From GREEN BUILDING to GREEN ECO-CITY

ZHANG HUA, Vice President of China GBC
2014-06-03
National Green Building Campaign

I、National Green Building Campaign
II、Eco-Community Case Study
The General Office of the State Council issued the Green Building Campaign Plan on Jan. 1st 2013

- Newly built buildings (By end of 2015)
  - Complete more than 1 billion m²
  - 20% meet green building standard

- Existing building energy-saving renovation (By end of 2015)
  - Complete over 400 million m² renovation for energy saving
  - Build heating calculation system in north China
  - Complete 50 million m² renovation in hot summer and cold winter areas
  - Complete 120 million m² renovation for public buildings, and turn 0.4 million dilapidated buildings in rural areas into energy-saving residential units
  - By end of 2020, achieve virtual completion of renovation for urban residential buildings in north China
### National Green Building Campaign

#### 1) Related national and local policies

<table>
<thead>
<tr>
<th>Category</th>
<th>National policy</th>
<th>Local policies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Area</strong></td>
<td>✓By end 2015, complete 1 billion m² newly built green buildings.*&lt;br&gt;✓From 2014, green building standards implemented in:&lt;br&gt;• Buildings invested by government&lt;br&gt;• Affordable housing invested by cities and municipalities&lt;br&gt;• Large-scale individual public buildings &gt; 20,000 m²</td>
<td>Jiangsu: &gt; 100 million m²&lt;br&gt;Shandong: &gt; 50 million m²&lt;br&gt;Beijing: ≥35 million m²&lt;br&gt;Shanghai: ≥10 million m²</td>
</tr>
<tr>
<td><strong>Building</strong></td>
<td>✓By end 2015, 20% newly built buildings to reach green building standards*</td>
<td>Ratio of newly built buildings to comply with green building standards:&lt;br&gt;Jiangsu: From 2015, 100%&lt;br&gt;Shanghai: From 2015 30%&lt;br&gt;Guangdong: By end of 2020, &gt;30%</td>
</tr>
<tr>
<td><strong>Financial subsidy</strong></td>
<td></td>
<td>Shanghai: RMB60/yuan/m² (2-star and above)&lt;br&gt;Beijing: RMB22.5/yuan/m² (2-star)&lt;br&gt;RMB40/yuan/m² (3-star)</td>
</tr>
</tbody>
</table>

*Green building campaign plan (Doc. No.1 of General Office of the State Council of PRC)
2) Development scale of green building projects

- **No. of projects**: 1446 (2008-2013)
- **Total building area**: 160 million m².
- **Rising trend**:
  - Number of projects awarded green building credential rose by 81.0% on 2012
  - Area of projects awarded green building credential rose by 112.3% on 2012
  - 2-star and 1-star projects represent a rapidly rising trend

Annual amount developing situation of project awarded green building evaluation credential from 2008 to 2013

Star level ratio distribution figure of project awarded green building evaluation credential from 2008 to 2013

Overall Star level ratio figure of project awarded green building evaluation credential
3) Development and transformation of green buildings

- **From individual model to large-scale development:** Construct green eco-city according to principle of “act according to circumstance”, commencing with planning, and encouraging green building practice on large scale.

- **From design-oriented to operation-oriented:** by end 2013, 1446 projects had been awarded green building evaluation credential - 104 (7.2%) operation credential; obtaining operation credential is now a key focus area for green building design.

- **From newly built to newly built & renovation:** use new development area and old town renewal as important measures in promoting green building on large scale.

- **From simplified development to diverse development:** Focus on difference in regional climates and building types, construct according to green building evaluation star-level standards, expanding the diverse development of green building.
First 8 model green eco-city areas obtained national financial subsidy in 2012

- **Sino-Singapore Tianjin Eco-city**, 30km²
  - Pop.: 300-350k
  - 10-15 years construction

- **Tangshan Bay Eco-city**, 74.3km²
  - Pop.: 800k
  - 4-5 years construction

- **Taihu Eco-city, Wuxi**, 150km²
  - Pop.: 1000k
  - 8 years

- **Chenggong New Area, Kunming**, 160km²
  - Pop.: 1500k

- **Yuelai Green Eco-city, Chongqing**, 3.4km²
  - Pop.: 57k
  - 9 years construction

- **Guangming New Area, Shenzhen**, 156km²
  - Pop.: 800-1000k

- **Zhongtian Future Ark Eco-city, Guiyang**, 9.5km²
  - Pop.: 173k
  - 5 years construction

- **Meixihu New Area, Changsha**, 7.6km²
  - Pop.: 178k
  - 8 years construction
Coastal areas incl. Jiangsu, Guangdong, Shandong and Shanghai continue to comprise the highest number of awarded green buildings in China.

