecological restoration of mountainous pits, and regional green development.

Despite its short exhibition period of just one month, over the past four years since its establishment, the expo has attracted over a million visitors. This project provides a new model for ecological restoration of urban brownfields in China and injects fresh vitality into local cultural tourism and regional economic development in Jiangsu.

Project Background

Since its inception in 2000, the Jiangsu Provincial Garden Expo has been held biennially, pioneering provincial horticultural expos in China. It has evolved from a single-function exhibition into the largest, longest-running, and most influential local gardening and horticultural event in the country, creating a brilliant "Garden Expo" brand with a positive impact throughout China.

As a second batch pilot city for "Urban Double Repair" in China, Nanjing has been committed to ecological restoration, urban renewal, and addressing urban maladies, while also focusing on improving and protecting livelihoods. The eleventh Garden Expo was thus chosen to be built in the northern mining agglomeration area of Tangshan, Jiangning District, Nanjing, covering an area of approximately 345 hectares. The site is located within the ecological corridors and greenway network of Qinglong Mountain, Huanglong Mountain, and Baohua Mountain. This area once housed over 60 various large and medium-sized quarrying, cement production, and supporting enterprises, as well as landfill sites and other "scattered, messy, and polluting" projects, leaving behind significant "ecological scars" from extensive development.

Issues and Conflicts

1.Complex and Variable Terrain,

The site has a complex and varied terrain, with high elevations in the north and south and lower areas in the middle, forming a natural longitudinal valley. The vertical elevation ranges from 20 to 160 meters, with distinct valley features, scattered quarry remnants, exposed soil cliffs, and numerous constraints.

2.Fragmented Habitats, Fragmented

The original habitats mainly consisted of ponds, small rivers, shallow areas, low hills, forests, shrubs, and grasslands, serving as important habitats for forest birds. However, excessive quarrying has led to fragmented habitats, reduced animal habitat areas, and isolated original habitats, resulting in fragmented patches.

3.Poor Soil Fertility, Low Permeability

The site is composed of open-pit quarries for limestone extraction, some farmland, villages, and wasteland. Due to years of mining activities, underground water samples have a pH value ranging from 7.10 to 11.37, with detectable levels of heavy metals and petroleum hydrocarbons. The overall soil structure is poor, with insufficient permeability, and various indicators fall below the requirements for planting soil.

4.Limited Plant Species Diversity

The existing vegetation in the expo park mainly consists of deciduous pioneer trees, shrubs, and herbaceous plants, with limited species diversity. The fragile ecology and competition among the limited plant resources necessitate reasonable protection and development.

Restoration Strategies

[Strategy One]: Ecosystem Construction

In the planning phase, tools such as remote sensing (RS) and geographic information systems (GIS) were used to simulate potential ecological corridors and overlay landscape and recreation networks, constructing a spatially efficient composite ecological network. The selection of adaptable species enhances survival and adaptability, promoting healthy ecosystem development.

Establishing Connection Corridors: Utilizing the site's terrain, protection mechanisms for local flora and fauna were established. The restoration of original wildlife habitats through quarry rehabilitation, slope restoration, forest vegetation restoration, and industrial site rehabilitation creates diverse plant landscape communities and establishes a comprehensive north-south ecological corridor, enhancing the Baohua Mountain-Qinglong Mountain-Purple Mountain urban ecological wedge system.

Expanding Ecological Patches: Ecological restoration efforts such as mountain and industrial site rehabilitation increase the area and improve the shape of ecological patches, promoting biodiversity and ecosystem service capacity. Network modeling identifies critical areas for landscape connectivity, guiding supplemental restoration and enhancing the ecological function of patches at different levels.

[Strategy Two]: Comprehensive Ecological Restoration

1.Terrain Design: Adopting a mining landscape restoration strategy, the terrain features such as height differences, mining status, surface undulations, and water resources distribution were considered. Landscape water systems were created using pits and lowlands from mining areas, and excess waste rocks and construction debris were used to form terraces, slopes, valleys, and quarry mouths. Re-greening efforts maintained slope stability in gardens affected by mining.

2.Rainwater Management: The park was divided into five drainage zones based on the terrain. The zones direct rainwater to the Jiuxiang River and Qixiang River systems, retaining original pits, adding water systems, and expanding water areas to manage heavy rainfall and promote rainwater storage, infiltration, and purification. Flood interception ditches and drainage ditches along the contour lines were constructed to divert mountain torrents downstream, with additional drainage channels and bioretention bands collecting road rainwater.

3.Soil Improvement: Restoring the soil matrix was prioritized, using site soil quality evaluation, improvement capability assessment, and green planting soil demand estimation. Scientific research on planting soil formulations and production techniques ensured landscape construction provided improved green planting soil, enhancing plant survival and maintaining good growth and landscape effects.

[Strategy Three]: Plant Community Reconstruction

1. Creating Plant Communities: Suitable plant species were selected based on different site conditions, forming diverse, colorful, and ecologically stable communities. These communities provide ecological and landscape value, creating animal habitats, protecting biodiversity, and meeting citizens' leisure and cultural needs.

2. Enhancing Habitat Diversity: Different plant habitats were created according to site conditions, attracting birds and insects with nectar and food plants, and providing habitats for various animals. Forest care, forest landscape modification, water ecological treatment, and cliff slope greening were implemented.

3. Increasing Native Plant Diversity: Local plant species were extensively used, reviving native plant varieties in Nanjing, enhancing ecological and landscape values.

4. Constructing Low-Maintenance Communities: Establishing adaptable, perennial, low-maintenance plant communities ensures ecosystem stability.

[Strategy Four]: Creating Space and Place

1. Public Space with Landscape Integration: Conforming to the terrain and environmental changes, gradient designs for elements like mountains, slopes, rock piles, and quarry mouths created distinctive spaces. Diverse plant spaces were formed through open grasslands, flower groups, cliff greening, and forest systems, linked by a small train line creating a colorful ecological corridor.

2. Functional and Artistic Land Landscape: The Beianmen node, facing the main peak of Huanglong Mountain, features an open terrain space with a natural view corridor between the Beijing-Shanghai high-speed railway and Huanglong Mountain. An underground "Floating Stone Palace" and viewing platform at the mountain's base facilitate transportation while maintaining landscape continuity.

3. Integrating Traditional Landscape Features: The "Su Yun Hui Valley" area, originally a quarry, applied the "three distances" (high, deep, and flat) principles from Song Dynasty landscape painting, creating different elevation areas with the geographical and cultural features of thirteen cities, forming layered garden spaces.

