

## The sustainable development of residential buildings

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**Abstract:** Based on the analysis of recent years shows that the residential building, now most residential buildings can only use 20-30 years, due to the current housing prices continue to rise, if you have been so it can not keep the building of sustainable development. So whether it is residential buildings or public buildings, their sustainable development is becoming a major problem facing the future of humanity, so in order to make sustainable residential buildings and public buildings have been developed, we have to analyze the current development pattern of society, Some find some strategies to promote the construction of sustainable development, and continue to use these strategies to promote sustainable building.

**Keywords:** residential buildings; public buildings; sustainable development; strategy.

### 1 The Present Situation Of The Development Of Residential Buildings

Sustainable development of residential buildings and public buildings, which on the one hand refers to the building on the outside with a bad environment adaptability during use, making the building no matter what kind of a bad environment can be carried out in self-regulation to meet the different needs of different users of its function, to achieve long-term use of the building; the other hand is in the process of construction of the building can be controlled by the material used in its construction process, labor, machinery to reduce input costs, in order to achieve energy-efficient buildings, and ultimately achieving sustainable development of residential buildings and public buildings. In fact, "sustainable" means is "not only meet the needs of contemporary people, but also to ensure the basic living needs of future generations. However, large-scale construction in contemporary society, many residential buildings and commercial buildings continue to emerge, there has now ghost town often said, contrary to the concept of sustainable development of the earth's bad environment caused a lot of damage. However, with the development of modern society, prices are constantly rising, while the modern features for building and bad environment have proposed higher requirements. These include the use of space, the building of the economy, construction of emotion, the uniqueness of the building, and so on.

#### 1.1 The use of building space

Building as a place of human activity, especially residential building, now rising prices, people can purchase some of the small size of the building to live, so in order to make a small apartment building in the context of some of the space to meet the user for the big house functional requirements on the use of, we have to create a space to meet this demand. Taking into account the changes in people's changes and age, with the constant changes over time, the population and age are constantly changing, so if the building does not change the space, it will not continue to change over time to meet user different needs.

According to the latest survey study abroad (Figure 1), studio, one-bedroom and two-bedroom cumulative total number of users accounted for 13% proportion of housing, and some singles, two people and three of the total number of households was as high as 70%, these free housing caused idle space, while many houses per year is needed for routine maintenance and heating, these costs have some statistics up to 2.52 billion euros. There is an important significance for the study of space construction and the sustainable development of buildings.

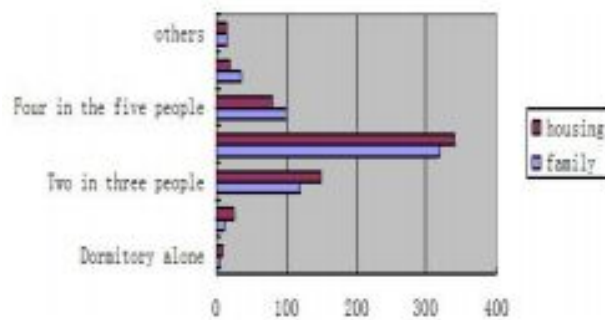


Figure 1 (unit: million)

### 1.2 The overall economics of building

Before the initial construction of a building when its economic cost is the developer primary consideration, but with the constant use of the building, the cost of its full life-cycle costs can be divided into construction, operation and dismantling of these three areas. But now the developers may only concerned about its construction costs, for the other two would not be concerned about the cost, which is what makes the quality of some of the buildings now there have been many problems. So from the building on the overall economy in terms of its impact on residential buildings and public buildings and sustainable development.

### 1.3 Building emotional

For many people, they think that some of the buildings can not move certainly not emotional at all, in fact, this theory is wrong, because now advocates a sustainable society, whether natural or artificial building bad environment, they have feelings, because they constitute the space we live in, carrying some of our ancient culture and we have been in the use of their feelings. So with the passage of the ring, around the building of a bad environment and culture also affect people's lives. So many developers have to do this and continue to demolish some of the buildings are still normal life. In this respect, it is also contrary to the requirements of sustainable development.

### 1.4 The uniqueness of the building

When the original architectural features many architects in pursuit of beauty and its unique, to design a lot of unique buildings. However, many of these buildings in terms of performance does not meet the requirements of sustainable development, including: comfort, lighting, insulation, ventilation and structural reliability buildings are not able to meet the requirements of the building. The main thing is when these unique buildings in construction increases the difficulty of construction, extending the duration of the project resulted in the pre-budget excess.

## 2 Examples Of Residential Building For Sustainable Development

Spain ACORDE project proposes a flexible layout into the use of space in the building housing the design stage and the increased use of space. And makes residential buildings can evolve along with the family constantly to adapt it to the new house functions and space requirements. The innovation lies in the same time it allows the user to make the purchase, rental and sales functions are divided and property modular based on actual demand. And also it implements the sustainable use of building structures and equipment, change the internal layout of houses in different stages required to meet the long-term use of such building under sustainable development.