1446 green building projects (2008-2013)
National Green Building Campaign

5) Distribution of different building types

- 1446 green building projects (2008-2013)

“307 public building projects awarded green building credential in 2013”
6) Green building evaluation standards and systems are continuously improved
Eco-Community Case Study

I. National Green Building Campaign
II. Eco-Community Case Study
1 Key aspects in eco-region construction

- Road monitoring and traffic information system
- Car parking management system
- Water utilities management system
- Firefighting monitoring system
- Environmental hygiene management system
- Environmental monitoring system
- Landscape management system
- Resident information service system
- Energy-saving lighting system
- Communication system

- Graded usage of energy
- Renewable energy usage
- High-efficient road and landscape lighting

- Analysis of ecological loading capacity (for land, water resource, atmosphere and soil)
- Industry layout, control of land use and development intensity:
  - Transit Oriented Development (TOD)
  - Development of underground space

- Layout planning of green buildings by star rating
- Green project management
- Correct proportion of green construction model project

- Raise comprehensive species index and local vegetation index via biodiversity protection plan
- Matching of vegetation structures
- Accessibility to urban vegetation
- Ecological recovery in urban areas

- Defined transportation zones, road network density and grade allocation
- Public transportation prioritization
- Establish independent bicycle and pedestrian systems
- High capacity and efficiency road network

- Optimize water supply
- Water facilities maintenance
- Water-efficient fixtures in buildings
- Flood management system (using rainwater collection and utilizing technology)

- Analysis of ecological loading capacity (for land, water resource, atmosphere and soil)
- Industry layout, control of land use and development intensity:
  - Transit Oriented Development (TOD)
  - Development of underground space

- Layout planning of green buildings by star rating
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2) Eco-city area planning in South Jie Fang Rd, Tianjin

**Geographic Position**

- South Jie Fang Rd. area is located in the South-East part of Tianjin
Planning goal
Construct a green, healthy, and intelligent eco-city area, making it an ecological construction model of urban development and renovation practice.

Surrounding environment
✓ Tianjin Cultural Center
✓ Meijiang Exhibition Center
✓ Meijiang residential area
✓ Liulin sub-downtown area of Tianjin Steel Corp.

Planned total land use area: 16.29km²
Building area: newly added 16.17million m², maintain 3.61 million m²
Planned population: 350,000 (newly added 240,000)
Original appearance in the area

Area features

- Mainly comprises land for residential and public facilities
- Newly built area combined with existing areas
- High population density (21,000 people/km²)
- High development intensity
Overall planning orientation
✓ Two cores: North core & south core
✓ Three axes: Welcoming axis, ecological axis, TOD axis
✓ Four belts: Automobile park, home furnishing park, design park, Haihe Park

Divided into South & North Zones
✓ North Zone to serve as a “HQ base and high-tech service zone”
✓ South Zone mainly for ecological residence
✓ This forms the basic layout of “Ecology in South, Business in North”.
### Ecological index system

- Analyze ecological planning measures, taking into consideration natural conditions, social & economic development situations.
- Planning will focus on systems incl. city functions, land, water, energy, waste, buildings, transportation, landscape & vegetation, informatization acc. to city’s overall planning orientation.

**Ecological Environment Protection**

- Natural environment
- Man-made environment

**Green Development**

- Intensive development
  - Green building
  - Energy and low carbon
  - Water resource use
  - Material use and low carbon
  - Green transportation

**Healthy & Comfortable Life**

- Healthy environment
  - Convenient and livable
  - Comfortable and livable
  - Human care
  - Mixed-function areas

**Intelligent Life**

- Informatization facility
  - Energy management
  - Life convenience
  - Safety guarantee
Index system 1

Ecological Environmental Protection

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Green Development
- Intensive development
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Healthy & Comfortable Life
- Healthy environment
- Convenient and livable
- Comfortable and livable
- Human care
- Mixed-function areas

