The reflection on architectural form caused by global issues such as population and ecology

LIU YANG
Northeast Normal University 130021 Changchun, Jilin Province, P.R. China
Jenniferliu_7@hotmail.com

Abstract. In 2011, Singapore held the Asian vertical city project design competition. Saudi Arabia is building the Jeddah tower, which is expected to be completed in 2020 and will be the world's first skyscraper with a height of 1,000 meters. Jeddah tower perfectly embodies the concept of "vertical city", which maximizes the living space and can accommodate the increasing urban population. The vertical scheme is an alternative to the horizontal land consumption, so the appearance of high-rise buildings significantly changes the urban environment.

1. Development of high-rise buildings
The development prospect of super high-rise buildings is very broad, which really solves the current urban land shortage, insufficient green land area and other problems. At the same time, its development has become an important part of urban development at the present stage. Tall buildings appeared in the 1880s. The industrialization in the 19th century made the social economy leap forward, so the vertical city gradually became the best way to effectively solve the contradiction between buildings and people, cities and buildings, and people and land.

According to Maslow's five needs theory, the design of higher buildings must meet the basic living conditions of the users. However, due to the rapid development of social economy, the majority of high-rise building users have been initially lifted out of poverty. They began to pursue and yearn for higher levels of spirit and material.

A survey of my overall results is that "the first-generation wanda plaza is relatively small in scale, mainly with a size of 40,000 to 50,000 m2. It makes profits by attracting the main stores at low prices and then driving the prices of stores at the ground floor. The second-generation wanda plaza site is the core area of the city, which realizes the improvement of the rate of return of property investment by virtue of the large number of people in the city center, convenient transportation, gathering for living, shopping and business office. The third-generation wanda plaza greatly improves the development volume and scale, and at the same time, the function types are expanded and the proportion is adjusted reasonably, which breaks the thinking pattern of pure business and gradually forms a business form integrating entertainment, sports and culture. The fourth generation of WD city added health buildings to further extend the consumption time through the leisure and entertainment experience, thus creating the reputation image of "every wanda plaza is the city center" and "24-hour city". In the background of commercial development, the urbanization of the exterior form of high-rise buildings and the development of the inner functional city are synchronized.
2. The influence of high-rise building on the city

Based on the analysis of the current development of high-rise buildings, the impact of high-rise buildings on the city mainly includes:

Influence on the spatial form of the city. Compared with other building types, high-rise buildings have more obvious aggregation. In the central area of the city, high-rise buildings directly determine the fabric and nature of the whole city. The Burj Khalifa in Dubai, the world's tallest building at 828 metres, is a real vertical city with a mix of hotels, apartments, restaurants, shopping and offices. It is a city model that maximizes the use of space and vertically integrates a variety of residential functions. The space is utilized to the maximum extent and vertically integrates the urban pattern of various residential functions. It is a building complex. In addition to integrating multiple functions, the comprehensive solution to the problems of vertical traffic and horizontal traffic evacuation should also be considered.

The ecological environment of the city. In the 20th century, the development of steel technology provided the conditions for the existence of high-rise buildings, and the urban population became increasingly dense. Le Corbusier, the world famous architect, put forward the concept of the vertical development of the city, which means that the buildings become taller, expand the capacity and liberate the ground. At the same time, it meets the living needs of urban residents and improves the quality of life.

Until the 19th century, buildings more than six stories tall were rare. The hydraulic helicopter can only lift about 15 meters and the reinforced concrete and pumping pumps make it possible to build extremely tall buildings. The 102-story Empire State Building was completed in New York City in 1931, and remained the world's tallest building for 40 years. At the end of 2004, Taipei 101 in Taiwan replaced the twin towers as the world's tallest building from 2004 to 2010. The Shanghai tower, completed in 2014, is 632 meters tall. The Burj Khalifa in Dubai, which opened in 2010, is currently the world's tallest skyscraper at 828 metres. After a long period of development and innovation, the vertical city has a rich variety of types and forms. Shanghai's proposed Bionic Tower, which will be 1,228m high and have 300 floors, will accommodate 100,000 people.

Therefore, high quality, high density and high composition are the architectural design principles, which take the coexistence and symbiosis space form as the architectural design theory. The method of architectural design is to enhance the continuity of architectural form and horizontal and vertical space, and to combine with the three-dimensional space pattern on the ground. The network traffic connection connects the individual vertical towers in series into a micro-urban system, and the top of the connection serves as a hanging garden, which is also a Shared public activity area between towers, further reflecting people's multi-directional extension of the horizontal dimension of high-rise buildings.
For example, in the case of the interweaving house in Singapore, the house is located on the outer green belt of the entire city, which requires that the individual blocks are of the same size and six stories high, with a total building area of 170,000 m² and a total of 1,040 units. The architectural concept is to create more space opportunities on the condition that a number of relatively scattered volumes have a set of units to synthesize a high-density organic cluster to ensure a good view and privacy of the building. The stacking strategy is the combination of public space and natural landscape, and the corresponding passive design strategy is used to achieve the sustainable development goal of architecture. The interweaving house breaks the monotonous tower pattern common in the city and presents a fuller vertical community, so that the overall architectural complex has an obvious geometric aesthetic and organic integration with the surrounding environment.

