

# China-Singapore Tianjin Eco-city South District

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Extension + refurbishment

**Address 1 - street** : 300450 ,

**Gross density** : 78 /ha

**Population** : 110 000

**Number of jobs** : 40 000

**Starting year of the project** : 2008

**Delivery year of the project** : 2020

**Key words** : Eco-environmental protection, energy saving and emission reduction, green building, circular economy



780



2 147 483 647 ¥

**Certifications :**

## ID CARD

Tianjin Eco-city, which used to be saline-alkali wasteland before its construction, is located in Tianjin Binhai New Area between Tanggu and Hangu with a total area of about 30 km<sup>2</sup>. In 2007, it was determined under the Sino-Singapore framework agreement that Tianjin Eco-City shall be built into an ecological city with "resource conservation, environmental protection and social harmony," and "become the model for the sustainable development of other cities in China." Since its commencement in 2008, the southern part of Tianjin Eco-city has been reached 95% of its design plan after 10 years of construction, which covers a total area of 7.8km<sup>2</sup> and plans to accommodate a total number of 110,000 people.

In terms of management, the high-level coordination and promotion mechanism has been established. At present, Construction Bureau of Sino-Singapore Tianjin Eco-City, as the competent department of planning and construction in specific planning and implementation, is mainly responsible for the regional urban and rural planning and land and resources administration of Tianjin Eco-City.

In terms of living quality, the proportion of residential areas with free sports and recreational facilities within 500 meters reaches 100%. To construct economical community, customized systems and services have been formulated to serve no more than 30,000 people of different groups within a radius of 500 meters in daily

medical care, business services, culture, and sports, etc.

In terms of economic development, it shall establish a comprehensive platform for technological innovations and applications in eco-environmental protection, energy conservation and emission reduction, green buildings and circular economy; a modern hi-tech ecological industrial base; a internationalized livable demonstration new city with 'resource-saving and environmentally-friendly features'; build the internationalized ecological cultural tourism, leisure and recreational area.

In terms of resource protection, Tianjin Eco-city has special plans for water supply, sewage, rainwater and reclaimed water to ensure the quality and safety of regional water supply; adopts advanced and applicable technologies to remedy the contaminated soil by adjusting measures to local conditions, so as to play a demonstration role as a national project in ecological restoration and construction of the saline-alkali soil; domestic garbage is collected separately and transported under closed conditions, and recyclable and renewable garbage is recycled by the Garbage Recycling Center.

In terms of biodiversity, Tianjin Eco-city has proposed a plan for biodiversity that the local plant index shall be no lower than 0.7. It has also restored and constructed two bird habitats (Parrot Cay and Egret Cay) and the ecological environment succession area in Yongding Island to protect the living environment of the local biotic population to the most extent. These standards enabled Tianjin Eco-city to have a total of 469 animal and plant varieties in 2013, including 332 animals and 137 plants.

## Programme

- Housing
- Offices
- Businesses and services
- Public facilities and infrastructure
- Public spaces
- Green spaces

## CO2 Impact

CO2 Impact : 1 040 000 CO2

## Method used to calculate CO2 impact

In terms of conventional energy applications, according to the energy-saving situation of buildings, the future eco-city 25 million square meters of buildings can save 103.08 million KWh of energy per year and reduce 1.04 million tons of CO2 emissions.

## Project progress

- Management phase

## Procedure type

- Urban développement permit

## Prescriptions and zoning

- Natural protection area
- Mountain area regulation

## Key points

- Quality of life
- Economic development
- Biodiversity

## Approaches used

- Ecodistrict national label
- Local charter

## Certifications

- Ecodistrict national label
- Autre

## Data reliability

Assessor

## TERRITORY

### Type of territory

Tianjin Eco-city, which used to be saline-alkali wasteland before its construction, is located in Tianjin Binhai New Area between Tanggu and Hangu with a total area of about 30 km<sup>2</sup>. In 2007, it was determined under the Sino-Singapore framework agreement that Tianjin Eco-City shall be built into an ecological city with "resource conservation, environmental protection and social harmony," and "become the model for the sustainable development of other cities in China." Since its commencement in 2008, the southern part of Tianjin Eco-city has been basically completed after 10 years of construction, which covers a total area of 7.8km<sup>2</sup> and plans to accommodate a total number of 110,000 people.