Intelligent Life
- Informatization facility
- Energy management
- Life convenience
- Safety guarantee
<table>
<thead>
<tr>
<th>Index level One</th>
<th>Index Level Three</th>
<th>Ecological Environmental Protection</th>
<th>Control level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Areas (existing)</td>
<td>Neighborhood</td>
</tr>
<tr>
<td>Natural environment</td>
<td>Local plant index</td>
<td>≥70%</td>
<td>≥70%</td>
</tr>
<tr>
<td></td>
<td>Green coverage</td>
<td>≥40% (≥31%)</td>
<td>≥40%</td>
</tr>
<tr>
<td></td>
<td>Park green area per capita</td>
<td>≥12m² (≥9m²)</td>
<td>≥1.5m²</td>
</tr>
<tr>
<td></td>
<td>Green coverage of residential area &amp; multi-layer vegetation on public land</td>
<td>≥90%</td>
<td>≥90%</td>
</tr>
<tr>
<td></td>
<td>Green coverage of riverside</td>
<td>100% (100%)</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Compliance rate of water quality</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Man-made environment</td>
<td>Environmental protection measures utilization rate in construction process</td>
<td>100% (100%)</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Sewage water treatment ratio</td>
<td>100% (100%)</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Solid waste collection ratio</td>
<td>100% (100%)</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Compliance rate of environmental noise</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Innocuous treatment rate of hazardous wastes and domestic garbage</td>
<td>100% (100%)</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Coverage of municipal pipelines</td>
<td>100% (100%)</td>
<td>100%</td>
</tr>
</tbody>
</table>

Residential buildings ≥40%
Public buildings ≥35%
Implementation effect of ecological landscape

- Natural bulk head: 80% utilize the natural type
- Self-cleaning of landscape water: Utilize combined treatment measures of physical, biological and chemical
- Use of regenerated water: Regenerated water utilized in green land irrigation
- Water-efficient planting: Flowers planted on mass scale to reduce lawn area
- Permeable pavement: 80% of the pavement utilizes permeable concrete
- Energy-efficient lighting: LED light source is 100% covered in landscaping lighting
Index system 2

**Ecological Environmental Protection**
- Natural environment
- Man-made environment

**Green Development**
- Intensive development
- Green building
- Energy and low carbon
- Water resource use
- Material use and low carbon
- Green transportation

**Healthy & Comfortable Life**
- Healthy environment
- Convenient and livable
- Comfortable and livable
- Human care
- Mixed-function areas

**Intelligent Life**
- Informatization facility
- Energy management
- Life convenience
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<table>
<thead>
<tr>
<th>Index level one</th>
<th>Index Level Three</th>
<th>Areas (existing)</th>
<th>Neighborhood</th>
<th>Buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensive</td>
<td>Construction land area per capita</td>
<td>≤70m²</td>
<td>≤100m²</td>
<td>Low levels≤43m²; Muti-levels≤28m²; Medium and high levels≤24m²; High levels≤15m²</td>
</tr>
<tr>
<td></td>
<td>Properly develop and use underground space</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Green building</td>
<td>Ratio of newly built green building</td>
<td>100% (30% above two-star)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Low carbon</td>
<td>Ratio of existed green building renovation</td>
<td>— (100%)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Water resource</td>
<td>Use ratio of clean energy</td>
<td>100% (100%)</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>use</td>
<td>Sub-item calculation ratio of energy classification</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Daily domestic water consumption per capita</td>
<td>≤100L (≤120L)</td>
<td>≤100L</td>
<td>≤100L</td>
</tr>
<tr>
<td></td>
<td>Rainfall penetration and collection use rate</td>
<td>≥50% (≥50%)</td>
<td>≥50%</td>
<td>≥20%</td>
</tr>
<tr>
<td></td>
<td>Unconventional water source use rate</td>
<td>≥50% (≥50%)</td>
<td>≥40%</td>
<td>Office≥60%; Residential≥30%</td>
</tr>
<tr>
<td></td>
<td>Water saving ratio of landscape design</td>
<td>≥75%</td>
<td>≥50%</td>
<td>≥50%</td>
</tr>
<tr>
<td></td>
<td>Ratio of water efficient irrigation</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Water use calculation ratio</td>
<td>100% (100%)</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Material use</td>
<td>Local material ratio</td>
<td>≥75%</td>
<td>≥75%</td>
<td>≥75%</td>
</tr>
<tr>
<td>and low-carbon</td>
<td>Ratio of reclaim and reuse material</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Ratio of using recyclable materials</td>
<td>—</td>
<td>—</td>
<td>≥10%</td>
</tr>
<tr>
<td></td>
<td>Integration of building, civil engineering and decoration</td>
<td>G</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>Green transportation</td>
<td>Coverage of slow transportation system</td>
<td>≥80%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Connection of fast &amp; slow transportation system</td>
<td>G</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td></td>
<td>Setting ratio of bicycle parking</td>
<td>≥15%</td>
<td>≥15%</td>
<td>≥15%</td>
</tr>
<tr>
<td></td>
<td>Setting ratio of gas station for hybrid vehicle/electric vehicle charging station</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Ratio of low emission and energy saving automobile parking</td>
<td>≥6%</td>
<td>≥6%</td>
<td>≥6%</td>
</tr>
</tbody>
</table>
### 100% use of clean energy

