Campus Planning in China
the Influence of Sustainability

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5.16.2012
The rapid economic development in China also brought about the unprecedented growth opportunities in higher education. Since 1999, “Mass Education” has finally replaced “Elite Education”. After years of large-scale enrollment expansion, Chinese higher education has entered a new era of “leaping forward”.

The number of universities and higher education enrollments have increased rapidly starting in 1999.
From 1997 to 2010, college students grew from 3 million to 22 million, and the total construction area for colleges and universities went from 144 million to 746 million square meters.

<table>
<thead>
<tr>
<th>Years</th>
<th>Total number of universities</th>
<th>Enrollments</th>
<th>Total number of students in school</th>
<th>Total construction areas (milion M²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>1020</td>
<td>1.00 million</td>
<td>3.17 million</td>
<td>143.73 million</td>
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<tr>
<td>2010</td>
<td>2358</td>
<td>6.61 million</td>
<td>22.31 million</td>
<td>746.04 million</td>
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The volume, scale and speed of construction are not seen elsewhere in the world.
1. In Situ Expansion

Expansions are often located within the original campuses or through acquisitions of adjacent land. The efficiency of land use is improved by the integration of the existing space and resources.
Currently, most colleges and universities are located in cities. With the rapid growth of student enrollments, shortage of campus space is increasingly conspicuous. Due to the high cost of urban land acquisitions, many institutions choose to build new campuses in the suburbs to meet the development needs.

When institutions face serious shortages of campus land reserve, or the management issues in a multi-location campus, they often choose the Ex-situ Relocation. The real estate exchange takes advantage of the difference of land value between a city and suburb.
4. University City

This is the idea of combining a campus expansion with a new town development.

Local governments first set aside an area in the suburb for colleges and universities, using them as catalysts to attract economic activities to form around them. A University City gradually comes into being, where institutions cluster together, sharing resources, taking advantage of the co-existence of the all members.
Strategies of Sustainable Campus Design

- Energy-saving and **Resource** Conservation
- **Landuse** Conservation
- **Climate** Adaptation
- Respect for Environment
- People-**oriented** Campus planning
- **Future-**oriented Campus planning
- Sustainable **Growth** of Campuses & Cities
- Sustainability of Campus Culture
- Sustainability of Local **Residential** Life
Energy-saving and Resource Conservation

- Establishment of a recycling system for materials and energy
- Optimization in energy consumption
- Minimization of pollution
- Application of green technologies

Sustainable campus model

- Reclaimed water system
- Dual water supply system
- Rainwater Harvesting
- Solar energy application
- Bio-energy application
Energy-saving and Resource Conservation

- Natural ventilation
- Natural lighting
- Use of water and green areas to improve campus micro-climate

Taking advantage of natural lighting and ventilation through proper building arrangements is one of the key premises in Chinese campus planning. Such a practice plays an important role in reducing energy (HVAC) costs and creating healthy environments.
The use of water and greenbelts as organic buffers effectively improves the campus microclimate, provides pleasant landscaping and conserves energy.
1. Restrictions of motor vehicles in campus (to reduce emissions and noise pollution)
2. Priority given to pedestrian network
3. Promotion of the using bicycles

Guangzhou University City offers bicycle rental business. Free within one hour.
Ecological Building
China has been promoting ecological buildings and energy-saving campuses.

The Design Center of Qinghua University is the first eco-building in the country.
Re-use of Building Waste

The rapid urbanization in China is accompanied by the demolition of a large number of old buildings. The accumulation of construction waste and the loss of city memories have become pressing issues.

Facing this situation, a Chinese architect collected hundreds of thousands of pieces of the building waste, and used them all on a project he commissioned, which won him the Pritzker Architecture Prize.
The debris from old buildings is no longer seen as an eye-sore. Its rebirth gives unique connotations to the new building. Memories of the old city have been carried forward.

The Xiangshan campus of The China Academy of Art
The Chinese landscape is largely made up of mountains and hills. Plains or areas with gentle slope only cover 17%. Thus, Landuse conservation is crucial. A concentrated layout shortens the lines of traffic flow, saves on infrastructure investment, improves the efficiency of landuse, and creates more open space.
Landuse Conservation

Concentrated Layout

All buildings in the Sichuan Fine Arts Institute group together, following the natural terrains. The ecology of the site is preserved.
Many new campuses are built in hilly areas. The idea of centralized planning works well in these types of terrain.
Concentrated Layout
Centralized planning can not only protect the environment, but also easily make the buildings and the environment to achieve harmony.
Landuse Conservation

Compact Campus
Compact Campus is a planning concept that was put forward as a way to deal with low-density, suburban sprawls. Compared to “Concentrated Layout”, a compact campus further improves the efficiency of landuse, reduces the cost of infrastructure and thus preserves more land resources.
Climate adaptation in campus planning is to minimize the dependence on conventional energy consumption and use the appropriate technologies to take advantage of the natural elements such as sun, wind, temperature, humidity to create a comfortable living environment.
Climate Adaptation

Campus layouts and architectural forms respond to the climate conditions in different regions.