## KEY FIGURES

### Green areas, roofs included

Green areas, roofs included : 4 000 000 m<sup>2</sup>

### Public spaces area

Public spaces area : 1 643 508 m<sup>2</sup>

### Office floor area

Office floor area : 829 663 m<sup>2</sup>

### Commercial floor area

Commercial floor area : 499 885 m<sup>2</sup>

### Public facilities floor area

Public facilities floor area : 81 404 m<sup>2</sup>

### Housing floor area

Housing floor area : 4 751 982 m<sup>2</sup>

### Number of residential units

Number of residential units : 50 000

### Number of social housing units

Number of social housing units : 10 000

### Green spaces /inhabitant

36.36

### Public spaces/inhabitant

14.94

### Total investment costs (before tax)

Total investment costs (before tax) : 628 ¥/m<sup>2</sup>

### Amount of the investment taken in charge by the local authorities

Amount of the investment taken in charge by the local authorities : 220 000 000 ¥/m<sup>2</sup>

## Project holder

**Name :** Construction Bureau China-Singapore Tianjin Eco-City

**Type :**

**General description :**

In 2008, Sino-Singapore Tianjin Eco-City Construction and Management Bureau was established, which is mainly responsible for the regional urban and rural planning and land and resources administration of Tianjin Eco-City as the competent department of planning and construction; management of construction and transportation; construction management of municipal public infrastructure, house buildings, landscaping and supporting facility projects; preparation, supervision and implementation and evaluation of green building indicator system.

## Project management

**Description :**

**Overall management:** It is mainly responsible for the regional urban and rural planning and land and resources administration of Tianjin Eco-City; management of construction and transportation; construction management of municipal public infrastructure, house buildings, landscaping and supporting facility projects; preparation, supervision and implementation and evaluation of green building indicator system.

**Public participation:** Tianjin Eco-City has a variety of forms for public participation during construction, including publicity, voting, dialogue and propaganda.

**Capital integration:** Government-invested projects are funded through the finance appropriation, and the competent department of the Management Committee implements project construction through the agent construction company.

**Whole process management method:** To achieve the goal of 100% green buildings, the Eco-City has formulated the *Interim Provisions on the Management of Green Buildings in Sino-Singapore Tianjin Eco-City* (hereinafter referred to as the *Provisions*) which was implemented as of September 1, 2010, requiring that activities of all construction projects in the Eco-City at the stages of planning, design and construction, operations management and evaluation shall be implemented in accordance with the *Provisions*. In addition, it has formulated control requirements for such processes as planning and design, green construction, operations management and evaluation of green buildings, covering the whole process of the construction of green buildings.

## Project stakeholders

Tianjin Eco-city Green Building Research Institute

**Function :** Technical consultancy agency

In June 2011, Sino-Singapore Tianjin Eco-city Green Building Institute was formally established to provide third-party professional evaluation for green buildings in the Eco-City. The evaluation includes the compliance review at the stages of design, construction and acceptance in accordance with the green building evaluation standard and declaration for star-level evaluation logo of green buildings according to the actual conditions of buildings.

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Tianjin Eco-City Investment and Development Co., Ltd.

**Function :** Developer

The Company has two responsibilities: the responsibility to purchase, sort and store land in the Eco-City; responsibility to carry out the construction, operation and maintenance of relevant facilities in accordance with the plan of the Management Committee of the Eco-City. The company is also entitled to corresponding investment, operation and income rights.

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## SOLUTIONS

Tianjin Eco-city Investment and Development Co., Ltd.

**Description :**

## Quality of life / density

First of all, the proportion of residential areas with free recreational facilities within 500 meters in Tianjin Eco-city reaches 100%. Combined with the community service center and slow traffic system, the community park and street greenbelt are constructed, so that residents have access to the street greenbelt and ecological cell center by walking 300 meters from any point in the ecological community, the community park and ecological community center by walking 500

meters and large-scale park by walking 1,000 to 2,000 meters. 80% of the trips can be achieved within 3km. In addition, the free public traffic system in the Eco-City, together with the plan for 100% coverage within 500 meters, ensure the convenience for residents to commute via green traffic in the Eco-City.

