

# Ecological Rehabilitation of Quanzi Mountain, Aozi Mountain and Wanghualou Mountain

by yiao chen / 2023-03-24 13:45:08 / China / 123 / CN



**Year of commitment :** 2017  
**Address 1 - street :** 103 250002 ,

**Biodiversity & Ecosystems :** / Urban ecosystem, Ecological engineering, Preservation, Shared garden /



100 000 000

## GENERAL INFORMATION

The project is located in ELITE CITY, Shizhong District, Jinan City, Shandong Province. Within ELITE CITY, there are three mountains: Quanzi Mountain, Aozi

Mountain and Wanghualou Mountain, which were originally quarrying areas. Poor management in the early stage and the long-term mining of stone and limestone has resulted in multiple mining pits and dilapidated mountain body, which not only severely damages biodiversity and ecological environment but also poses a risk of landslides and falling rocks. In addition, the terrain of ELITE CITY is high in the east and south and low in the west and north. There are dozens of naturally formed flood discharge ditches along the residential area, which erode the surrounding roads to different degrees and seriously damage the surrounding vegetation. **Mountain restoration, garden construction, ecological restoration and landscape improvement of flood discharge ditches** are carried out accordingly to protect biodiversity and ecological environment, thus achieving a huge change from abandoned mines and barren mountains to vibrant and lush areas. The ecological environment in the area has undergone a fundamental transformation.

**Mountain restoration.** The excavated soil will be backfilled to the mountain body and mining pits in combination with the construction of surrounding buildings to restore the exposed mountains. Six broken mountains with an area exceeding 300,000 have been restored.

**Garden construction.** Great importance is attached to the protection of the ecological environment of the mountain while the mountain is restored. **More than RMB 50 million has been invested** in the implementation of the landscape upgrade project in Aози Mountain and Quanzi areas, thus significantly enhancing the overall image of the southern region of Jinan, and the garden has been endowed with the use function, **8.4 kilometers of pedestrian road, 4.6 kilometers of cycling road and 10 kilometers of mountaineering road** are also constructed. The pedestrians for climbing mountain are made of gravels in the mountain, locally available materials, thus reusing waste materials. **In the construction process, we abandoned the use of mechanical equipment of our own accord but used primitive transportation tools like mules to transport building materials for the purpose of the reduction in secondary damage to the mountain.** In addition, in important node areas of activity, convenient entertainment venues such as children's playground, elderly fitness and leisure activities are also built.

**Ecological restoration.** In the development process, we always adhere to the concept of green development, emphasize the protection of biodiversity and continuously carry out tree-planting activities. At present, we have planted over 40 species and 100,000 trees, with a green area of over 1.6 million . Besides, a large reclaimed water station with a daily capacity of 10,000 m<sup>3</sup> is built for the community of ELITE CITY to not only irrigate all the green area with reclaimed water but also meet the needs of landscape irrigation and garage flushing in the community residential area.

**Landscape belt of flood discharge ditches.** In combination with the concept of “**low-carbon materials, clean energy, resource recycling and environmental awareness**”, we restore and enhance 9 landscape belts of flood drainage ditches, covering an area of over 150,000 and a length of over 4,750 m. Mountain reservoirs and fish-scale pits for afforestation on the top of the mountain are built, with intercepting ditches constructed along the mountaineering road, to enhance the conservation function of “infiltration, stagnation and storage” of rainwater, thus the project has become a demonstration park of sponge city.

**Project significance:** Nine major parks, namely, Lingxiu Park, Quanzi Mountain Park, Yuanxiang Sports Park, ELITE CITY Forest Park, Hongyegu Park, Aози Mountain Park, ELITE CITY Sports Park, Wanghualou Mountain Park and Huoli Park, have been built presently by relying on **Quanzi Mountain, Aози Mountain, Wanghualou Mountain and flood discharge ditches**. The **community ecosystem of “three mountains and nine parks”** with a total green area of 1,610,100 , which is known as the “back garden of Jinan”, has been formed to create a healthy air environment. In the meantime, the fitness footpath of more than 30 kilometers and the outdoor fitness venue of more than 23,000 are constructed to provide rich fitness and entertainment space for the residents in the community. They make the project awarded the titles of “**National First and Largest WELL Community Operation Gold Certification**” and “**Global Green Model Community**”.

