Large-Scale Sustainable Landscape Projects in China

Presenters
- HU, Jie ASLA
- ZHENG, Xiaodi ASLA

Background
In the background of economic globalization, China has entered into the phase of rapid development of urbanization.

On the one hand, the construction of new cities and new regions have entered into a peak period, and the urban scale landscape planning and design projects are quickly spreading nationally;

On the other hand, the imbalance of urban physical environment and spiritual environment, and the disappearing of city culture has lead to the similar characters and similar planning and design between cities.

Our solutions
- Inherit and develop the outstanding urban landscape theory in and out of China
- Break out of microscopic scale landscape planning and design
- Strengthen the category of "Ecology and Culture as the Guide of Landscape Planning and Design in Urban Scale"
- Establish a complete theory system of landscape planning and design

The landscape planning is not only the green space system planning, but also is a part of city master planning under the lead of urban planners.

The landscape architects know about nature very well, which is basis of city forming. How to develop the naturalness of urban city is the spirit source of creation, and the landscape architects can provide various argumentations and alternative plans to the planners.

Urban scale landscape planning and design does not only meet the needs of man and nature, and also adapts to urban social and cultural atmosphere, will excavate, maintain and create the distinguished city characteristics, so as to enhance the city image and improve urban competitiveness.

Urban scale landscape planning and design respects the natural texture, inherits the urban culture, and supports the urban ecological and cultural construction with the generous natural conditions and cultural heritages.

The goal of urban scale landscape planning and design is to minimize environmental pressure brought by urban growth, and bring traditional Chinese landscape design concept and modern ecological techniques into new city development.
Case Study 1: Beijing Olympic Forest Park Planning and Design, China

The site of the park is 6.8 ha. and is located in the North of urban Beijing where the city meets natural forests. It is the northern end of the historical South-North Central Axis around which the city developed and along which are situated National monuments such as the Forbidden City, Coal Mountain, etc.

As a key component of the Olympic Green, it is part of a master plan entitled 'Axis to Nature' established by the Olympic Committee and designed to make a transition from the urban environment; from a severe urban context to a new ecosystem planned according to principles of sustainable development.

In order to respect the cultural significance of the Central Axis and the urban context of the Forest Park, the laws of Feng Shui guided preliminary design workshops to create the landscape formations. The design was developed to merge traditional Chinese landscape concepts that emphasize the need for the artificial to appear natural and harmoniously picturesque, with contemporary technologies.

Culture & Nature

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Main Mountain — Yangshan Mountain

The analysis of other important mountains in Beijing helped to establish the location, orientation, dimensions and design of our new landforms.
Why we build an artificial mountain here:

- The mountain was constructed with the construction and excavation for the Olympic Subway, Olympic Avenue and adjacent development area.
- No new soil was brought into the Olympic Forest Park site to construct the mountain.
- The mountain is a new landmark in the north of the city.

Tian Jing (Land of Heaven) — The Peak of Yangshan Mountain

Tian Jing is enhanced with tall Chinese pines, scenic stones and a sight-seeing platform. Visitors can pause here for a brief appreciation of the views of the Lake and central axis or can linger longer to enjoy the enchanting scenes.

Looking South along Central Axis

Brooks Running down the Forests

Water falls from the mountain to form brooks that flow through forests to the main lake. A series of scenes are designed around the brooks which progressively pass through ecological plant communities of mixed woods, grassland, and lakeside wetlands.
Olympic Forest Park is the first domestic urban park overall making use of reclaimed water as the source of water system and recharge for landscape water.

### The Water System

- Total Water Surface: 67.7 hectares
- Water Surface of the Main Lake: 20.3 hectares
- Constructed Wetland Surface: 5.7 hectares
- Municipal River Surface: 25 hectares
- Existing Water System: 16.6 hectares

### Water Treatment Process in the Wetlands

- Increase the liability of the entire water treatment system
- Demonstrate a variety of water treatment technologies
- Integrate water treatment functions with scenic effects
- Construct a natural and ecological treatment system
- Provide an educational center for ecological education

### Underwater Corridor

- Observation of wetland from a different view
- Education for the structure of wetland
- Block off water flow
- Slow water speed

### Flowers Terrace

- Aeration
- Scenic Effects
Greenhouse for Water Purification

- Reduce pollution content in the water and improve water quality
- Offer a scientific and interest scenic spots for the public
- Show a new and secure sewage water ecological treatment technology
- Provide a design demonstration of urban landscape water purification system

Distribution of the buildings that adopt sewage treatment techniques

Zero discharge and reclamation ensures zero pollution to environment

Main Techniques
- Membrane Bioreactor (MB)
- Fast Bio-degradation Treatment (FBT)
- Bio-Degradation of Dejection Treatment (BDT)

Stormwater Utilization System

- Make use the conditions of topography, hydrology and municipal storm water.
- Make use of municipal river-ways and lake water system to collect rain water.
- Make use of the collected water to irrigate and to wash the roads.
- Make use of green lands in the park to increase the permeability of hard paving.