## Net density

-0.03

## Culture and heritage

### 1 Cultural inheritance and promotion

Protect tangible and intangible cultural heritages, integrate historical culture and modern culture and shape regional characteristic culture. Build ecological civilization and carry out green and healthy modes of production, living and consuming.

### 2 Protection of intangible cultural heritages

Protect traditional regional cultures such as Hangu Printmaking and Flying Cymbal (a kind of folk art combining traditional music, dance and martial art), cultivate talents for inheritance, promote the continuation of regional intangible culture and maintain diversity and creativity; explore the culture of the Jiyun River and actively build a cultural environment.

### 3 Protection and renewal of original villages

Qingtuozi Village: Protect and utilize the texture and spatial pattern of Qingtuozi Village, and transform the village into a comprehensive cultural functional area integrating characteristic tourism and folk activities through renovation, remediation and renewal.

Wuqi Village: Transform the village in accordance with planning, utilize the original industrial structures and other facilities combined with the landscape design and preserve historical memory.

## Social diversity

Carry out joint regulation of urban industrial structure and population structure; implement various policies for attracting high-quality talents; properly resettle the original rural residents and provide housing and employment security; reform the household registration management mode and reduce the obstacles to the flow of talents to enable migrant personnel to enjoy the treatment of citizens.

Build hospitals, sanatoriums and standardized community medical and health service centers, promote dual referral and push down the focus of basic medical services. Build advanced clinical medical centers and modern general hospitals with domestically and internally advanced level, and improve the medical aid and charitable medical aid system.

Build an ecological community with a service radius of about 500 meters and a service population of no more than 30,000, which mainly provides residents with daily healthcare, commercial services, cultural and sports services, finance, post and telecommunications and public management and other services.

## Social inclusion and safety

The master plan of the Eco-City clearly points out that a comprehensive command center shall be established in the Eco-City, which integrates functions of public security, fire control, traffic and disaster prevention and mitigation. Improve healthcare service facilities and safety guarantee system.

Establish the public security prevention system with organizational coordination, rapid response, efficient operation and in-place service to improve the level of social security. Improve the social relief and security system, build a multi-channel, multi-level, convenient and effective system for resolving contradictions and prevent mass incidents. Formulate and implement safety precautions for large-scale venues, strengthen safety supervision and timely detect and eliminate the hidden danger of accidents to ensure the safety of the masses. Strengthen the security protection of transportation, power supply, water and gas supply facilities and major government departments and enhance their stability and resistance to destruction, so as to prevent terrorist attacks and secondary and derivative disasters. Establish the emergency mechanism and basic database of emergency management of the Eco-City, maintain and update in a timely manner and prevent high-tech crimes and hidden danger of information security, so as to provide support for counter-terrorism disposal.

## Ambient air quality and health

Targeted standard of ambient air quality: Before 2020, the total number of days of secondary or higher air quality level in one year shall be no less than 275, comprehensive air quality index shall be improved by 20%, and concentration of PM 2.5 shall be no higher than 55 $\mu\text{g}/\text{m}^3$ .

Targeted standard of noise in functional area: It shall meet the requirement stipulated in the *Quality Standard for Acoustic Environment* (GB3096-2008) and rate of reaching requirement of *Technical Specification for the Division of Functional Areas in the Acoustic Environment* (GB/T15190-2014) reaches 100%

The upper reaches of Tianjin Eco-city are seriously polluted. Setting up circulation pump stations and culvert gates to introduce desalinated seawater and reclaimed water and achieve measures such as surface water connection in the city can ensure that the quality of the surface water in the city meets Category IV standard.

Garbage collection and utilization rate is no lower than 70%, and the reuse rate of effluent from the centralized sewage treatment facilities reaches up to 100%.

## ECONOMIC DEVELOPMENT

### Local development

Comprehensive platform for technological innovation and application and popularization of eco-environmental protection, energy conservation and emission

reduction, green buildings and circular economy; national eco-environmental training and popularization center; modern hi-tech ecological industrial base; "resource-saving and environmentally friendly" demonstration new town that is suitable for living; exchange and display window with participation in the construction of international ecological environment, and build the international ecological cultural tourism, leisure and recreational area.

