



Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Analysis of the planning strategy of a low carbon community based on “Cradle to Cradle”: Taking the project of the low carbon community in changing, Xi’an for example

Quanhua Hou and Jie Li

Chang’an University, School of Architecture, China

ABSTRACT

This project is in accordance with the low carbon community theory of “cradle to cradle”, putting forward the low carbon community planning strategy of “Sixmac system”, overcoming the problems from six different aspects including the land utilization of the community, spatial arrangement, road transport, natural environment, energy use and implementation management, making further implementation of the theories’ design philosophy, and it also brings forward the specific low carbon requirements, which guarantees the construction of the low carbon community, and it also would have the direct and demonstration effect on the construction of the low carbon community in the future.

Key words: Cradle to cradle, low carbon community, planning strategy

INTRODUCTION

The project is located in the new district of Changning, Chang’an district, the city of Xi’an. In accordance with the urban-rural integration development pattern of “multiple centers in one city”, the new district of Changning is a comprehensive development zone under the planning of “Big Xi’an” and with the make up of the former Changning. The development goal of the new district of Changning is to accomplish the harmonious development of the low carbon new district in the aspects of zoology, culture, habitation and industry using the abundant agricultural resources, favorable natural resources and human resources and excavating the cultural deposits of the strict [1-5].

The project base construction area covers 223.68 hectare, which is about 20km distant from Xi’an, it is located at the south shore of Gush river in Changning, facing South Avenue on the east, having many colleges and universities like Xijing University and Peihua University on its east side, Meridian Avenue to its west, with Zte's industrial park nearby; Shenheer Road to its south; a planning Gush River Ecological Wetland Park to its north, which is planned to be constructed same time with the project [6-9].

Being the South Shore district of the Changning City gush river area, the base is prominent with its ecological resources, Chang’an Town to its east, it’s rich in culture atmosphere, with the nearby subway and the convenient public transportation, it has a close link with the city center of Xi’an. According to the function blocks in the Overall Planning of the New City of Changning (here and after known as the Changning overall), the base is the high class residential zone in Shenmuyuan. Synthesizing the background information and the surrounding resources, the analysis results of the base should be planning to live life the main function, to construct Changning’s ecological and livable low carbon demonstration community fusing multiple service industry [10, 11].

PLANNING AND DESIGN CONCEPT

2.1 THE MEANING OF THE LOW CARBON COMMUNITY

The low carbon community means, in residents' daily life, with the optimization of community building, to control

the the carbon emissions of fossil energy from seven different aspects including community environment greening, low carbon in building, energy efficient utilization, green transportation hierarchy, resources recycling and low carbon life initiate.

Now, the domestic academia's research on the low carbon community is still in its infancy, the main concentration of the study object is the spatial structure plan, the urban transport structure and the urban energy structure, and they put forward corresponding planning strategy as well. But problems also exist, there are problems like the research emphasis is still focusing on the urban left over, business is business, trying to solve our problems using others' theory can drag the design behind the reality, which also ignores the sustainable development that brings with the designs that are fully combined with their own.

2.2 “CRADLE TO CRADLE” THEORY

The theory of “cradle to cradle” was put forward by the American architect McDonough and the German environmentalist professor Braungart when they are collaborating among their domains. The theory is taking the growth pattern of a cherry tree as an example: a cherry tree absorbs nutrients from the environment, so it'd be rich in flowers and fruits, at the meantime, the flowers and the leaves that have fallen nourish the things nearby. This theory was firstly applied in industrial design, focusing on the recycle of the research material and the products, then it extended to the use of urban planning later. The theory believes that we should build an integral system, hoping that the buildings, systems, communities or even the whole city can be interdependent with the surrounding ecosystem in a mutual promotion way.

The ultimate goal of the “cradle to cradle” theory is to connect the natural resources and the artificial ingredient harmoniously and constantly circulate them with the power that comes from the sun or other forms of energy(wind energy, solar energy and hydro energy), relying on these infinite clean resources can highly reduce the environmental problem, energy problem and satisfy the human requirements as well.