Then, take the platform vertical city as an example. This kind of vertical city presents a visual feeling of lifting the ground vertically into the air, and uses relatively small fulcrum to connect with the ground to save space on the ground. The future social development and the trend of people's life analysis, new technology and new media related to the space demand will continue to increase.

3. Vertical city
Vertical cities can improve the efficiency of the use of limited land resources, which frees up the unused urban space and provides a new lifestyle and concept. Energy efficiency is another major driver for building superstructures. According to the international energy agency, today's buildings are responsible for more than 40 percent of global primary energy consumption and 24 percent of global carbon dioxide emissions. Energy costs continue to rise. Ultra-high buildings can generate their own energy from wind power, solar-powered photovoltaic walls and geothermal heat for heating and cooling, providing a net zero energy efficiency.

It focuses on the layout of diversified functions and large volume, and gathers people to the greatest extent, thus forming the city landmark and the city center. Vertical cities make their internal activities more systematic with mass transit and rail stations.

3.1 Skyscraper feasibility analysis
According to the current trend of building development, skyscrapers will continue to exist and continue to rise, and exist as vertical cities, for the following reasons:

First, new building technology and building materials will appear continuously, and heightening gradually becomes possible.

Second, the development trend of the population is continuously increasing. The required living space will be continuously expanded and the land area of the earth will be basically unchanged, so how to solve the problem of increasing population habitation? Hong Kong China is a major metropolis in the world and one of the most densely populated cities. With 40% of the land covered by parks and nature reserves, human beings have paid more and more attention to environmental protection. They realize that only by protecting the environment can they have the resources for sustainable development. Although Hong Kong China covers an area of 1,107 square kilometers, 75 percent of the territory is off-limits to development. Increasing the height of buildings is definitely a solution to the population problem. With a large population, China now has the most skyscrapers of any country in the world, accounting for 66% of the global total.
3.2 Disadvantages of skyscrapers

As the global economy starts to slow down, the cost of vertical cities will be a factor. Vertical cities are characterized by labor and time consuming, huge volume, and huge and strict requirements on structure, ecology and other technologies. Therefore, the developer can pay the capital cost and technical cost directly determines the success of the vertical city construction. At present, the vast majority of people have fully adapted to and get used to high-level life, but there are some people do not agree with this life concept. In addition, vertical city construction is also affected by security factors.

Compared with the traditional high-rise buildings, the super-high-rise and high-rise buildings in the vertical city have more public space, which also means that users have to pay more cost to live in the vertical city. The operation and management of public space is an important indicator for the sustainable development of vertical cities. If not properly handled, public and private affairs will be separated in vertical cities, which will affect users' private lives. This could even turn public spaces in vertical cities into crime sites. Vertical cities appear in a completely new architectural form, and existing building codes may be vacant or in conflict with existing codes, which will bring great difficulties to the actual construction.

4. summary

Using the modern high-rise building as the research clue and the current outstanding high-rise building as the research basis, this paper summarizes the development trend of the contemporary high-rise building towards vertical urbanization to the greatest extent, and reanalyzes the high-rise building with the combination of urban design thinking, so as to provide some directions and reference measures for the future high-rise building space design. In the future, the trend of social development and people's life is analyzed, and the space demand related to new technology and new media will continue to increase. In a word, this report shows that the main achievements of the urbanization development of high-rise buildings are as follows: Firstly, the author retrospectively analyzed and summarized the influence of contemporary high-rise buildings on the city, and further proposed that high-rise buildings are the vertical extension of urban space. Secondly, the characteristics of vertical urban development are elaborated in depth. By comparing the design and practice of typical high-rise buildings at home and abroad, the new changes in the spatial composition of high-rise buildings are obtained. Finally, based on the analysis of urban design, the design methods and strategies of high-rise buildings are optimized, and the urban elements are reasonably integrated to build a micro-city, which provides valuable reference for the form change of high-rise buildings in the future.

References

[1] Stephan Reinke. Vertical lifestyle in the 21st century: multi-generational, integrated communities [J]. World architecture journal, 2017 (3): 41-44.

[2] Zhang yuanda, Yuan feng. Development process and phenomenon interpretation of vertical city -- Shanghai skyscraper [J]. Time architecture, 2005 (4): 50-54. More references
[3] Wang zheng-dong, wen fan, Chen rui. Thinking on the Asian vertical city model of compact city based on Hanoi, Vietnam [J]. Time architecture, 2014 (4): 148-154.
[4] Guo huangfu. Research on the development trend of vertical city -- high-rise buildings [D]. Tianjin university, 2015:39-39.
[5] Zhang xi, Xu yanbin. Vertical city: seeking the sustainable life of modern people [J]. China real estate industry, 2016 (20): 47-48.