## Progress Status

Delivered

## Data Reliability

3rd part certified

## Funding Type

Public

## Sustainable Development

Attractiveness :

### Enlarging fitness space and upgrading humanistic care.

In the project was constructed not only a landscape ecosystem of more than 1.6 million of “three mountains and nine parks” but also fitness footpath of more than 30 kilometers and outdoor fitness venues of 23,000 in combination with the mountains and flood discharge ditches to provide larger fitness and entertainment spaces for the surrounding communities and enhance the cultural atmosphere of communities. Owners spontaneously organize over 1,000 outdoor activities every year, such as mountain day, Taijiquan exercises, tree planting and community marathons (including more than 1,200 indoor activities). Such activities not only create a comfortable and pleasant atmosphere in the ELITE CITY itself but also beautify the street scenery in the area. Therefore, such activities as an important component of urban landscape contribute to the creation of high-quality urban quality and beautiful scenery.

### Increasing green area and creating a healthy microclimate

First, the green coverage rate of the community reaches over 70%, with a per capita green area of 20 m<sup>2</sup>, which is more than 7 times higher than the standard requirements. The negative oxygen ion content reaches 10,000/cm<sup>3</sup>, and the community is known as a “WELL Community in a forest park”. Second, plant species, including broad-leaved plants are reasonably arranged to enhance their carbon sequestration capacity, and reduce carbon dioxide emission by over 23,000 tons annually; and third, improve the surrounding environment and the surrounding microclimate of the community to create a healthy air quality.

### Improve ecological environment and ensure biodiversity

After the planting soil is backfilled in the cliff areas of Quanzi Mountain, Wanghualou Mountain and Aози Mountain, native plant with strong soil fixation ability, such as cotinus coggygria, flowering peach, purple-leaf plum, sophora japonica var golden, cherry blossom and black locust, are used to ensure the stability of the soil slope while increasing the richness of mountain greening; and more than 40 species and 100,000 water resistant plants such as metasequoia are planted around the flood discharge ditch. In addition, wooden bird nests are arranged on both sides of parks and roads to attract bird for habitation, and pigeon squares are constructed to effectively enrich biodiversity.

## **Rainwater and sewage recycling to save water resources**

**First, the construction of sponge city.** Based on the natural resource conditions of the project, build a mountain water reservoir, and a greening fish-scale pit on the mountaintop, and build a soil covering building and sponge demonstration base near the mountain to achieve the goal of collecting and reusing mountain rainwater, infiltrating rainwater, and reducing runoff; and the conservation function of "infiltration, stagnation and storage" of rainwater is comprehensively enhanced. The flood discharge ditch of the community has opened the valley hydrological corridor with three mountains to enable the community to become a demonstration park of sponge city. **Second, recycling of reclaimed water.** Construct a large-scale community reclaimed water station with an actual daily capacity of 10,000 m<sup>3</sup> to achieve 100% reclaimed water irrigation for green areas, and the reclaimed water can meet the needs of landscape irrigation and garage flushing in residential areas of the community.

## **Continuously improve the environment to attract residents to purchase properties**

Continuously optimize and improve ecological infrastructure construction to gather popularity for local governments and increase taxes, bring economic and social benefits to the investment and construction party, seek greater development space for operators, and bring more improvement to the living environment quality and appreciation space for owners. Since 2004, the project has become from a barren land to a community of over 110,000 people, and high-quality ecological environment is one of the important factors for residents to settle down. Combined with the construction of commercial and other supporting facilities, it directly provides over 15,000 job opportunities to drive 35,000 people in the surrounding areas. Shandong Genfu Company has ranked first in the Shizhong District of Jinan City in terms of tax payment amount for many years.

### **Well Being :**

#### **Provide outdoor fitness space and advocate a healthy lifestyle.**

Relying on the advantages of the mountain, build a 30 km of fitness footpath around the mountain and a 23,000 m<sup>2</sup> of outdoor fitness venue, equipped with a football court and basketball court, an over 5,000 m<sup>2</sup> of elderly activity space and an over 6,400 m<sup>2</sup> of children's activity space.

#### **Increase the green area and create a healthy microenvironment.**

First, the green coverage rate of the community reaches over 70%, with a per capita green area of 20 m<sup>2</sup>, which is more than 7 times higher than the standard requirements. The negative oxygen ion content reaches 10,000/cm<sup>3</sup>, the surrounding environment and the surrounding microclimate of the community can be improved to create a healthy air quality. The trees and vegetation in mountain parks can absorb a large amount of carbon dioxide and other air pollutants, including ozone, sulfides, and carbon monoxide. Second, trees and vegetation can reduce the concentration of particulate matter and pollutants in the air, improve air quality, lower urban temperatures, provide cool shade, and regulate air humidity. Third, a high-quality living environment has a very positive impact on urban vision and noise control.