By taking the circular economy and the low-carbon economy as the criterion, develop ecological, hi-tech and pollution-free industries through technological innovation, institutional innovation and concept innovation. Relying on the industrial communities in Binhai New Area, develop diversified, low-consumption and high-output industrial clusters, establish the environmental access system, encourage and develop the circular economy and low-carbon economy, promote the recycling of renewable resources and implement on-line monitoring of the emission of major pollutants.

## % of public spaces

21

## % of office area

11

## % of commercial area

6

## Circular economy

It includes the higher vocational education of ecological services, water restoration, energy substitution and other ecological environmental protection technology; training of service outsourcing talents and creative industry talents; comprehensive higher vocational education that is adapted to the leading industries of Binhai New Area; university-owned technological industry; university education service industry. Based on the characteristics of eco-environmental protection and technology, form the scientific and technological R&D industrial system covering the development of environmental protection technology, standardization of technology and process and industrialization of scientific and technological achievements. Develop real estate industry of green buildings, and focus on real estate development and operation, real estate management, real estate brokerage and agency, etc. Eco-tourism resort; eco-creative base; hold international high-level professional conferences in ecological and energy-saving fields; knowledge-intensive service outsourcing, health industry and ecological logistics. Bio-environmental protection, bio-energy, genetic engineering and life science and other biotechnology industries; aerospace, shipbuilding and other ancillary industries; green energy industry; precision instrument manufacturing and other high-end manufacturing industries.

## TRANSPORT

### Mobility strategy

The comprehensive traffic planning for Sino-Singapore Tianjin Eco-City raises requirements for green traffic indicator, external motor vehicle corridor, internal road network, urban public transport, parking system and intelligent transportation.

1 Efficient service: Achieve the goal of rapid access externally, as well as 100% coverage within the service radius of 500 meters around bus stops internally. The slow traffic network is convenient and connects every plot in the city, and achieves a seamless connection with public traffic system.

2 Reasonable trip distance: reasonable layout of the land for various uses such as living, business and industry, so that residents have access to the ecological cell center by walking 300 meters, ecological community center by walking 500 meters and 80% of various trips can be achieved within 3km.

3 Sustainable trip structure: The proportion of trips through non-motorized modes among internal trips shall be no lower than 70%, and that through public transportation shall be no lower than 25%. The proportion of trips through cars shall not exceed 10% of the total trips.

## SMART CITY

### Smart City strategy

#### 1 Tianjin Eco-City Operation & Management Center

The O&M Center for public utilities in Tianjin Eco-City is a comprehensive management platform for the operation of public utilities in Sino-Singapore Tianjin Eco-city, which was put into trial operation on May 8, 2013.

The O&M Center for public utilities re-integrates sixteen specialties such as road, bridge, drainage, water supply, fuel gas, heating power, environmental sanitation, traffic and sewage treatment, forming six major business systems including systematic operation monitoring, emergency command and dispatching, repair and maintenance, customer service and material management, and efficient closed-loop management through mutual linkage and connection between businesses can be achieved.

The dedicated network of public utilities has established a dedicated network connecting the operation dispatching system and video monitoring system of 5 professional companies. At the same time, it is centralized to the operation and maintenance center, which is divided into three categories, business, video and settlement. At present, it has achieved data connectivity with four companies of energy, municipal administration, environmental protection and water affairs. In addition, business data can achieve real-time extraction and centralized display, and the functions of operation alarm and customer service connection can be preliminarily achieved.

#### 2 Tianjin Eco-city Energy Management Platform

The energy management platform of Tianjin Eco-city is an intelligent management platform based on real-time information integration, which fits the construction of the Eco-City as a smart city. The platform integrates renewable energy and conventional energy, and covers the implementation of energy conservation and emission reduction in main energy-consuming fields such as green building, traffic, industry and municipal administration, which can effectively improve the level of energy management in buildings and the park, improve the efficiency of renewable energy utilization and reduce the overall energy consumption of buildings. It is praised as "China's first city-level comprehensive energy management platform" and has reached the leading level in China.