2.3 THE APPLICATION OF THE “CRADLE TO CRADLE” THEORY

There are lots of design practices that are directed by the “cradle to cradle” theory around the world, involving all kinds of architecture, office space such as Cherry tree 901, private residence such as the Virginia beach house, factories such as Ford car river Rouge plant, research institute such as Lewis environmental research center. In China, from 2004, two sets of sustainable cities and towns development projects start in succession, distributed at Beijing, Zhejiang, Shandong, Guangxi, Chengdu, etc, and all of them achieve remarkable results. Table 1 shows the Chinese and American sustainable cities and towns development demonstration project.

Table 1 The Chinese and American sustainable cities and towns development demonstration project table

number	project name	application unit
1	Zhejiang Wenling Dongpu farm project	Zhejiang Dongpu Agricultural Development Co., Ltd.
2	Shandong Jinan Tangye district project	Licheng District People's Government of Ji'nan city in Shandong Province Ji'nan Tangye planning Co. Ltd.
3	Beijing Miyun New District project	Beijing city Miyun Industrial Development Zone Administrative Committee Beijing Yongji Century Real Estate Development Co., Ltd.
4	Liuzhou high tech Zone Guantang Pioneer Park	Liuzhou high tech Industrial Development Zone
5	Project of water environment in Eastern Metro Ningbo	The eastern city of Ningbo new city construction headquarters
6	Project of Chengdu Runde orchid garden area and the project around the ancient Shu Wangcong cultural industrial park	China Railway eight bureau group Chengdu Railway Engineering Co. Ltd.

2.4 THE EVALUATION OF THE “CRADLE TO CRADLE” THEORY

This paper considers that, there are three reasons why the “cradle to cradle” theory can stand out among so many low carbon sustainable theories.

Sustainable in an active and developing way. The “cradle to cradle” theory believe that, sustainability is built on ecological benefit, its goal is not to find out how humans will have the least negative effect on the natural world, but to let all human activities become the positive factors in economy, environment and social health, it believes that sustainability doesn't necessarily mean to inhibit the development of economy.

The elimination of waste in the circulation of energy flow. According to the current constructions, “zero

emission” merely realizes self-circulation in an individual system, such as building self-circulation and system of water circulation. But the “cradle to cradle” theory advocates an efficient and nutritious circulation system in nature, which wouldn’t have the concept of waste.

A solid theoretical foundation and extensive practice. Not only did The interdisciplinary cooperation by McDonough and Braungart creatively sum up the concept of “cradle to cradle” on the ideological foundation of ancient natural flow, but they also cooperate with many well-known companies and government organizations to practice their theory, not just architecture, or other aspect, but to apply the theory into dozens of square kilometers of a cities’ new district, so the theory would no longer be just empty talk.

PLANNING OBJECTIVES ORIENTATION

3.1 Planning and technical route

Directed by the theory of “cradle to cradle” and taking the actual situation of the project, a set of complete planning and technical route has been established (figure 3) to accomplish the planning of the Changning low carbon community.

3.2 The overall positioning

With the theory structure of “cradle to cradle” and performance indicators, a multipurpose community concept plan (residential area, commercial area, cultural scientific research area, leisure and entertainment district) is made, and a demonstration community which is low carbon, economic, social inclusion, environmentally friendly and resource efficient is also built.

3.3 Target decomposition

The planning decomposes the target of the community construction into five aspects: economic, connection, ecological, vitality and mark. Economically, the industry chain should be paid attention to, with the base of constructing a low carbon residence community, to be committed to the integration of regions in the existing function and introduce modern business services, leisure, culture research function; vitally, to shape the community culture, form the community vitality; connectively, we need to develop a traffic environment which is transit oriented, slow prioritized, and with good traffic liquidity; ecologically, applying the ecological technology to integrate the community environment into the natural environment, in order to make the new mark of the new city of Changning.

PLANNING STRATEGY

4.1 Planning design strategy

The design principle of the low carbon community theory under the “cradle to cradle” theory mainly include two aspects which are the design with nature and design combining the history, integrating the project, this paper puts forward the planning strategy “six pulses system” including “geographical pulse, green pulse, energy pulse, institutional pulse, streets’ pulse and culture pulse” (figure 1), which will solve the problems in the planning design and achieve the goal of low carbon community planning.