4. Revitalizing Industrial Heritage: The Yin Jia and Kun Yuan white cement plants retained 42 silos, 3 chimneys, and 21 individual buildings, incorporating new structures to create multi-functional venues. The giant quarry and exposed cliffs of the China Cement Plant were transformed into a plant garden, cliff theater, and quarry hotel through reinforcement, greening, space remodeling, and functional integration.

Implementation and Effects

This Garden Expo led with planning, transforming quarries into parks, turning quarry mouths into gardens, and converting barren areas into homes, accumulating rich experience for the healthy development of landscape architecture in Jiangsu Province, positively impacting urban greening and living environment improvement.

1. Ecological Benefits:

Creating a coordinated natural environment around the project, the expo built a scenic road extending nearly 10 kilometers east-west, enhancing the Seven Xiang River landscape and surrounding village facilities, improving urban space quality and functionality. In over three years, the park's green area increased from less than 10% to 80%, with public green areas reaching 166 hectares and forest maintenance covering about 91.22 hectares. The ecological system's restoration enriched biodiversity, adding nearly a thousand plant species, transforming barren land into a renowned "mountain garden."

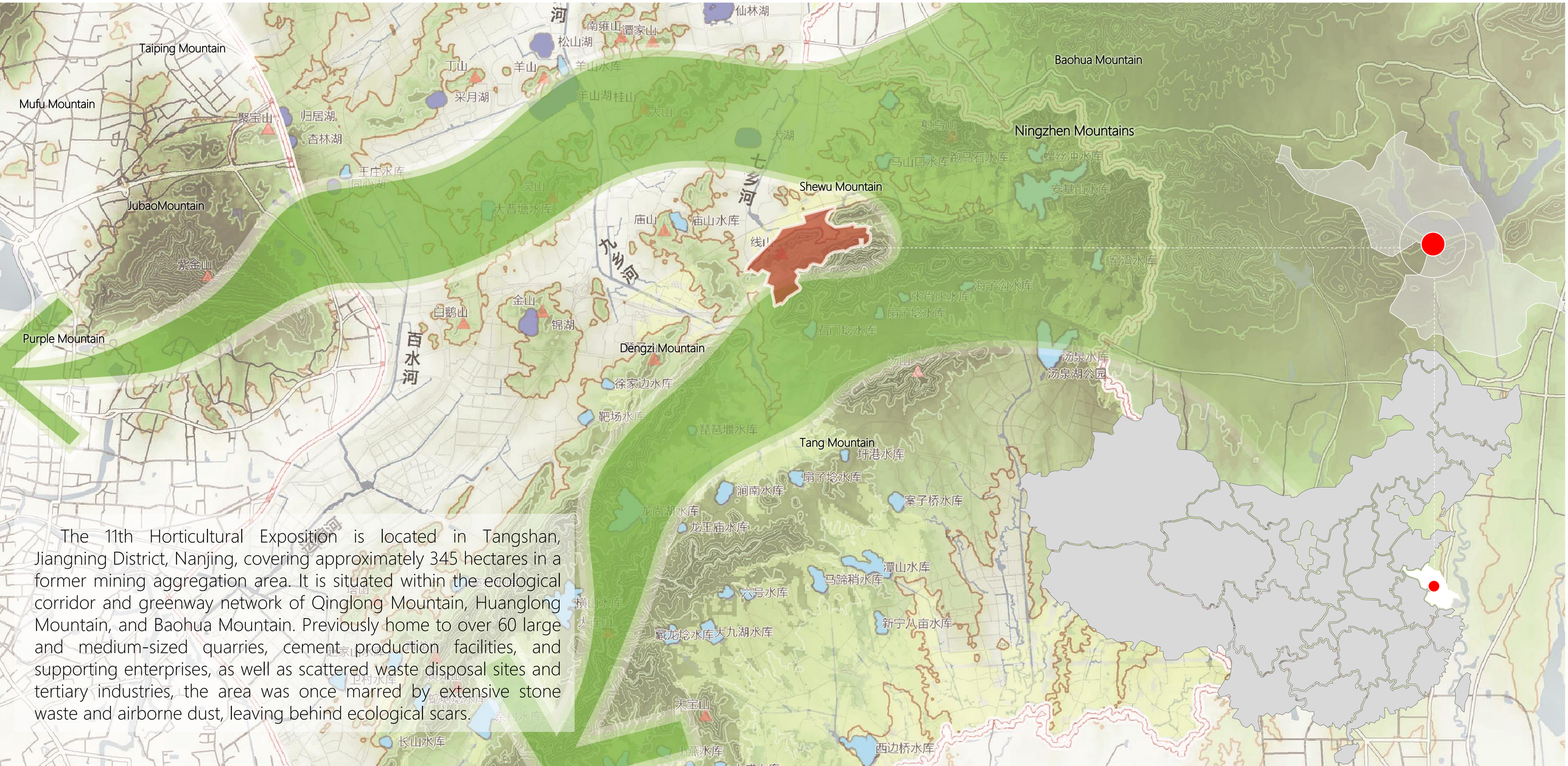
2. Economic Benefits:

The Nanjing Garden Expo's construction added about 155 hectares of agricultural and unused land, creating 2,330 acres of construction space, promoting economic development with significant economic benefits. The expo triggered interconnected economic effects, fostering growth in related industries and enhancing Nanjing's urban brand.

3. Social Benefits:

The expo park created a pleasant living space and natural healing space for residents, attracting over a million visitors in over three years, injecting new momentum into Jiangsu and Nanjing's cultural tourism industry, and vividly showcasing Nanjing's continuous pursuit of green development and ecological civilization.

Location Introduction



The 11th Horticultural Exposition is located in Tangshan, Jiangning District, Nanjing, covering approximately 345 hectares in a former mining aggregation area. It is situated within the ecological corridor and greenway network of Qinglong Mountain, Huanglong Mountain, and Baohua Mountain. Previously home to over 60 large and medium-sized quarries, cement production facilities, and supporting enterprises, as well as scattered waste disposal sites and tertiary industries, the area was once marred by extensive stone waste and airborne dust, leaving behind ecological scars.

Issues and Contradictions
Site Analysis

1. Complex and Varied Terrain with Exposed Cliffs

The site features a complex and varied terrain with elevations ranging from 20 to 160 meters, distinct valley characteristics, scattered pits, exposed soil cliffs, and numerous limiting factors.



2.Fragmented habitats, fragmented habitats

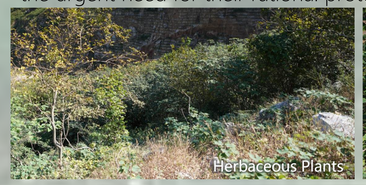
The original habitats included reservoirs, small rivers, shallows, low hills, forests, shrubs, and grasslands, vital nesting and breeding grounds for forest birds. However, extensive quarrying fragmented the overall habitat, reducing the area available for animal habitats, isolating original habitats through excessive construction and excavation, resulting in fragmented patches.