#### **Enhance the cultural atmosphere of community**

Based on the unique space supporting facilities, create the "Fan Community" brand, set up 28 owner interest clubs, held over 1,200 events annually, with nearly 30,000 owners participated. In addition, a Quancheng Study has been built in the forest park, with a collection of over 10,000 books, and it is a "spiritual paradise" for book enthusiasts to promote the upgrading of community service and cultural facilities.

### **Social Cohesion :**

#### **Enhance the cultural atmosphere of community**

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#### **Biological science popularization base**

The ecosystem of "three mountains and nine parks" is rich in flora and fauna to become an educational base for schools in the community to organize outdoor activities and popularize biodiversity.

#### **Build green and WELL Community image**

The per capita green area is 20 m<sup>2</sup> and is more than 7 times higher than the standard requirements. The negative oxygen ion content reaches 10,000/cm<sup>3</sup>, the surrounding environment and the surrounding microclimate of the community can be improved to create a healthy air quality. At the same time, the outdoor fitness and entertainment space conveys a healthy lifestyle to help the ELITE CITY community win the titles of "WELL Community Gold Level Operation Certification" and "Global Green Model Community".

### **Preservation / Environmental Improvement :**

#### **Use local materials to reduce transportation carbon emission**

Backfill the excavated earthwork of surrounding buildings into the mountain mine, use local materials to turn waste into treasure. This not only reduces waste caused by the outward transportation of earthwork, but also restores the exposed mountains. A total of 6 broken mountains with an area of over 300,000 has been restored.

#### **Protect the environment to reduce secondary damage**

During the construction process of pedestrian mountain climbing footpath, we proactively abandoned the use of mechanical equipment and used primitive transportation tools such as mules to transport building materials so as to reduce secondary damage to the mountain.

#### **Improve ecological environment and enhance biodiversity**

After the planting soil is backfilled in the cliff areas of Quanzi Mountain, Wanghualou Mountain and Aozi Mountain, native plant with strong soil fixation ability, such as cotinus coggygia, flowering peach, purple-leaf plum, sophora japonica var golden, cherry blossom and black locust, are used to ensure the stability of the soil slope while increasing the richness of mountain greening; and more than 40 species and 100,000 water resistant plants such as metasequoia are planted around the flood discharge ditch. In addition, wooden bird nests are arranged on both sides of parks and roads to attract bird for habitation, and pigeon squares are constructed to effectively enrich biodiversity.

### **Resilience :**

Combined with the condition of the mountain to be restored by the project, water and soil erosion will be reduced by building mountain reservoirs and green fish scale pits on the top of the mountain, and intercepting ditches will be set up along the mountain trails, and construction technologies such as permeable pavement, rainwater collection, sunken green spaces, and rain gardens will be implemented to enhance rainwater. The conservation function of "seepage, stagnation, and storage" reduces water and soil erosion, and the total annual runoff control rate reaches more than 75%, reduces the occurrence of debris flow disasters, and improves the adaptability of surrounding areas to natural disasters and the resilience of mountains. The restored mountain is more solid and stable, preventing debris flow from flowing into surrounding houses, reducing the scope and damage of disasters, and thus improving resilience after natural disasters. The flood discharge ditch can control mountain runoff, reduce the scale of debris flow, reduce the damage of debris flow to the surrounding environment, improve the ability to resist natural disasters, and make the mountain more resilient. In addition, mountain restoration increases the diversity and strength of ecosystems to increase resilience to natural disasters. The restored mountain is more beautiful and the environment is more beautiful. It also provides a good ecological environment for local residents and tourists, promotes the development of social economy and improves the living environment of local people.

[Responsible use of resources :](#)

#### **Rainwater and sewage recycling to save water resources**

**First, the construction of sponge city.** Based on the natural resource conditions of the project, build a mountain water reservoir, and a greening fish-scale pit on the mountaintop, and build a soil covering building and sponge demonstration base near the mountain to achieve the goal of collecting and reusing mountain rainwater, infiltrating rainwater, and reducing runoff; and the conservation function of "infiltration, stagnation and storage" of rainwater is comprehensively enhanced. The flood discharge ditch of the community has opened the valley hydrological corridor with three mountains to enable the community to become a demonstration park of sponge city. **Second, recycling of reclaimed water.** Construct a large-scale community reclaimed water station with an actual daily capacity of 10,000 m<sup>3</sup> to achieve 100% reclaimed water irrigation for green areas, and the reclaimed water can meet the needs of landscape irrigation and garage flushing in residential areas of the community.