## RESOURCES

### Water management

Tianjin Eco-City has special plans for water supply, sewage, rainwater and reclaimed water. The goal of these special plans is to safeguard the quality and safety of regional water supply and ensure that the guarantee rate of water supply is 100%; focus on water conservation, allocate water resources reasonably and optimize the utilization of quality water to guarantee that the proportion of unconventional water consumption is no lower than to 50% of the total water consumption; ensure that the quality of water supply meets the state's *Hygienic Standard for Drinking Water* (GB5749-2006) and WHO's *Guidelines for Drinking Water Quality* (Third Edition); establish complete and reasonable sewage system and rainwater collection and ecological utilization system that are in line with the requirements of sustainable development, improve the water environment around Sino-Singapore Tianjin Eco-City and relieve contradictions between the growth in water consumption and shortage of water resources in the eco-city; determine the scale of sewage treatment rationally to make sure that sewage can be recycled reasonably and discharged in an orderly way. In addition, there will be no water accumulation in the planning area with the establishment of rainwater collection and discharge system, so as to prevent water-logging and control the pollution of urban runoff.

### Soil management

Adopt advanced and applicable technologies to remedy contaminated soil by adjusting measures to local conditions, treat and improve the saline-alkali soil, restore the beach ecosystem in Binhai New Area and play a demonstration role of national project in ecological restoration and construction of saline-alkali soil. Make sure that the net loss of natural wetland during construction is zero, and the existing wetland is classified as temporary ecological preservation area and any behavior that is irrelevant to ecological restoration and wetland protection shall be strictly prohibited. Achieve reduction, recycling and hazard-free treatment of waste, and ensure that the hazard-free treatment rate of garbage reaches 100% and garbage recycling rate is no lower than 60%.

### Waste management

The garbage in Tianjin Eco-City is generally classified into five categories, that is, recyclable garbage, kitchen garbage, poisonous and harmful garbage, other garbage and large garbage, which can be recycled indifferent methods.

There are four types of garbage cans in some communities and commercial districts, that is, recyclable garbage can, kitchen garbage can, other garbage can and harmful garbage can. Generally speaking, three garbage cans are placed on the streetsto collect paper, bottle and other garbage respectively.

In addition, the Eco-City implements the integral system and recycling schedule for fixed recyclable garbage in each community and commercial district, and door-to-door recycling can be reserved for large garbage. In addition, kitchen garbage and other garbage are provided with specific recycling and conveying system respectively.

## BIODIVERSITY

### Biodiversity and natural areas

In as early as 2008, Sino-Singapore Tianjin Eco-City made a plan for biodiversity based on the basic goal of 'highlighting the protection and restoration of original ecology and building the natural ecosystem with reasonable ecological structure, complete service function and quality environmental quality.'

1 Combine environmental restoration and landscape construction to establish the plant communities dominated by local adaptable plants with a local plant index of no lower than 0.7.

2 Restore and construct two bird habitats (Parrot Cay and Egret Cay) and the ecological environment succession area in Yongding island to protect the living environment of the local biotic population to the most extent.

Tianjin Eco-City investigated ecological resources in 2013, and the results show that the city has a total of 469 animal and plant varieties, including 332 animal varieties and 137 plant varieties.

## ENERGY/CLIMATE

### Climate adaptation, resources conservation, GHG emissions

The Eco-City formulates the index of 100% green buildings, that is, all buildings must be green buildings in all these 10 years of construction. Formulate indexes for indoor noise, lighting and heat and humidity comfort in terms of indoor environment of building noise, light and heat, so as to improve the comfort of buildings; optimize resource consumption, follow the principle of 'Take passive as priority, active as auxiliary and renewable energy as supplement' at design stage, take energy consumption quota as constraint and optimize design through integration to avoid technology accumulation; optimize design through building structure, select green building materials and adopt new structural system and prefabricated industrialization to save building materials for green buildings; formulate and

issue the *Tentative Standard for Energy Consumption Baseline in Tianjin Eco-City* by decomposing indicators such as total urban carbon emission and renewable energy utilization, which becomes China's first quantitative energy consumption standard for green buildings so that corresponding technical system can be adopted based on actual energy consumption level.

## Energy sobriety

Energy is the driving force for the development of a city. In the face of the increasingly severe energy crisis, the Eco-City promotes energy conservation and emission reduction in an all-round way, actively develops and utilizes new energy and optimizes energy structure. It has installed solar water heating facilities for all residential buildings and achieved GSHP cooling and heating in public buildings and the industrial park. The buildings that apply various new energy cover a total area of 2.13 million m<sup>2</sup>, which can save 10,500 tons of standard coal and reduce 25,500 tons of CO<sub>2</sub> emissions, and has initially formed a new energy utilization system with geothermal energy, solar energy and wind energy as the main energy.