3.Infertile Soil with Poor Water

Permeability years of mining activities have left the soil with poor overall structure. Soil permeability is generally insufficient, and various soil indicators fall below the requirements for plant growth.

4. Limited Plant Diversity

The existing vegetation in the expo park mainly consists of deciduous pioneer trees, shrubs, and herbaceous plants, resulting in a limited variety. Due to the fragile ecological conditions, the plant species on site face significant competition for survival, highlighting the urgent need for their rational protection and development.




Plan Layout

The total planned area
of the Expo Park is about 345 hectares

1 Visitor Center at the No. 1 Entrance
2 Banshan Hotel
3 Moat Landscape
4 Huaxiang Station
5 Banshan Terrace
6 Main exhibition hall
7 Shigu Landscape Axis
8 Shigu Precipice
9 Shigu Whispering Garden
10 Shigu Lake
11 Sakura Railroad
12 Huase Station
13 Huawei Station
14 Taizhou Garden
15 Huai'an Garden
16 Yangzhou Garden
17 Lianyungang Garden
18 Boutique Garden Architecture
19 Nantong Garden
20 Suzhou Garden
21 Nanjing Garden
22 Zhenjiang Garden
23 Xuzhou Garden
24 Suqian Garden
25 Surging Wave Waterfalls
26 Living Complex
27 Green Vault
28 Adventure Island
29 Visitor Center at the No. 2 Entrance
30 Geology Museum
31 Huayu Station
32 Water Train
33 Underground Pumice Palace
34 Visitor Center at the No. 3 Entrance
35 Huanghua'an Inn
36 Village of Small Lake
37 Village of the Ming Culture
38 Yangshan Monument Materials

Project Strategies

STRATEGY1. Ecosystem Construction

1. Expand ecological patches

Through ecological restoration, damaged mountainous areas, and industrial relics are repaired to increase the area and improve the shape of ecological patches. This promotes biodiversity and ecosystem services.

Additionally, using network modeling, critical areas for maintaining landscape connectivity are identified for supplementary restoration. Different levels of ecological patches are correspondingly enhanced to strengthen their ecological functions.

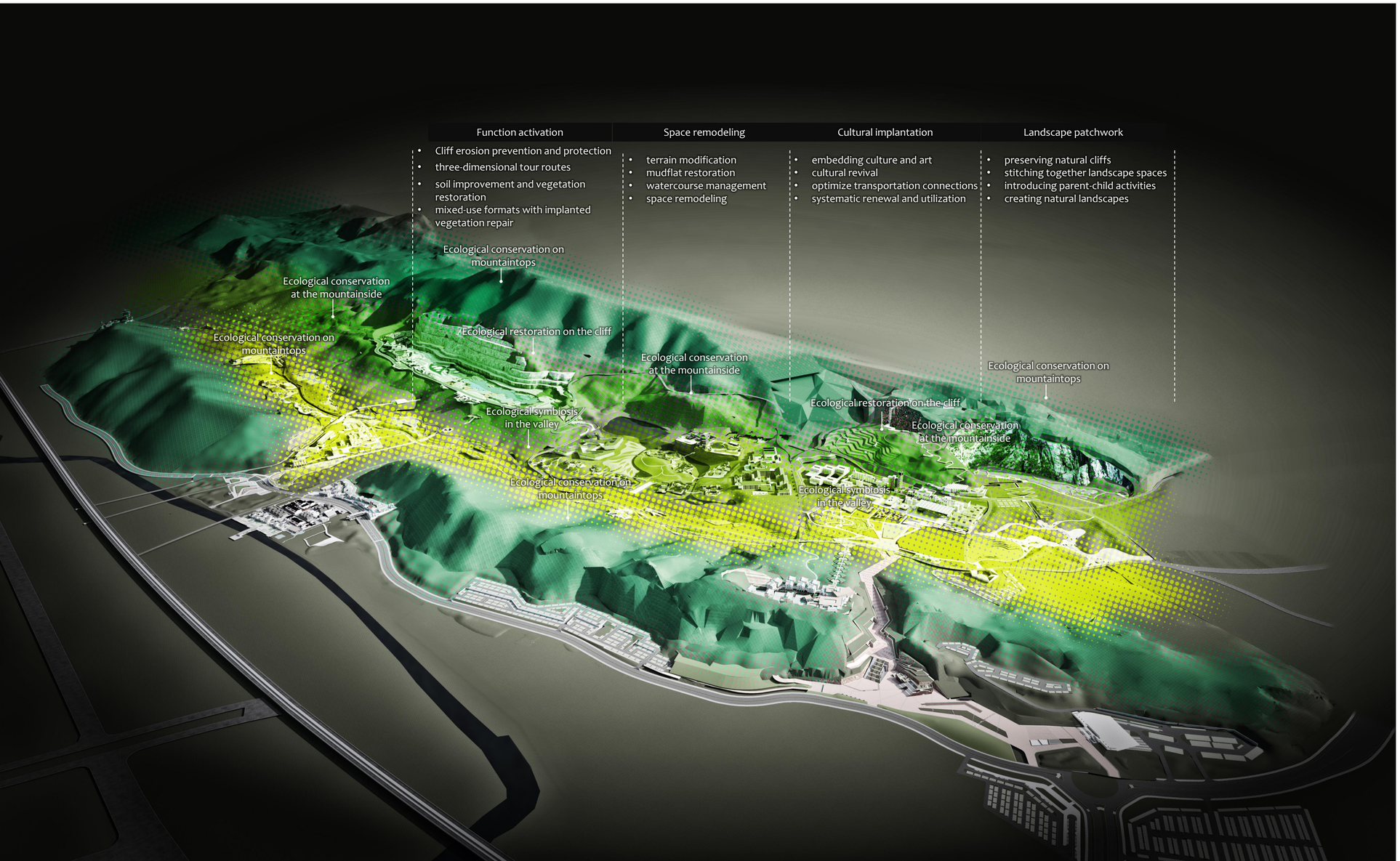
2. Linking ecological corridors

Utilizing the terrain, mechanisms for protecting flora and fauna are established to foster the development space for local biodiversity.

Methods include quarry restoration, hillside rehabilitation, forest vegetation restoration, and industrial heritage refurbishment.

This restores original habitats for wildlife, creates diverse plant landscapes, establishes complete north-south ecological corridors, and enhances the urban ecological wedge system between Mount Baohua, Mount Qinglong, and Mount Zijin, constructing a composite ecological system.