#### **Reduce carbon emission**

First, reasonably arrange plant species, strengthen their carbon sequestration ability, and plant broad-leaved and evergreen plants in priority, the annual carbon sequestration amount of the Project can be calculated according to the carbon sequestration capacity of the corresponding plants as  $161.01 \times 10,000 \times 14.3 \text{ kg/m}^2 = 23,024 \text{ tons}$ .

#### **Use local materials to reduce transportation carbon emission**

Backfill the excavated earthwork of surrounding buildings into the mountain mine, use local materials to turn waste into treasure. This not only reduces waste caused by the outward transportation of earthwork, but also restores the exposed mountains. A total of 6 broken mountains with an area of over 300,000 has been restored.

#### **Protect the environment to reduce secondary damage**

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## Governance

Shandong Luneng Genfu Development Co., Ltd.

[Holder Type :](#) Public Local Firm

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## Sustainable Solutions

Ecological Rehabilitation

[Description :](#)

#### **Existing problems**

There were several quarries within the Project. Poor management in the early stage and the long-term mining of stone and limestone has resulted in multiple mining pits and dilapidated mountain body, which not only severely damages biodiversity and ecological environment but also poses a risk of landslides and falling rocks.



The terrain of ELITE CITY is high in the east and low in the west, high in the south and low in the north. There are dozens of naturally formed flood discharge ditches along the residential areas, which erode the surrounding roads to different degrees, and seriously damage the surrounding vegetation.

#### **Construction ideas and objectives**

**Improve ecological environment and enhance biodiversity.** Carry out mountain restoration, garden construction, ecological restoration and flood discharge ditch landscape improvement and other work, to create an "city oasis" ecosystem with high greening rate; achieve a fundamental change in the ecological environment of the area, and enhance the biodiversity science popularization education base.

**Enlarging fitness space and upgrading humanistic care.** Combine the mountain and the park to create a rich fitness and entertainment space for children and the elderly, and for activities and leisure, enhance the cultural atmosphere of the community, and embody the concept of harmonious coexistence between man and nature.

**Strengthen the reclamation of waste water and create a sponge water storage demonstration.** Build mountain reservoir and green fish scale pit at the mountain top, and build earth-covered buildings and sponge demonstration base near the mountain, to comprehensively enhance the conservation function of rainwater "seepage, stagnation and storage", and create a sponge city demonstration park.

#### **IAdvantages and significance of construction**

The nine parks, Lingxiu Park, Quanzi Mountain Park, Yuanxiang Sports Park, ELITE CITY Forest Park, Hongyegu Park, Aozhi Mountain Park, ELITE CITY Sports Park, Wanghualou Mountain Park and Huoli Park, were created based on Quanzi Mountain, Aozhi Mountain, Wanghualou Mountain and flood discharge ditch, forming a **community ecosystem of “three mountains and nine parks”**, with the total green area of 1.6101 million m2, which is called the “Backyard Garden of Jinan”.

**Provide outdoor fitness space and advocate a healthy lifestyle.** Based on the advantages of the mountain, a fitness trail of 30 km around the mountain and outdoor fitness venue of 23,000 m2 were built, equipped with special areas for football and basketball; it is also provided with an elderly’s venue of over 5,000 m2 and a children’s venue of over 6,400 m2, assisting the Project to win the title of **“the First and Largest Gold Certification of Healthy Community Operation in China”** and **“Global Green Demonstration Community”**.

**Enhance the cultural atmosphere of community.** Based on the unique space supporting facilities, create the “Fan Community” brand, set up 28 owner interest clubs, held over 1,200 events annually, with nearly 30,000 owners participated. In addition, a Quancheng Study has been built in the forest park, with a collection of over 10,000 books, and it is a “spiritual paradise” for book enthusiasts to promote the upgrading of community service and cultural facilities.

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**Recycle the reclaimed water.** Construct a large-scale community reclaimed water station with an actual daily capacity of 10,000 m3 to achieve 100% reclaimed water irrigation for green areas, and the reclaimed water can meet the needs of landscape irrigation and garage flushing in residential areas of the community.

- Air quality
- Soil management
- Management of natural areas
- Environmental charter

## Photo credit

Shandong Luneng Genfu Development Co., Ltd.

## Contest

## Building candidate in the category



Users' Choice