1. A scattered and open layout facilitates ventilation, thus is suitable for areas with hot and humid weather.
2. A semi-open layout, which is open on the south side and enclosed on the north side, is suitable for regions with hot summers and cold winters.
3. A compact and enclosed, urban layout benefits energy-saving, thus is suitable in regions with cold climate.
Climate Adaptation

In China, the prevailing wind comes from the southeast in summer, and northwest in winter. Campus planning takes into consideration of this environmental characteristic, benefiting from the southeastern breeze and protecting against northwestern wind.

The campus plan is open to the southeast and enclosed to the northwest.
Climate Adaptation

Courtyard layout
Chinese campus Planning usually adopts the traditional courtyard layout, which has numerous benefits.

The courtyard at the center facilitates natural ventilation for its surrounding buildings and allows them to stay cool in the hot summer. The buildings grouping together as an enclosure protect themselves from the winter wind.
Respecting the environment roots deep in Chinese tradition. Construction must maintain and utilize the existing topography, and reduce damage to the ecological environment. Buildings must be integrated into the nature.
Integration with the Nature

The tradition is still inherited by contemporary designers. Campus Planning always tries to keep the original natural landscape. Buildings are designed with moderate scale, and are in harmony with the nature.
Conforming to the terrain, planning can maximize the protection of the original topography, and create harmony with nature. Earthworks can be reduced significantly.
Chongqing Institute of Technology has a flexible layout, which conforms to the up and down of the mountains. It retains the original valley and rainwater system.
4 Respect for Environment Campus planning

Wetlands Region Campus Planning
Planning emphasizes the creation of the interwoven texture of aquatic environment.

Zhejiang University is located within the wetland area. The planning effort was try to reserve wetland totally. Building groups are concentrated along the water system, in order to maximize the protection of the natural environment.
Rice Cultivation in an Architecture University

The site of Shenyang Architectural University once was a large tract of paddy fields. The University makes a green investment and created a unique landscape by reserves the paddy fields. Students go to class through the paddies, they also study and recess in them. Students enjoy the urban and rural life at the same time, especially during spring cultivation and fall harvest.
Flexible Growth
The development of an university is a continuous and organic process. There is often no ultimate ideal state. Therefore, a sufficient flexibility should be considered in the beginning of the campus planning.

Flexible strategy is reflected in:
1. Possibility of phased construction
2. Adaptability of architectural space
3. Integrity in development process
Universal Modular Design

Universal modular design are often adopted in Chinese campus buildings.
1. Modular design has strong adaptability and possibilities in dividing interior space.
2. Modular design produces a clear context for future expansion.
3. Modular design can reduce the financial investment and shorten the construction period by rapid production.
Future-oriented Campus planning

Growth Pattern of Network Mode
Sustainable campus planning must guide the future development, and thus prevent the possible chaos from haphazard development. The network growth mode provides a clear context for future construction.
Cell Growth Mode - Same function building group as a cell group

Cell growth mode makes it possible that various building groups grow like cell division. The new growth is always included in the overall framework of the campus. The development of the campus maintains flexible and unified at the same time.
Cell Growth Mode - Independent school group as a cell group
The buildings with close functional liaison are often planned together as a cell group. This strategy is also beneficial to the campus pedestrian system.
Campus planning should be people-oriented. It should consider and respect the material and spiritual needs of users, be consistent with human behavior, and focus on the emotional feelings of users.

People-oriented planning should emphasize on appropriate campus-scale, walk priority, separation of pedestrian and vehicles, and create a multi-level campus communication space.
Suitable Scale Control

The new scale of university is far bigger than before. This large campus scale will bring a lot of inconvenience in real life.

For example, large scale planning will be easy to lead to the long distance between residential area and teaching area. It will cause an increase in traffic flow in terms of bicycle, which is neither safe nor silent. Furthermore, additional bicycle parking areas will be needed. Large-scale campus also makes it inconvenient for pedestrian by increasing the walking distance.

The best contact mode is triangle

<table>
<thead>
<tr>
<th>Exercise Area</th>
<th>Teaching Area</th>
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<tbody>
<tr>
<td>Residential Area</td>
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Traditional model

Simple expansion model

Upgraded Compound Model
When the size of the campus becomes very large, the traditional layout is no longer appropriate. West Campus of Zhejiang University is a very large campus, it is about 2.6 kilometers from east to west, and 1.7 km from north to south. Compound layout is used in the planning.