Project Strategies
STRATEGY1. Ecosystem Construction

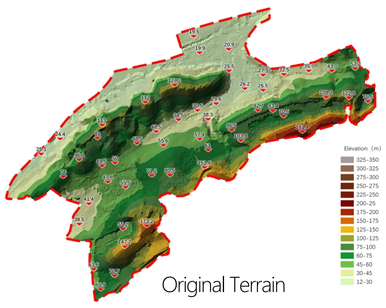


3.Constructing Composite Systems

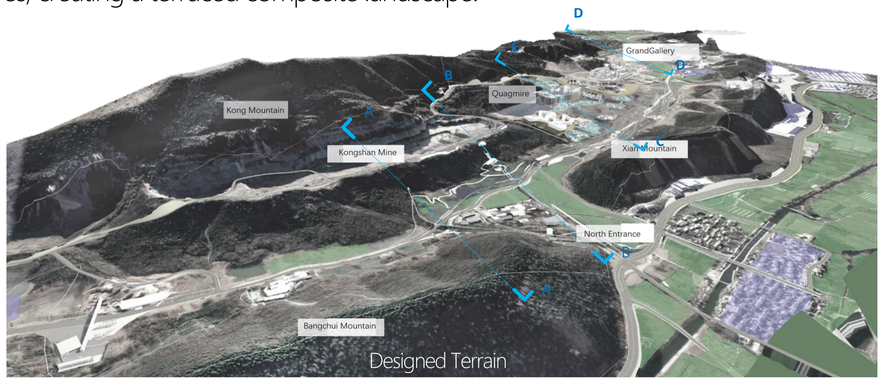
During the planning phase, tools such as remote sensing (RS) and geographic information systems (GIS) are employed to simulate potential ecological corridors. Overlaying landscape and recreational mapping networks, a well-functioning composite ecological network is constructed. Tailored to the expo park's varied landscape resources and spatial characteristics, the park is divided into four primary functional zones and distinctive landscape areas: summit ecological conservation, cliff ecological restoration, hillside ecological conservation, and valley ecological symbiosis. Accordingly, four categories of ecological restoration and enhancement strategies are devised based on site-specific conditions.

1. Terrain Design

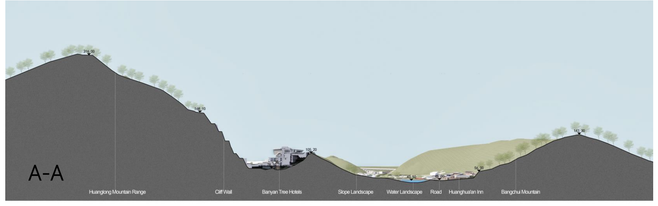
Based on the site's terrain, current conditions of mountain mining, and distribution of water resources, a mining restoration strategy is implemented that follows the natural terrain gradient. Pits and depressions from mining areas are utilized to create a landscape water system. Excessive waste rock and construction debris from mining and storage areas are used to shape various typical landforms such as plateaus, slopes, and valleys. The degraded mountainous areas in the regeneration gardens and future garden plots are covered with soil and vegetation to stabilize slopes. In traditional classical garden areas, natural terrain and pits are used to guide water systems, constructing terraced dams for ponds, waterfalls, streams, and other water features, creating a terraced composite landscape.

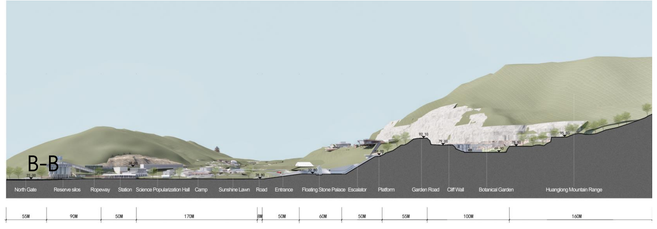


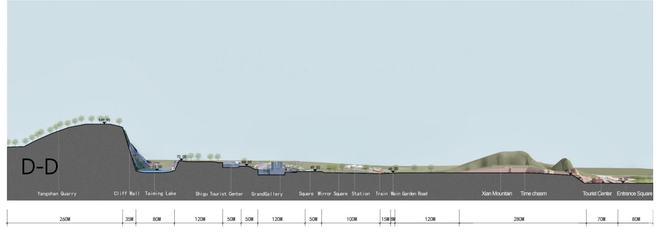
Original Terrain



Designed Terrain

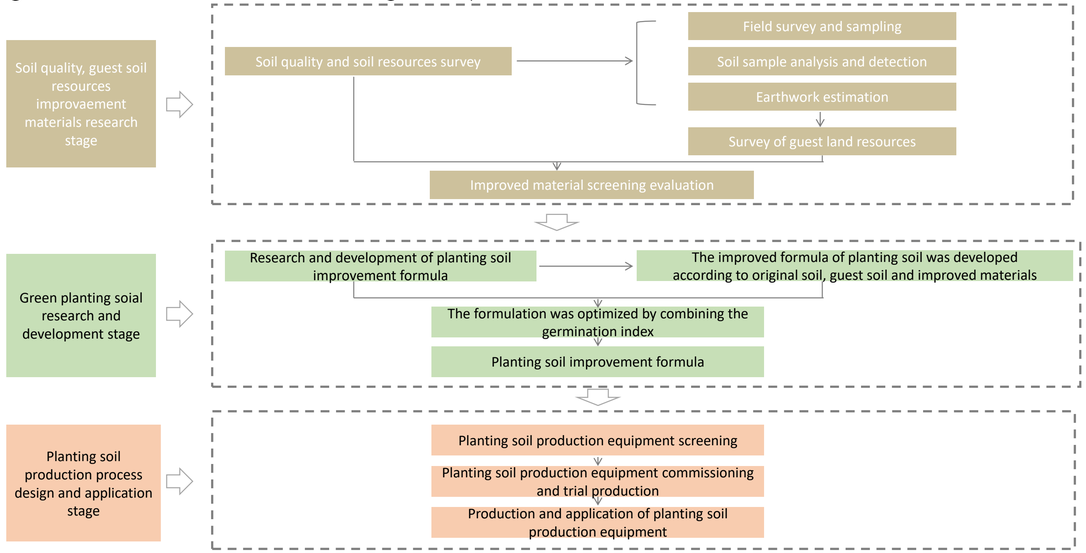




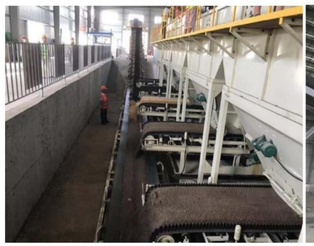
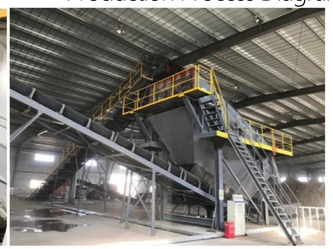


2. Soil Improvement

The restoration of soil on mountain slopes primarily focuses on restoring soil matrix. This involves evaluating the existing soil quality on-site, assessing the capability for soil improvement, and estimating the demand for planting soil for greening the park area. Scientific formulation development for planting soil is conducted, followed by trial production, process debugging, and acceptance according to the overall project construction plan. This process aims to provide improved greening planting soil for landscape construction in the park, enhancing plant survival rates and ensuring long-term robust growth and aesthetic effects of the garden plants.