<table>
<thead>
<tr>
<th>Heating</th>
<th>Heating area (million m²)</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chen Tang heat &amp; power plant</td>
<td>8.6</td>
<td>43%</td>
</tr>
<tr>
<td>Gas station</td>
<td>4.2</td>
<td>21%</td>
</tr>
<tr>
<td>Converted gas station</td>
<td>6.1</td>
<td>31%</td>
</tr>
<tr>
<td>Renewable energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deep geothermal well</td>
<td>3 pairs of 3500m deep geothermal wells mined to provide heating for 500,000 m² residential buildings.</td>
<td></td>
</tr>
<tr>
<td>Ground source</td>
<td>3814 ground source heat pumps installed to provide heating and cooling for 560,000m² public buildings.</td>
<td></td>
</tr>
</tbody>
</table>

Pave 2014 shallow layer ground source heat pumps in Tai Hu Rd. Public Park.

Pave 1800 shallow layer ground source heat pumps in Wei Jin River Public Park.
Newly built: 100% green building
Existing: 100% green building

- Realize green renovation of existing residential buildings:
  - Building enclosure, incl. sloping roofs, insulation, windows, etc
  - Regional heating system
  - Lighting system upgrade
  - Site rainwater management

- Protection and utilization of buildings and landscapes of historic value
  - Green renovation scheme for existing factory building——General factory of electric machine
Rain water penetration and collection use rate $\geq 50$

Unconventional water source use rate $\geq 50$

- **Regenerated water**
  Use existing and planned water pipe system supplement water to:
  - Rivers
  - Central green oasis in planned area
  - Buildings

- **Rainwater**
  Rainwater gutter (grass gutter), rainwater garden, ecological rainfall gutter and permeable pavement supplement water to:
  - Rivers
  - Underground water supply
  - Buildings
Index system 3

- Healthy & Comfortable Life
- Ecological Environmental Protection
  - Natural environment
  - Man-made environment
- Green Development
  - Intensive development
  - Green building
  - Energy and low carbon
  - Water resource use
  - Material use and low carbon
- Intelligent Life
  - Healthy environment
  - Convenient and livable
  - Comfortable and livable
  - Human care
  - Mixed-function reas
  - Informatization facility
  - Energy management
  - Life convenience
  - Safety guarantee

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## Index system

<table>
<thead>
<tr>
<th>Index level one</th>
<th>Healthy &amp; Comfortable Life</th>
<th>Control level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Index Level Two</strong></td>
<td><strong>Index Level Three</strong></td>
<td><strong>Areas (existing)</strong></td>
</tr>
<tr>
<td>Healthy environment</td>
<td>Building meets minimum requirement of sunlight and natural light</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Compliance ratio of water hose quality</td>
<td>100% (100%)</td>
</tr>
<tr>
<td></td>
<td>Interval of household garbage collection</td>
<td>≤24h (≤24h)</td>
</tr>
<tr>
<td>Convenient and livable</td>
<td>Ratio of public service, cultural and sports facilities within 500m away of neighborhood</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Neighborhood coverage within 100m of schools</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Coverage of public bus stops within 500m of neighborhood</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Coverage of subway stations within 800m of neighborhood</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Ratio of handicap-accessible facilities</td>
<td>100%</td>
</tr>
<tr>
<td>Comfortable and livable</td>
<td>Roadside shaded ratio</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Ratio of exterior wind environmental computer simulating optimization design</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Intensity of urban heat island effect</td>
<td>≤1.5℃</td>
</tr>
<tr>
<td></td>
<td>Setting ratio of shading and wind shelter facilities in public bus stops</td>
<td>100% (100%)</td>
</tr>
<tr>
<td>Human care community</td>
<td>Protection and utilization of buildings and landscapes with historic values</td>
<td>G</td>
</tr>
<tr>
<td>Mixed community</td>
<td>Housing diversity index</td>
<td>≥40%</td>
</tr>
<tr>
<td></td>
<td>Mixed developing ratio of neighborhood</td>
<td>≥80%</td>
</tr>
</tbody>
</table>
Coverage of public bus stops within 500m of neighborhood: >80%