Planting and Biodiversity Design

- Tolerance Capability
- Eco-efficiency
- Biological Features
- Aesthetic Value
- Natural
- Semi-natural
- Artificial
- Site Conditions
- Transport
- Geology & Hydrology
- Vegetation
- Landscape Consideration
- Zoning of Planting
- Plant Community Modeling
Ecological Contributions to Beijing

- Annual output of Oxygen: 5490t
- Absorption of CO2: 5200t
- Annual absorption of SO2: 32t
- Annual dust detainment by trees: 4600t
- Annual recharge of water: 6.7 m³
- Forest Humidity: 27% higher than the other place
- Forest Temperature: 3-5°C lower in Summer,
- 2-4°C higher in Winter

The Swift Tower —— The First Swift Tower in China

- Protection: Protect Beijing Swift Species and Biodiversity
- Combination: Ideal Habitat and Special Landscape
- Creation: Scientific Techniques and Artistic Form

The Ecological Corridor

- Location: Over the highway known as the 5th Ring Road, which divide the Forest park as a northern and a southern part.
- Functions: To link southern part and northern part of Olympic Forest park, and to provide pathway for the movement of animals.

Technologies for Eco-buildings

- External Wall Thermal Insulating
- Geothermal Pump System
- Optical Lighting
- Independent humidity and temperature control air conditioning system
- Eco-core System
Solar Photovoltaic Panels

- Non-polluted
- Educational
- Environmental benefits

Solar Photovoltaic Panels Combination with Landscape Furniture

Area: 550㎡
Power: 80Kw
Annual Electricity Generation: 80,000℃

The first domestic urban park to make use of recycling solid waste.

Case Study 2: Tieling Fanhe New City Planning and Design, China

Tieling New City General Plan

The city of Tieling is 35 kilometers away from Shenyang City, one of China’s top ten most dynamic cities. The New City is located 4 km south of old city’s municipal border and 4 km north of the region’s High-tech Industrial Development Zone.
From the site satellite photos, it could be seen that there was no complete natural environment in the New City. The mountain and the city area were separated by National Highway 102 and three artificial railway corridors. Many factories and villages were built at the foot of the mountain; therefore, the ecologically sensitive areas between the mountain and Liao River were damaged by artificial environment. The Fan River mainly had a mix of narrow and wide river courses, causing unstable water level. The construction of New City may also bring new ecological problems, such as air pollution, noise, groundwater pollution, etc.

Firstly, regarding the people's expressed love for the old city's Dragon Mountain and Chai River landscape, they yearned to have a traditional Shan-Shui garden city. Secondly, the area lacked high-quality leisure and entertainment facilities.

Therefore, we have planned to take advantages and make full use of the existing natural landscape conditions and landscape resources, create a modern ecological Shan-Shui garden city pattern, enhance the city's attractiveness and the cohesiveness of future construction.

STRATEGIES
1. Emphasize ecological corridors through the city;
2. Protect Lotus Lake Wetland;
3. Develop traditional Chinese characteristics and living environment.
Strategy 1, Emphasize Ecological Corridors Design

Fan River Ecological Axis

Tianshui River Urban Cultural Axis

Shen-Ha Highway

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Ecological Corridor 1:
Fan River Ecological Axis

The existing Fan River was only 50-60 meters wide with the ability of resisting flooding at a rate of once every 10 years.

The design has widened Fan River to 420 meters wide to create a large-scale ecological corridor with the ability of resisting flooding at a rate of once every 50 years.

It has kept the existing natural river stream and created an interaction between the River and the City.

The green coverage rate has reached 80 percent on each riverbank. Although it has reduced construction area, it can improve city’s natural features, strengthen the security of migration pathway between the Mountain and the River, and improve urban environment quality and provide leisure and entertainment space.

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Ecological Corridor 2:
Tianshui River Urban Cultural Axis

We have built a man-made river-Tianshui River in the middle of the city to form a new city central axis, which can also bring water from Fan River to form the city waterscape and also to enrich the Lotus Lake in the north.

The Tianshui River green space is the richest ecological landscape corridor, both in terms of its environmental protection function and its function as an urban ventilation channel.

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From the perspective of landscape ecology, it serves as the ecological link between the Lotus Lake Wetland and the Fan River Ecological Corridor.

From an urban disaster prevention perspective, it serves as a safe distribution site for resilience. The open space also has commercial function, such as tourism, sports and fitness activities.