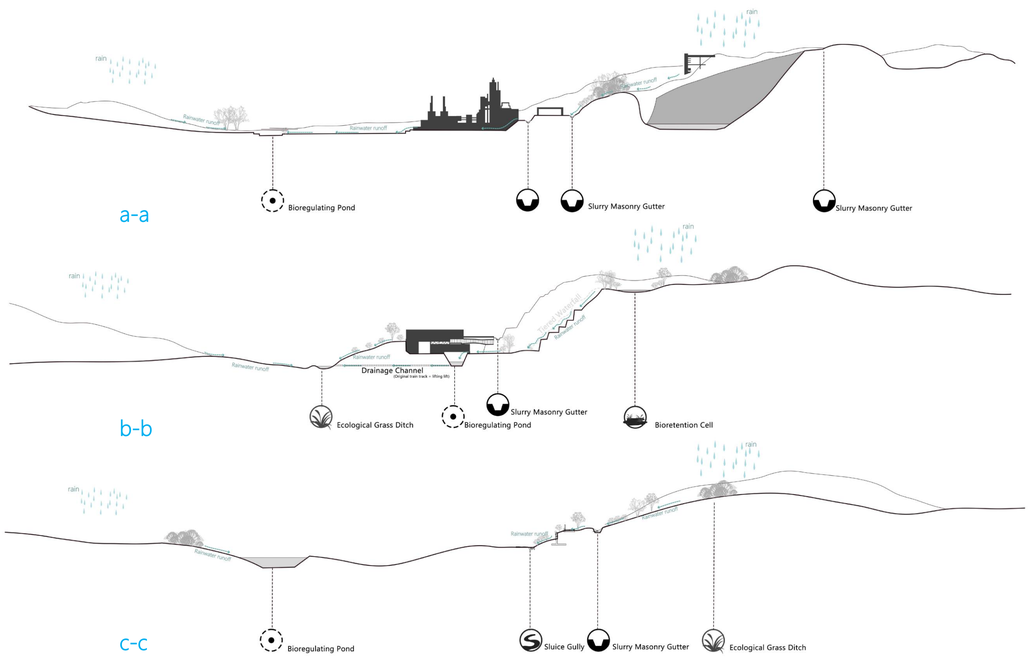


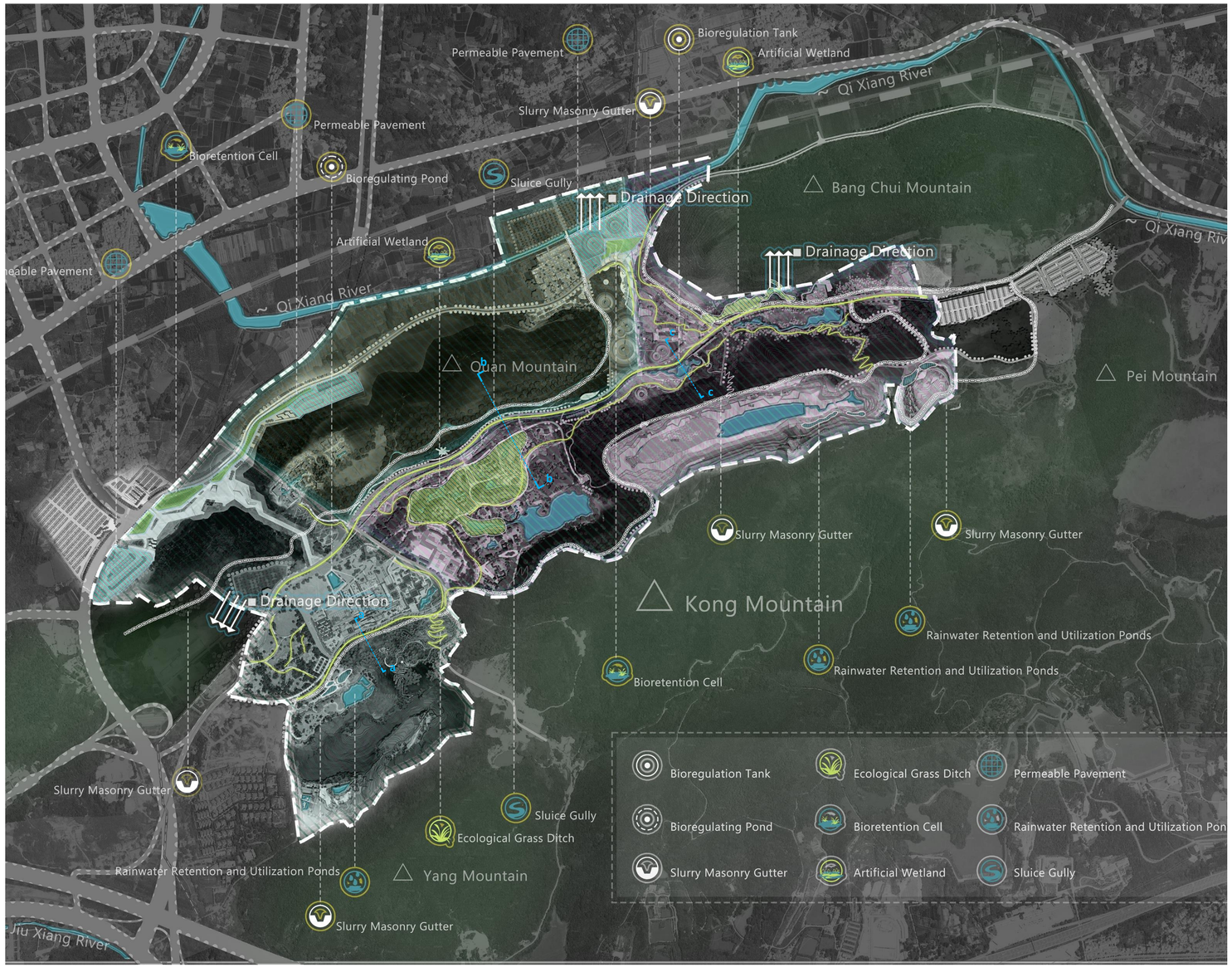
Production Process Diagram of Planting Soil:

3. Rainwater Management

The project emphasizes the professional coordination and systematic design of the rainwater system, making full use of the natural terrain. It integrates the road network and contour lines to circularly arrange flood interception ditches and drainage ditches, intercepting direct impacts of mountain floods on the park area. In small local areas, it combines low-lying and elevated terrain to create depressions, adapting to the terrain to arrange rainwater collection surfaces. In these collection areas, ecological and drainage functions are integrated into landscape water bodies, promoting the accumulation, infiltration, and purification of rainwater.