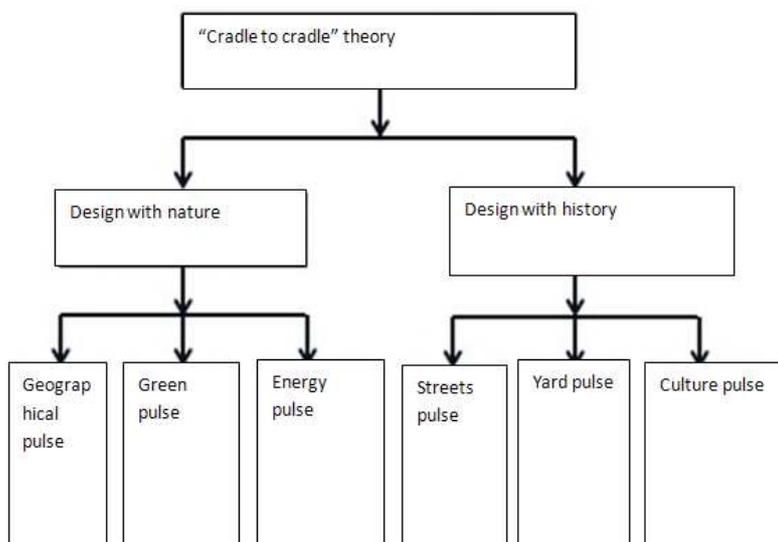


Fig.1 The design strategy of the six pulse system

Geographical pulse. Land, given by nature, carries the whole project, first we do elevation and analysis on the base of land using status, the using situation of the project’s base’s current land is not diversified, and the elevation changes slowly, which is suitable for construction. Planning uses the method of the land composite use, which is divided into three modes: the planar composite use all of the modes carry out a positive attempt on planning’s using the land intensively. The specific practice is, in the premise of ensuring the land of all kinds of public facilities, replace and adjust the land in moderation, and further refine the nature of the land in the planning according to The Classification of the Using of City Land and Standards of Construction Land. (GB50137-2011) , which forms the layout of Changning’s low carbon community land using. Fig.5 shows the land composite use pattern.

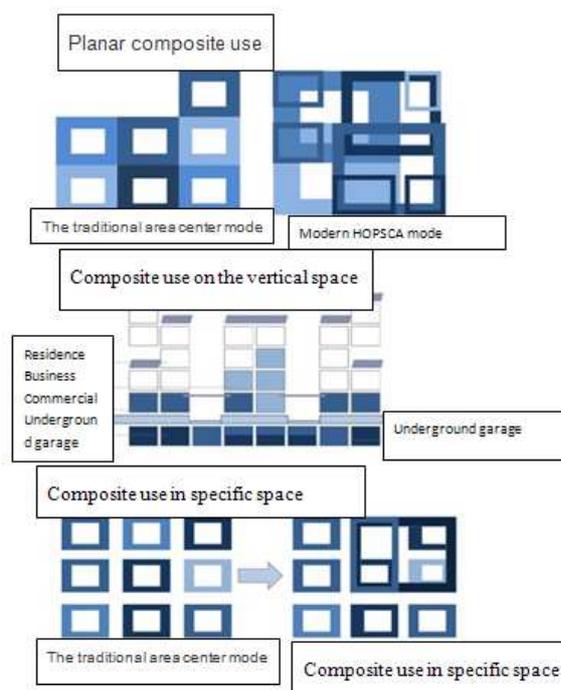


Fig.2 The land composite use pattern.

Green pulse. The planning gives full play to its own ecological advantages, with the continuation of the base green pulse, introducing the external conditions of the green land to the community, which forms the communities’ internal divergent greening skeleton, penetrates the greening along all the roads into every neighborhood, forms the green space system of “introducing the green inside, the green becoming the street”. The planning also pay attention to the rational use of the Gush river ecological wetland on the north and the public green land on the west, gives full plays to use the function of sightseeing and visiting of the large ecological green land, which shows the ecological characteristics of landscape superiority of the base. Fig.3 shows the General layout plan of Changning low carbon community.



Fig.3 General layout plan of Changning low carbon community

Energy pulse. “Cradle to cradle” theory believes that design should be built on the “ancient” thoughts relating to the natural energy flow, it’s like we use solar heating in winter and use breeze traverse in summer to create a enjoyable environment. Specific practice is: with the application of ecological technology, choose clean energy like solar energy and wind energy while choosing. When it comes to architecture, to take full advantages of solar energy, collecting solar energy with the roof, and turn it into electric energy and heat energy for the use of the residents.