## Energy mix

**Geothermal energy utilization:** Geothermal resources are abundant in the area. By using GSHP, deep geothermal heat pump and other heat pump technology, all kinds of geothermal resources are fully utilized and widely used in building heating and cooling.

**Solar energy utilization:** The area has sufficient sunlight, with an average annual total solar radiation of 80-240w/m<sup>2</sup> and an annual sunshine duration of 2,600 to 2,700 hours. The Eco-City promotes the solar water heating system in an all-roundway, and specifies that the guarantee rate of the solar water heating system in residential buildings shall reach 80% and that of public buildings with demand for hot water shall reach 60%. Meanwhile, the Eco-City centrally installs photovoltaic power generation system in non-open green space and restricted open space, and connects to the nearby grid to provide power for the city as distributed generation.

**Wind energy utilization:** The area is located in the Bohai Gulf, where the wind resources are not abundant. The wind power plant in the estuary of the Jiyun River has been built, whose total installed capacity is 4.5KWH, and the annual on-grid energy is expected to be 522.5KW.

**Biomass energy utilization:** Make full use of food residue and kitchen garbage in the city, actively develop the biomass energy industry and achieve the recycling of internal resources.

## Total electricity needs of the project area /year

Total electricity needs of the project area /year : 160 306 000,00 kWh

## Total electricity production of the project area /year

Total electricity production of the project area /year : 14 203 500,00 kWh

# BUILDINGS

## Buildings

There are a total of 105 new buildings in the southern part of Tianjin Eco-City, with a gross building area of 6.4002 million m<sup>2</sup>, and all of them reach the green building standard. Among them, there are 60 green buildings with two-star or higher grade and its building area is 3.8588 million m<sup>2</sup>, accounting for 60.29% of the gross building area.

Tianjin Eco-City was originally known as saline-alkali wasteland, where the only original building that already exists is a school in the northern part. At the beginning of construction, it planned the school as the urban management center of the entire city, while the entire southern part is the newly built urban area, where all buildings are newly built and there is no existing building, so the area proportion of existing building that passes the star-level certification of green buildings is 0%.

In the southern part of the city, the low-carbon experience center, commercial street and public housing display center have obtained the operation logo of green buildings; the low-carbon experience center and Luhua Garden have obtained Singapore's Green Mark.

The low-carbon experience center and service center adopt steel structure design, and the steel structure is natural fabricated structure. Compared with fabricated concrete buildings, the fabricated steel structure buildings have the following advantages: 1) there is no cast-in-situ node, installation speed is faster and construction quality can be guaranteed more easily; 2) seismic performance is better; 3) self-weight is lighter and basic cost is lower; 4) steel structure itself is recyclable, which is more environmentally friendly; 5) the well-designed steel structure fabricated buildings are more economical than fabricated concrete buildings. 6) The beam column section is smaller, and the more usable area can be obtained.

Tianjin Eco-City carries out post-evaluation of the construction effect of the green building project, carries out green technology management of 35 projects that have been built and put into operation and achieves an evaluation of the green performance of projects through comparative analysis of the projects in terms of design, actual condition and operation.

At the '7th Conference of the Joint Work Committee of Sino-Singapore Tianjin Eco-City' held in May 2016, the Ministry of Housing and Urban-Rural Development agreed to support the 'Benchmarking of evaluation standard and a national standard for green buildings in the Eco-City'. At the end of 2016, the Ministry of Housing and Urban-Rural Development and Construction Management Committee of Tianjin Municipality formally approved the benchmarking of green standard and a national standard for green buildings in the Eco-City, which means the project that obtains the mark of the Eco-City can obtain the national mark correspondingly.

According to the reply of the Municipal Construction Committee to the opinions of the benchmarking of green buildings and national standard for green buildings in Sino-Singapore Tianjin Eco-City, the projects that reach the control targets of green buildings in Sino-Singapore Tianjin Eco-City shall be presented with the one-star green building evaluation mark; the green building projects that won the silver award shall be presented with the national two-star green building evaluation mark; green building projects that won gold or platinum award shall be presented with the national three-star green building evaluation mark.



### Building candidate in the category

