

The Relationship between High-Rise Building and Urban Environment

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ABSTRACT High-rise buildings have become an inevitable trend in future building development. Since today's building theories and technologies have not fully matured, we should perform a comprehensive analysis by combining urban environmental conditions in order to promote sustainable development of high-rise buildings. This study will discuss development prospects and problems of high-rise buildings via the relationship between urban environment and high-rise buildings, in order to form a more comprehensive and mature understanding of future development direction and the focus of high-rise building, and to propose appropriate countermeasures to the negative impacts of high-rise buildings on the development of urban environment.

KEYWORDS

High-rise building
Urban environment
Negative impacts

1. Introduction

Excellent high-rise buildings must have a symbiotic relationship with their urban space, and should not ride the momentum to guide urban space, nor destroy the harmony of urban space. An excellent high-rise building is a place that cultivates human nature, a place that considers users' needs and pursues the public interest of the city. High-rise building development must strike a balance within the urban development in order to create a better urban landscape and living environment for people, and to achieve healthy and sustainable development.

2. Positive impacts of high-rise building on urban environment

2.1. Saving land

Our country is a populous country and, in especially urban areas, the population is dramatically increasing while current construction lands in most cities have far exceeded a population which local resources can afford. Rapid devel-

opment of the Chinese economy has even exacerbated the concern, with larger numbers of people are now concentrated in cities. Before Midwest small-town strategy function efficiency, usage of urban land accordingly become rapid.

High-rise building can effectively solve this problem. It occupies less land, making people's lives easier with living spaces evolving vertically. According to statistics, a 30-story building saves more than 40% land than a 5-story building, which is a considerable number. Vacant lands are of great significance to the living environment by increasing afforestation and improving urban environment. Higher green rate can purify air, reduce urban noise and wind speed, and adjust temperature and humidity of the locality [1].

2.2. Convenience of contacts and exchanges

High-rise buildings provide very convenient social contacts and exchanges for residents due to its spatial overlay features. Relevant units set in a same building can reach each other quickly just by taking the elevator. Of course, this also puts forward higher requirements for technology and innovative intelligence in high-rise building elevator system. Moreover, since high-rise buildings are often in groups, large number of units are concentrated in a small area that makes work and life function of a small piece of area very complete, providing people with living and working convenience.

2.3. Enhancement of city's image

At present, high-rise buildings especially in dense high-

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rise building areas are undoubtedly seen as a symbol of metropolitan centers. It epitomizes the renewal of urban face, forms the center of social activity of city, organizes together different types of social living space scattered in the cities, and gives full play to the synergy of architectural space. This has had a positive effect on the adjustment of urban spatial structure, on reduction of traffic load, on improvements of work efficiency and on working and living environment. In addition, since high-rise buildings are generally located in the more important urban locations, high-rise buildings' body mass scale are hence larger, and the modeling is more diverse and very characteristic. Therefore, high-rise buildings hold in an important position in the entire urban landscape environment, and they have a tremendous impact on the overall image of a city.

3. Negative effects of high-rise building on urban environment

In the overall environment of city, high-rise building construction is closely related to urban landscape and urban space, which reflects the structure and culture properties of contemporary urban society. In the early construction of high-rise buildings in China, architectural design is beyond the city's planning, which marginalized the position of high-rise building in the construction of urban culture. It just passively participates, resulting in the loss of high-rise buildings in urban space. We have often likened the high-density of high-rise buildings to "reinforced-concrete forest", which in itself is a strong evidence of the importance of planning and development of high-rise buildings to the urban environment. Thereby, since high-rise buildings determine the character of the city's overall environment in a way, we must not let it fall into a situation of disorderly development.

3.1. High-rise building and Urban Environment

The immediate environment of high-rise buildings, typically the artificial environment of a city, is an indispensable substance platform for people's survival. Fundamental to the nature of a city is its residents as the main body, and high-rise building as a special space environment; if we consider high-rise buildings as a main body, then the variety of biological factors and abiotic factors are its surrounding environment. This article focuses on technical level analysis of high-rise building ecology.