Streets pulse. The traditional neighborhood is divided at the city branch division, with a separation distance of 300-500 meters, forming a neighborhood dimension of 9-25 hectare, whose advantage is being good in internal organic, disadvantage being too closed and lack in openness. This planning adds public roads which is of street level on the traditional neighborhood division, with the distance of 200-300 meters, forming a more reasonable and pleasant neighborhood scale space. The planning returns to the traditional transportation, with the full consideration of the sidewalk settings, focusing on the slow system of the group living in the community and special traffic organization, which forms a residential spatial pattern of “streets in the front and yards in the back. This helps the continuation of the organic traditional neighborhood, increase composite functions, and also helps improve the social interaction. Fig.4 shows the street scale pattern.



Fig.4 The street scale pattern



Fig.5 The traditional mode of residential garden

Yard pulse. "Cohesion" is the Chinese traditional architectural space idea, therefore the construction’s spatial organization is the basic techniques for the whole city design. From the residential neighborhood layout to the concept building group, or the public and residential buildings within the space are all reflecting this concept. Planning focus on creating multiple public center, forming a cohesive effect on different levels of the courtyard. Fig.5 shows the traditional mode of residential garden.

Cultural pulse. The planning is aimed at continuing the Changning’s historical cultural pulse and showing the cultural characteristics of Changning area , and enhancing its overall image, make the Changning low carbon community the local culture display window. At the same time, focus on the shaping of community culture, drive community activities with the improved system of public space, organize the good neighborhood, forming a harmonious living environment.

4.2 Public facilities strategy

According to the planning community neighborhood size and number, we formed different levels of public space in the community, according to the scale of public center, which is corresponding to public facilities from different grades, we form three service system, thus completing the "full coverage" configuration of the public facilities. The specific approach is to configure in community centers of different grades, and ensure the public middle level walking accessibility, based on the service radius of facilities (service radius of middle schools is 1000 meters, primary schools being 500 meters, kindergarten being 300 meters).

4.3 Management strategies

By summing up the practice of planning construction of excellent low carbon community home and abroad, the planning turn the strategies into practical implementing measures, which completes the technological route of the planning. The measures includes seven aspects like optimizing of community structure, advocating low carbon transport, using new technology and new energy, increasing the green carbon sequestration, increasing low carbon management and advocating low carbon lifestyle. And it also puts forward complete low carbon index system in order to guarantee the low carbon community construction’s implementing.

CONCLUSION

This paper always adheres to the theoretical guidance of planning, with the guidance of “cradle to cradle” theory, it sums up systemic technological route of low carbon community planning, and it does an indepth study on the communities’ geographical pulse, green pulse, energy pulse, yard pulse, streets’ pulse and culture pulse, it puts forward suitable planning strategy, and the mode of low carbon community has been well used, and it provides demonstration and reference for the future construction of cities’ low carbon community.

REFERENCES

- [1]Liu Xiao-lan. *China Sport Science and Technology*. **1984**, 29(13), 46-49.
- [2]Luo Yang-chun. *Journal of Shanghai Physical Education Institute*. **1994**, 23(12), 46-47.
- [3]Wan Hua-zhe. *journal Of Nanchang Junior College*. **2010**, 3, 154-156.
- [4]Li Ke. *Journal of Shenyang Sport University*. **2012**, 31(2), 111-113.
- [5]Zhang Shu-xue. *Journal of Nanjing Institute of Physical Education*. **1995**, 31(2), 25-27.
- [6]Pan Li. *Journal of nanjing institute of physical education(natural science)*. **2004**, 19(1), 54-55.
- [7]Li Yu-he; Ling Wen-tao. *Journal of Guangzhou Physical Education Institute*. **1997**, 17(3), 27-31.
- [8] Xu Guo-qin. *Journal Of Hebei Institute Of Physical Education*. **2008**, 22(2), 70-72.
- [9] Chen Qing-hong. *China Sport Science and Technology*. **1990**, 21(10), 63-65
- [10] Tian Jun-ning. *Journal of Nanjing Institute of Physical Education*. **2000**, 14(4), 149-150.