Lotus Lake region is a mixed composition of degenerating rice fields, abandoned reservoir, fish ponds, and a number of artificial wetlands and natural river wetlands. Because of the overemphasis on agricultural production, the absence of management and the lack of environmental awareness, the wetland was gradually disappearing and water quality was seriously worsening.

Located on the East Asian Flyway of Migratory Birds, the region has rich bird’s resources: 15 species, 45 families, 83 genus and 165 unique types dominate: 43.2% of Liaoning Province bird species, 36.2% of Northeast region bird species, 12.4% of the national bird species. It is the home to Oriental White Storks, Swans, Mandarin Ducks, and other protected birds.
To meet this need for habitats protection, the city government had proposed a national wetland park, with a total area of 47 square kilometers, in order to give legal protection to the bird’s habitats.

The first step is to preserve 6.7 square kilometer as core area of Wetland Park to protect and attract birds.

Lotus Lake ecological habitats can approximately be divided into eight types: Open Water, Beach, Swamp, Grass, Tree, Paddy Field, Pond, and Village.

The bird habitats in the area are: Deep Water 37%, Shallow Water 32%, Cattail Swamp 15%, Reed Swamp 0.32%, Beach 7.62%, Ponds 1.05%, Shrub 3.25%, Trees 3.78%.

During spring, autumn and winter seasons the Lotus Lake had only one-third of the total surface water. The water quality could not meet the Standard of China for Landscape Water because of the spot pollution and surface pollution. Long-term sediment accumulation had contaminated the water, difficult for fish to survive.
To resolve these problems:

Construct a 3.1 kilometer-long artificial river - the "Tianshui River", to bring water from Fan River into the wetland, in the same time, form new urban central axis by waterscape.

Transfer 60,000 tons of sewage water from the sewage plant into the Wetland.

Build an artificial wetland area to treat the sewage water.

The artificial wetland purification area is 67.68 hectares. Wastewater will stay in the wetlands for the total of 7.5 days.

By processing through sub-surface wetland and free-surface wetland, the water can meet the Standard of China for Landscape Water. Therefore the rivers and lakes are fully linked to each other in the New City to provide long-term ecological infrastructure for the water security of the wetland.

C. Return Farmland to Forest

Build Fengguan Mountain with the earth excavation of Tianshui River, with a total green space of 150 hectares on the Mountain.

The richness of the mountain variations and the nearby area of planted trees have made the Lotus Lake a good living environment for many types of birds and wild animals, and have created a complete food chain for this area.
Strategy 3: Develop Chinese Traditional Culture

There is a Dragon Mountain in the Old City, and therefore we designed Phoenix Mountain to unite the Old City and the New City. The Dragon and Phoenix together is the luckiest sign for Chinese, and represents the Tieling people’s longing for a better life.

Ruyi Lake

Ruyi Lake is an important urban landscape that shows the San-Shui characteristics. It’s also a combination of the city politics, culture, finance, tourism and other functional services in the city open space.
The Administration Center represents not only the authority, but also the whole new human-oriented administration ideas. It was placed facing south on the central axis to command the four directions, which followed the eastern philosophy and satisfied the requirements of public safety. Living in a Shan-Shui garden city had long been the dream of everyday Chinese people, in ancient time only the Emperor’s imperial garden had such an ideal environment.
Project Background

Total Planning Area: 105 square kilometers, including 38.8 square kilometers of Core Area

2006 Site Photos

GIS Analysis

Using the concept “Better City, Better Life,” the design team addressed local culture and social characteristics through multi-faceted landscape strategies and ecological measures in order to reconstruct the brownfield.

Essential environmental components that affected the design process include: earthquake fault zones, land permeability, soil productivity, biological diversity, soil subsidence, surface water, land use, and landscape value.

Based on thorough analyses of these factors, decisions were made regarding the appropriate direction for land development, land-use configuration, functional structure, and environmental function zoning.

Improve the regional ecological environment by enlarging areas that have high ecological value to the environment such as woodland and water. After the design, the region ecological value has been increased by three times.

Strategies:
The City That Grows From Nature

1. The use of ecological methods to analyze regional ecological factors and to carry out a comprehensive evaluation system to build the ecological security pattern, and to balance the artificial and natural landscapes;
2. Form multi-level and distinctive urban ecological corridors;
3. Inherit the regional historic traditions and local characteristics, to shape an open, secure and comfortable urban environment, to integrate urban culture and the city image;
4. Build upon the existing condition and urban waste resources, bring in the urban ecological design concept to establish a multi-level urban ecological system for internal ecological cycle;
5. Research of environmental protection measures to establish a reasonable model for urban spatial development.