3.2. Environment and ecology issues caused by contemporary high-rise building development

Although modern high-rise building has only a hundred years of history, as an intervener of urban environment, its presence has greatly changed urban form and quality of environment. The flow of its inside and outside substance, energy, and information is high, and will inevitably lead to a number of unfavorable factors in ecological aspects, including:

3.2.1. Large local ecological impacts

Especially in high-level intensive areas, group effects amongst buildings are very obvious, including impacts of sunlight, air quality, air intrusion, the formation of local "wind valley" and so on.

3.2.2. Energy consumption is huge

As a high-consumption building type, the costs required by post-operation and management of a high-rise building account for a larger proportion of the total cost in its life cycle.

3.2.3. Environmental pollution

High-rise building discharges a large number of wastewater, waste gas and waste every day, in addition to producing light pollution, heat island effect, and interference of electromagnetic waves.

3.2.4. Increased local traffic pressure

The commute in and out of high-rise building will produce concentrated streams of people, and large number of vehicles creating parking problems as well as freight traffic problem, which then will have a greater impact on surrounding traffic.

3.2.5. Low quality of interior space

A high-rise building is mainly a fully enclosed space, with most its interior adopting mechanical ventilation, resulting in lack of fresh air flow and inadequate change of temperature and humidity, rendering easier to form indoor air pollution. High-rise building space lacks interaction between people, as well as lacking communication with the external environment. It has some impact on urban spatial morphology and infrastructure, causing difficulty in forming an organic combination of historical context and urban surroundings, and its monotonous form and lack of features impact the overall harmony of urban space [2].

4. Recommendations for reducing negative impacts of high-rise buildings on urban environment

4.1. Prohibiting construction of high-rise buildings in particular areas

In areas with perfect building environment and highly sensitive skyline, or protected areas of historic city, for example, even increasing one high-rise building in these areas will destroy the whole city.

4.2. Combination of prohibition and encouragement

Strict prohibition should be made in specific areas such as in the vicinity of suburb's center, around vast open space, riverside, highlands, and major public activity centers, while encouraging constructions in other areas.

4.3. Limit high-rise building site

In addition to its single unit's design quality, the landscape

effect of high-rise buildings depends largely on their sites. The location of high-rise building should consider the following principles: firstly, avoid intensive high-rise buildings as much as possible since intensive buildings will lead to deterioration of environmental quality and to traffic congestion; secondly, arrange for an open area in the city; thirdly, some high-rise buildings with typical height and body mass should be set in prominent locations of the city to become landmarks; fourthly, avoid building in main landscape orientation which influence and shelter each other; and fifthly, improve overall efficiency in line with the regulation of urban construction.

4.4. Control of body mass and height of high-rise building

Among the recommendations are ensuring good sunlight conditions for urban greening; protecting the coordinated relationship between landscape conditions of historic buildings and surrounding buildings; ensuring reasonable sunshine and good visual conditions in places that draw flow of people and places where people gather such as city streets, city squares and others; ensuring proportional spatial relationship between buildings; comprehensively considering the whole idea of urban physical environment within a certain range.

4.5. Control the density of high-rise buildings

Be sure to leave enough space for people flow, public venues and vehicles to benefit from the centralization.

4.6. Actively promote overall design concept

Environments with high-rise buildings should be coordinated with other buildings to give a warm, easy tempera-

ment. The microclimate of this space must not deteriorate due to the emergence of high-rise buildings, and it should make people happy to live there. We should consider the overall environmental design based on urban planning and design requirements [3].

4.7. Actively promote sensibility of layout and humanity of design

High-rise buildings have practical significance and shortcomings on urban environment, which should go toward health and maturity on the basis of sensible development, and strive to create a harmonious urban living environment.

5. Conclusion

High-rise building is one of the indispensable elements of urban space, yet at the same time high-rise buildings also affect the balance of an urban environment. Buildings cannot exist without their environment and their relationship with urban space. Excellent high-rise buildings must have a symbiotic relationship with urban space, and must not destroy the harmony of urban space.

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