It is very reasonable to use traditional triangular layout in small campus.
Separation of Pedestrian and Vehicular traffic

Ring road system can reduce the cross of pedestrian and vehicular traffic. Vehicles run in the outer ring road, and internal part are mainly used for walking system.

It is very important to take the principle of separation of pedestrian and vehicular traffic to ensure a safe, pleasant environment for walking.
Separation of Pedestrian and Vehicular traffic
Through shared elevated ground floor, we can achieve the goal that separate pedestrian and vehicular traffic in 3 dimension. It makes the walking transportation convenient, safe and comfortable.
Shape of the Communication Space

The various levels of interaction space is essential in universities. The campus needs to provide different levels of communication space to meet the requirements of the teachers and students.

It is necessary to emphasize on the design of public and outdoor space, so that freely exchanges between individuals will become possible.
Campus culture is formed through a long period of time. Sustainability of campus culture is a prominent issue in the new campus planning.

**Shenyang Architectural University** moved to a new site. Memory would be lost as a result of the demolition of the old site. Therefore, the old gate, old statues, were relocated to the new campus. The cost was covered by the donations from the alumni.

**Zhongshan University** set up a new campus in a University City. In order to carry forward the campus memory, a copy of the memorial arch was built in the new campus.
Sustainable development includes not only the protection of the ecological environment, but also the human culture. A sustainable campus is both an ecological and cultural oasis.

A poetic waterfront community has always been the dream of the Chinese people. If such an organic integration of man-made and natural environment is lost, it would be a great loss to the human culture.
Sustainability of Traditional Culture

To inherit the traditional culture is the responsibility of any contemporary planners. In the planning of Jiangnan University, the designers transform the campus into a poetic water town, where waterways connect every building. A diverse pedestrian systems are laid out between land and river. As a result, a modern campus with an oriental taste is created.
Sustainability of Campus Culture

The ancient Chinese scholars were fond of making his own home a private garden. Many such gardens together constituted a unique garden city. The planning idea of Zhejiang University is just the “Campus Garden”. Many traditional landscaping techniques are used in the campus.
Sustainability of Regional Culture
Learning form the local regional culture, you can create a campus with unique characteristics.

The constructions of Chinese universities becoming a prime example to the world; how to maintain the cultural traditions, and achieve sustainable future development at the same time.
Sustainable Growth of Campuses & Cities

Resource Sharing
Growth of higher education institutions promotes the sustainable development of cities. Through resource sharing, colleges and universities enrich urban culture and help to drive local economic growth.

Institutional sports, conference and academic facilities are open to the public and have become venues for important public events.

Beijing University Gymnasium was used as the Olympic Badminton Hall.
Resource Sharing
A university city is formed by a number of institutions, which is the ideal place for resource sharing. Sharing takes place on three levels: city, university city and campus.

The shared facilities are concentrated: Library Center, Sports Center, Convention Center, Student Activity Center, museums, supermarkets, concert halls, opera houses, the network center, auditorium and other groups to a variety of shared resources.
Optimization of Industrial Structure

In the planning of a University City, colleges and universities are usually bundled with a high-tech park to promote collaborations. As a result, a University City combines teaching, research and industrial productions, becomes an integral part of the city and brings about the industrial upgrading of the city.
Sustainable Growth of Campuses & Cities

Optimization of Urban Spatial Structure
A university city can have influence on the positioning of the city's long-term development. Most university Cities are located in the areas where future growths will take place.

- Guangzhou University City is an important step in the development of Pearl River New City.
- Zhengzhou Longzihu University City is an important step in the development of Zhengdong New City.
- Hangzhou Xiasha University City is an important step in the development to Qiantang City.
- Shanghai Shongjiang University City is an important step in the development to Shongjiang New City.
The construction of a new campus will inevitably bring about the migration of local residents. Is it possible to allow the continuity of the local residential life in the grand scheme of the sustainable campus development?

In the planning of Guangzhou University City, four villages were preserved. Eventually they were integrated into the new community. Huge population of the University City and a long-term, stable consumer group provide adequate employment opportunities for those original residents.
The planning of the Sichuan Fine Arts Institute explores a symbiotic mode of development between the local residents and the school. These local residents maintain their lifestyle by exchanging agricultural products and labor services with the institute. They become an integral part of the school community.

Sustainability of Local Residential Life

Field

Landscape farming

Output

Gardener

Wage

Purchase by University

Product
Pigs, cattle, chicken, sheep are raised, too. The coexistence of the development of agricultural life and campus life.
Uncle Huang, 55 years old, is a special gardener in the Sichuan Academy of Fine Arts. He and his wife work on the farmland surrounded by the modern college buildings eight hours a day. The couple dedicate themselves to taking care of the plants and trees of the campus. As the leader of the gardeners, Huang genuinely enjoys his life.