Project Strategies

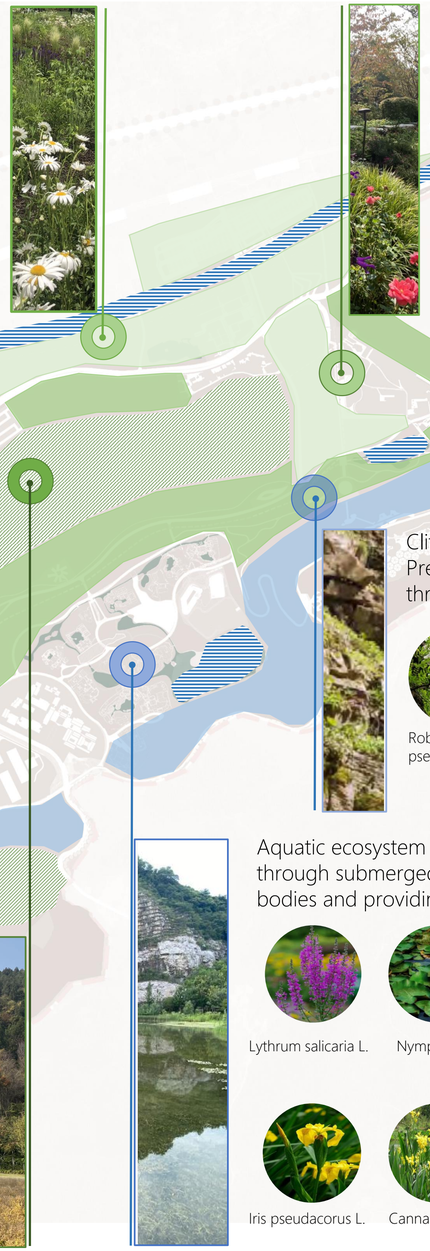
STRATEGY3. Plant Community Reconstruction

Through analysis of different geographical conditions, selecting suitable plant species for growth to create diverse habitats, forming communities with a variety of tree species, rich colors, and high ecological stability. This approach enhances the ecological and landscape values of the communities, builds habitats for wildlife, protects biodiversity, and meets the leisure and cultural needs of residents.

Enhancing Habitat Diversity: Different plant habitats were created according to site conditions, attracting birds and insects with nectar and food plants, and providing habitats for various animals. Forest care, forest landscape modification, water ecological treatment, and cliff slope greening were implemented.

Increasing Native Plant Diversity: Local plant species were extensively used, reviving native plant varieties in Nanjing, enhancing ecological and landscape values.

Constructing Low-Maintenance Communities: Establishing adaptable, perennial, low-maintenance plant communities ensures ecosystem stability.



Grassland vegetation communities
Establishing low-maintenance and sustainable plant communities through naturalistic planting methods.


Acorus gramineus ' Ogan'


Gaura lindheimeri Engelm. & A. Gray


Stipa tenuissima


Brassica campestris


Ilex x attenuata 'Sunny Foster


Coreopsis basalis (A. Dietr.) S. F. Blake


Salvia uliginosa Benth.


Mauranthemum paludosum (Poir.) Vogt et Oberprieler

Food supply sparse forest vegetation communities
Fully exploit local plant resources to construct diverse habitats, selecting dense shrub species to isolate human disturbances and provide concealed habitats for small animals.


Salvia nemorosa L.


Nandina domestica 'Firepower'


Rhododendron simsii Planch.


Gardenia jasminoides J.Ellis


Hypericum monogynum L.

Cliff vegetation communities
Prevent soil erosion and accelerate greening of cliffs through hydroseeding technology.


Robinia pseudoacacia L.


Mucuna sempervirens Hemsl.


Trifolium repens L.

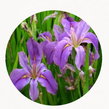

Ligustrum japonicum 'Howardii'


Lespedeza bicolor Turcz.

Aquatic ecosystem purification vegetation communitiesForming aquatic ecosystems through submerged, floating, and emergent plants, simultaneously purifying water bodies and providing food sources for fish and birds.

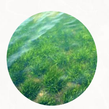
Lythrum salicaria L.


Nymphaea L.


Iris hybrids 'Louisiana'


Cyperus involucratus Rottboll


Hydrocotyle vulgarisL.


Vallisneria natans (Lour.) H. Hara

Iris pseudacorus L.


Canna glauca L.

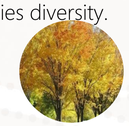

Arundo donax 'Versicolor'


Arundo donax L.


Schoenoplectus tabernaemontani (C. C. Gmelin) Palla

Dense forest vegetation communities
Undertaking forest structure transformation and nurturing, selecting food and nectar plants with high fruiting rates, long flowering and fruiting periods, and abundant flowers to provide a rich food source for wildlife. Introducing colorful foliage trees to enrich seasonal changes and enhance species diversity.


Liquidambar formosana Hance


Zelkova serrata (Thunb.) Makino

Eriobotrya japonica (Thunb.) Lindl.

Malus halliana Koehne

1. Public Spaces with Landscape Integration

In response to site topography and environmental changes, targeted gradient designs were applied to elements such as hills, slopes, ore accumulation areas, and cliffs. This approach shaped distinctive terrain spaces like hills, plateaus, mountain crevices, valleys, and water bodies. By incorporating sparse forests, clustered flower beds, cliff greening, mountain forest ecosystems, and tree-lined pathways, unique botanical spaces were created. These efforts resulted in multiple distinctive spatial nodes interconnected by a small train line, forming an east-west natural and vibrant ecological landscape corridor.

2.Integrated Landscapes of Functionality and Artistry

The Beianmen node faces directly towards the main peak of Huanglong Mountain and features relatively flat terrain. An open terrain space was designed, preserving a natural visual corridor between the Beijing-Shanghai High-Speed Railway and Huanglong Mountain, ensuring the mountain's complete visibility. At the foot of the mountain slope, transportation transitions were facilitated through underground spatial nodes like the "Floating Stone Palace" and viewing platforms, meeting both transportation needs and maintaining landscape continuity along the east-west axis of the mountain.