Technologies:

1. Subsidence Area Ecological Restoration
2. Garbage Hill and Coal Ash Hill Reformation
3. Recycle and Reuse
4. Red-Branch Ecological Protection
5. Artificial Wetland Water Purification System
6. Earthquake Fault Zone as Sports Area
7. Improve Urban Risk Management and Disaster Response Mechanisms
8. Solar Energy Street Light
Eco-City Master Plan Concepts

Ecology
- Material Reuse
- Recycled & Regional Content
- Green Power
- Pollution Reduction
- Optimized Energy Performance

Living
- Higher living standard
- Dynamic and enjoyable living and leisure environment
- Mixed Use of entertainment district with office, office, and civic center

Safety
- Provide and ensure a safe environment for human, wildlife, and urban ecology within surrounding context. Earthquake prevention, soil and land subsidence responsive management systems.

Eco-City Structure
- Urban Green Core
- Ecological Network
- Green Corridors in Finger-Like spreads

Eco-City Ecological Pattern

Ecological Pattern
Radiating Web Structure
City Planning Diagram

Eco-City Land Planning Distribution:
1. Urban green network branching out from the central green space
2. Ecological corridors extending out from the central green space toward the remainder of the Eco-City
3. Ecological corridors will divide the Eco-City into different function zones and ensure the future development

Eco-City Land Use Planning
Combination of the whole system analysis, take a full consideration to the core area as a center to the ecosystems capacity and to conserve land resources, to create an organic organization of urban functions, to form a high-efficient land-use structure to improve the comprehensive utilization of land resources.

- Green Area: 2068.9Ha
- Water area: 998.6Ha
- Other Area: 811.5Ha
- Planning Area: 3880Ha

Eco-City Core Area Master Plan
30.8 square kilometers
Central Park in Core Area

Garbage Hill Perspective Drawing

Central Park planning and design will continue the region Shan-Shui characteristic, and act as the inner city natural ecology, and history, culture and modern civilization integration. The park main idea is to preserve, restore and rebuild the existing landscape elements (hills, water, wetlands), create a beautiful environment, and provide a friendly close to nature space.

Ground Subsidence

The impact of coal mining to the natural environment can be seen mainly on water resources and soil surface destruction, leading to a certain level of land subsidence and water table changes. The after-effects are: ground subsidence basin, ground fissures, collapse pits, land function damage; permanent or seasonal water production and feet soil salinization.

Considering the possible future changes in terrain the landscape design is based on vegetation landscaping, we avoid hard landscaping and large-scale building construction, and we use earthquake-resistance wooden structure in the construction. We retain the original vegetation in the region to give a full transformation to the urban environment. Construct an organic road network between the city to maintain the infiltration between the city and the park.
Garbage Hill location is in the west side of the planning region, as a disposal area for Tangshan City domestic and commercial waste. The annual disposal volume is 289,800 tons with the total landfill volume of about 4.5 million tons and garbage pile up to 50 meters high. The garbage piling contains of organic-rich and loose garbage, the bottom of the hill is connected with the underground water causing a serious underground water pollution for about dozen of square kilometers and had a great impact to the surrounding neighborhood.

In addition, in the northeast planning region, there is a more than 30 meters high coal ash, emitted from Tangshan City power plant, with a large number of coal ash, coal residue, and coal rock.

Garbage Hill Strategy:
Create an anti-pollution layer at the bottom of the hill, implement garbage compaction and covered with soil and plant on the surface. Low lying land around the hill functions as the barrier between the garbage hill and the water area, to prevent water contamination.

Coal Ash Hill Strategy:
Transfer the unused soil from the planning area to the coal-ash area to improve the coal ash area soil quality. The existing good vegetation is retained and used for landscaping added with wild flowers plantation, high-resistance and anti-pollution ground covered for the green area.

Convert waste materials into treasure by reusing wasted dry branches, trunks and stems inside the eco-city as the ecological embankment, at the same time also function as lake transitional zone along the lakeshore for biological activity, provide a habitat for the insects and aquatic organisms, and a close-water experience for visitors.

Comparison before and after Construction
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Learning Objectives

- Reveal the procedure and complexity of bringing large-scale landscape projects from concept to reality under current Chinese system and regulations.
- Gain insight into the fascinating new role and opportunities for landscape professionals during the creation of new cities under China’s fast-paced urbanization process.
- Learn re-utilizing strategies of mining subsidence brownfield.
- Understand development challenges presented by coastal saline-alkali lands and learn design approaches adopted during development process of international metropolis.
- Learn about the opportunities, challenges and frustrations of American Landscape Architect practicing in China.

Q & A

2009 ASLA Annual Meeting & EXPO Annual Meeting: September 18-21 Exposition: September 19-20 CHICAGO

Beyond Sustainability: REGENERATING PLACES AND PEOPLE

Q & A