- 1 public bus hub
- 9 bus terminals

Coverage of subway stations within 800m away from neighborhood: >60%

- Combine subways with bus lines and stops.
- Layout of subways: five horizontal with one vertical.
Coverage of neighborhood within 1,000m away from schools: $\geq 80\%$

Coverage of public service and cultural, sports facilities within 500m away from neighborhood: 100%
Index system 4

Ecological Environmental Protection
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Green Development
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- Material use and low carbon

Healthy & Comfortable Life
- Healthy environment
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- Comfortable and livable
- Human care
- Mixed-function areas

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- Energy management
- Life convenience
- Safety guarantee
## Index system

<table>
<thead>
<tr>
<th>Index level one</th>
<th>Intellgent life</th>
<th>Control level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Areas (existing)</td>
<td>Neighborhood</td>
</tr>
<tr>
<td>Index Level Two</td>
<td>Index Level Three</td>
<td></td>
</tr>
<tr>
<td>Informzation facilities</td>
<td>Accessibility of users’ fiber-optic</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>-100%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wi-Fi coverage</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>-100%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Network inlet bandwidth per unit</td>
<td>Residential building≥100M (100M)</td>
</tr>
<tr>
<td></td>
<td>Public building≥1000M (1000M)</td>
<td>Public building≥1000M</td>
</tr>
<tr>
<td></td>
<td>Average Wi-Fi inlet bandwidth</td>
<td>≥5M (5M)</td>
</tr>
<tr>
<td>Energy management</td>
<td>Coverage of public building energy consumption monitoring system</td>
<td>100% (100%)</td>
</tr>
<tr>
<td></td>
<td>Coverage of landscape lighting intelligent monitoring managing system</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Installation ratio of household intelligent power meter</td>
<td>100% (100%)</td>
</tr>
<tr>
<td></td>
<td>Coverage of electricity using information collection</td>
<td>100%</td>
</tr>
<tr>
<td>Life convenience</td>
<td>Coverage of bus stops with electronic information screens</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Coverage of public parking lot guidance system</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Installation ratio of urban traffic guidance system</td>
<td>100%</td>
</tr>
<tr>
<td>Safety guarantee</td>
<td>Remote monitoring ratio of elevators in neighborhood</td>
<td>100% (G)</td>
</tr>
<tr>
<td></td>
<td>Intelligent video security monitoring</td>
<td>G</td>
</tr>
<tr>
<td></td>
<td>Installation ratio of security sensors in neighborhood</td>
<td>100% (G)</td>
</tr>
</tbody>
</table>
Intelligent Life Index

Image source: http://tw.nec.com/zh_TW/solutions-smartcity-smartcity2.html
**Range of Phase I**

- Phase I area is located in the south part, and the land use area is 5.76 km².
- The overall building area is approx. 7 million m², among which, the residential building area is 4 million m².
- The population in Phase I area is about 130,000.
- Commenced from the end of 2012.
Automobile park
A 4S automobile sales distributing center has generated spontaneously in recent years, and the renovation of the automobile park represents an upgrading of original industrial environment and a rebuilding of the ecological environment.

Urban complex:
Commercial as the core business type, having certain regional redial force.

Residential plot: Land use 42,900 m², building area 120,000 m².

Commercial: Consuming business type.

Urban park: Land use 120,000 m², promoting the development of commercial and business products in north.
Phase I residential buildings in South Jie Fang Rd.: One-star level green building

- Development and use of underground space
- Countryside plants and multi-layer vegetation
- Slow traffic network
- Permeable ground
- Natural lighting and ventilation
- Heating calculation and in-room temperature adjustment
- Water supplies and metering of differentiated quality
- Water-saving fixtures and equipment
- Water-efficient irrigation
- Reclaim and reuse of materials
- Handicap-accessible design

<table>
<thead>
<tr>
<th>Index</th>
<th>Index value</th>
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<tbody>
<tr>
<td>Total building area (m²)</td>
<td>Plot 22# 210,357</td>
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</tbody>
</table>
Community cultural and sports center in South Jie Fang Rd.

Awarded:
- Zero energy consumption building
- 3-star green building
- LEED Platinum
Thanks!