3. Spaces Infused with Traditional Landscape Elements

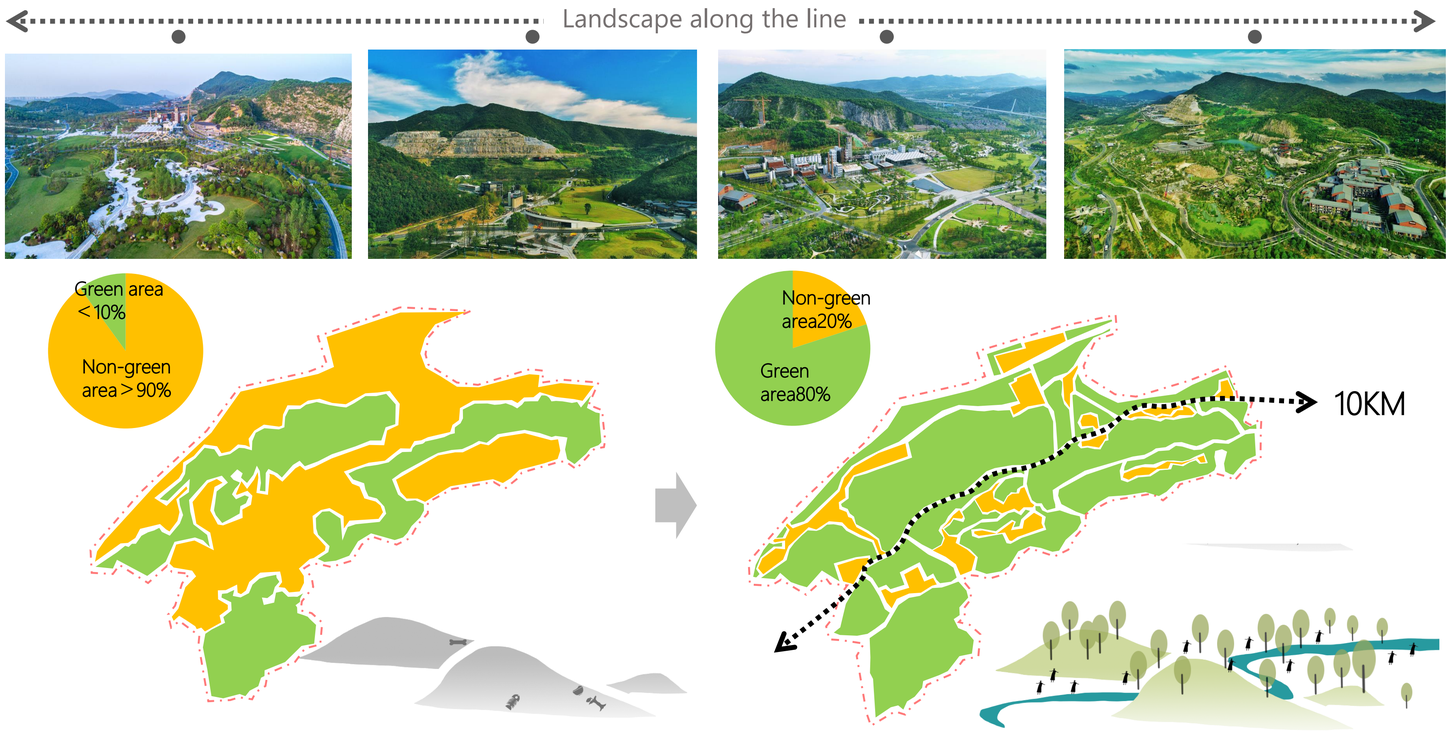
The "Suyun Huigu" area, originally a quarry pit, creatively employs the principles of "Three Distances" from Song dynasty landscape paintings (high, deep, flat). This concept was applied to delineate land uses with varying elevations, integrating geographic and cultural characteristics from thirteen cities to create a layered garden space vertically.

4. Revitalizing Industrial Heritage

The former Yinja and Kunyuan white cement factories preserved 42 silos, 3 chimneys, and 21 standalone buildings, with additional new construction overlaying parts of the site. This transformation resulted in a versatile venue integrating exhibition displays, office conferences, and leisure services. Leveraging the colossal mining pits and exposed cliffs of the Chinese cement factory site, interventions such as cliff stabilization, plant-based restoration, spatial reconfiguration, and diverse functional formats were implemented. The outcome is a comprehensive "Mountain-Water Mine Garden" featuring botanical gardens, cliffside theaters, and a mining pit hotel.

Ecological Benefit

In order to create a coordinated natural environment around the project, a scenic road stretching nearly 10 kilometers from east to west has been built, the landscape along the Qixiang River around the project has been improved, supporting facilities of surrounding villages have been improved, and regional transportation facilities have been constructed and optimized, greatly improving the quality and function of urban space.



More than three years after the opening of the Horticultural Expo, the overall green area of the park has also increased from less than 10% before the planning to 80%, the green area of the park's public area has reached 166 hectares, and the total area of forest tending is about 91.22 hectares. The continuous restoration of the ecosystem has enriched the biodiversity, increased the plant species of the park by nearly 1,000 species, and the former "barren land" has become a famous "mountain garden". After restoration, the original "ecological scar" has been transformed into "urban green lung".

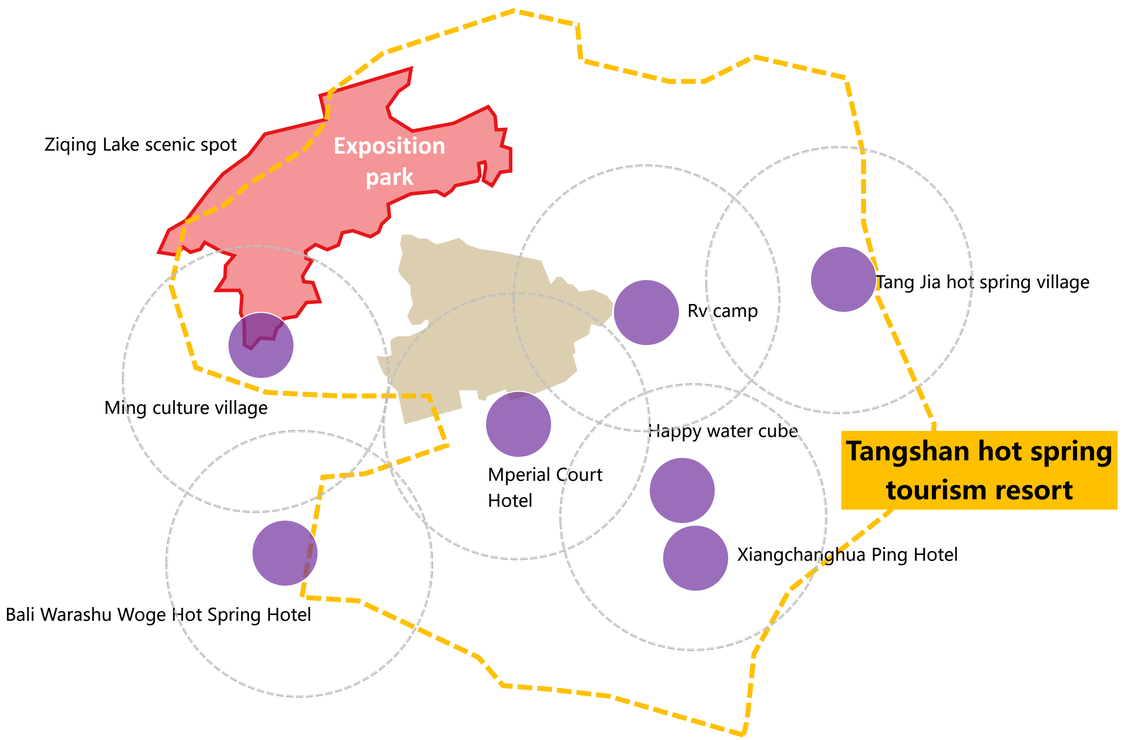
Social Benefit

The Expo Park creates pleasant living space and natural healing space for the common people

In more than three years, with ecology, experience and exhibitions, the circle of fans has exceeded one million, which not only injected new momentum into the cultural tourism industry of Jiangsu and Nanjing, but also injected vitality into the urban economic development, and more effectively demonstrated the beautiful picture of Nanjing's continuous promotion of green development and construction of ecological civilization.

Economic Benefit

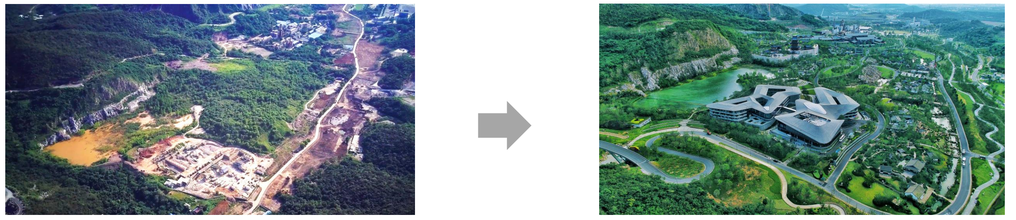
To create a harmonious natural environment around the project, a scenic road stretching nearly 10 kilometers east-west was constructed, enhancing the landscape along the Qixiang River banks surrounding the project. This effort also improved the supporting facilities in nearby villages and optimized several regional transportation facilities, significantly enhancing the quality and functionality of urban spaces.



Over the past three years since the opening of the Horticultural Expo, the overall green area within the park has increased from less than 10% before planning to 80%. The green area of public spaces in the park has reached 166 hectares, with a total forest nurturing area of approximately 91.22 hectares. Continuous ecosystem restoration has enriched biodiversity, with nearly a thousand additional plant species introduced. What was once barren land has transformed into a renowned "mountainous garden," turning former ecological scars into an "urban green lung."

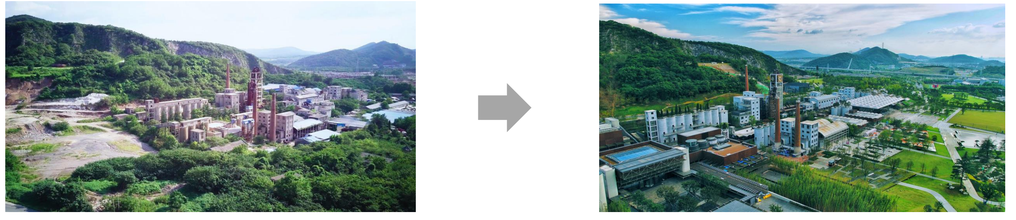
1. Transform Mining Pits into Parks

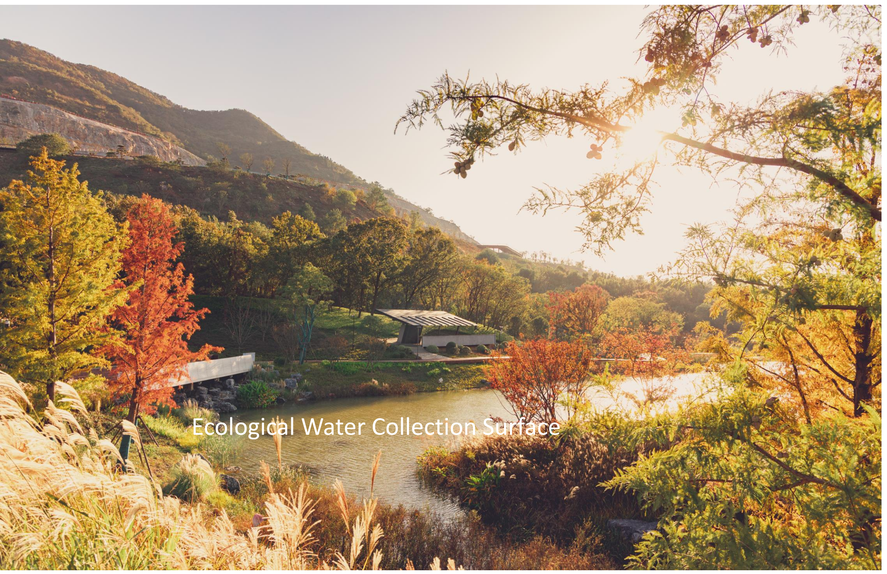
2. Convert Quarry Sites into Gardens



3. Open up Valleys as Recreational Areas

4. Turn Wastelands into Habitats





1 2
3 4

1.Cliffside Flower Valley Aerial View
2. Realistic image of the mud pit
3. Vegetation Ecological Restoration
4. Water Storage Landscape

Realistic Image

1 2
3 4

1. Landscape Axis towards Entrance 2
2. Aerial View of the Entrance2
3. Landscape of the Entrance 2
4. Landscape Transformation of Cement Factory

Realistic Image

1 2
3 4

1.Cliffside Flower Valley Aerial View
2. Realistic image of the mud pit
3. Mine pit restoration
4.Water train photo

Realistic Image

Landscape of the Time Art Valley Lands

Realistic Image

Valley Vertical Aerial View

Realistic Image

Bird’s-eye View of the Whole Park