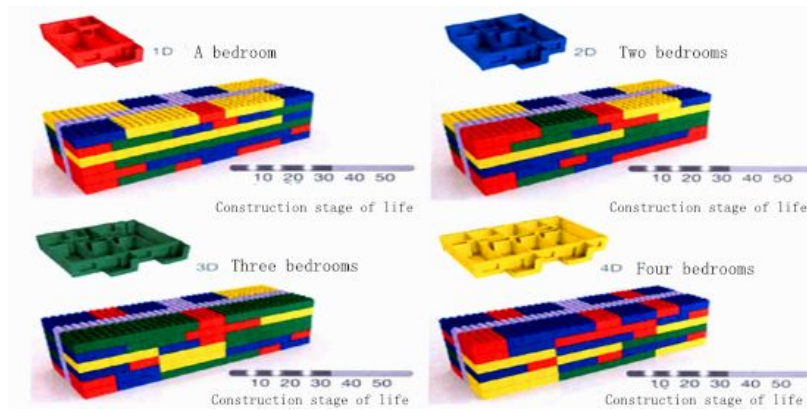


Figure 2

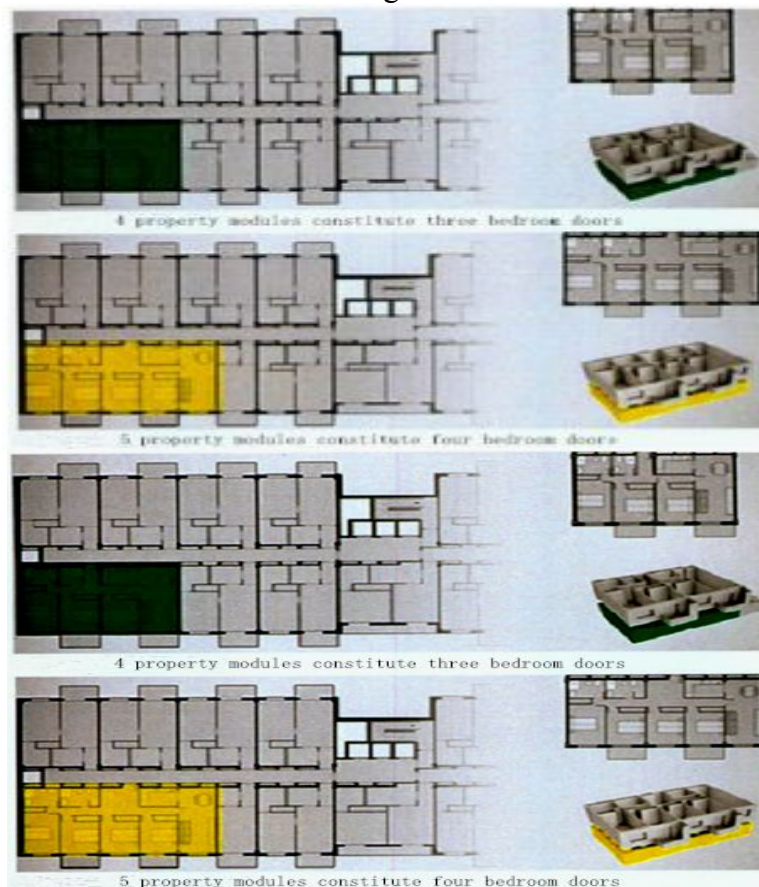


Figure 3

By viewing the above Figures 2 and 3, we can see that, both for initial sales, or for the changing needs of the future occupants, property portfolios and modular partitions can adapt to different residential projects. In line with the architectural requirements of sustainable development, reducing energy consumption, and more and more to take advantage of the space and the reuse of the building, in line with the needs of people in life, more able to adapt to the development of society.

### 3 Residential Building Sustainable Development Strategy

#### 3.1 The Selection and development of the sustainable use of some materials

From the type of material in terms of construction materials into the structural material and non-structural materials, in order to make a buildings to meet the safety, practicality, economy, durability, etc., you have to choose the right material. But for construction materials must meet the requirements of its useful life, non-structural materials is also necessary to have some durability,

can be replaced, recycling, environmental protection and other requirements. With the advancement of technology, to the extent possible to develop a material to replace steel and concrete materials, and is capable of making this material has the characteristics of recycling. From the energy consumption is concerned, we also need to develop a new type of building material, both thermal insulation and can ultimately achieve the sustainable use of energy, reducing the daily economic input.

### 3.2 Strengthening the main structure and with variable separation

From the life of the building is concerned, life is the life of its main building the main structure of the decision, so in order to maintain the sustainable use of the building must be such that the main structure of the durability to meet the longest life of the building. If you like this makes the main structure and variable after separation, you can ensure that changing the variable or replace aging while avoiding the main structure of the building caused not able to continue to use.

Figure 4 below is the case in the main structure remained unchanged, by removing a bedroom and changed into an example of the restaurant, so the child can increase the housing space, so that the function has been improved housing.

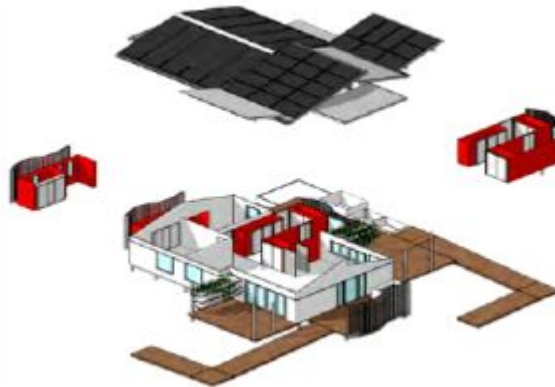


Figure 4 Building renovation diagram

### 3.3 Advocates prefabricated building elements heavy use

With the continuous improvement of the node connection technology, assembled technology now has been a rapid development, with respect to the traditional field of wet work is concerned, low labor intensity, short duration, less construction workers, but also can save a lot formwork and scaffold site construction costs. At the same time members can be factory specialized processing, to achieve the scale of the construction industry, fast, high quality. So advocates prefabricated building elements in line with the sustainable development of the extensive use of the building, and can be assembled into different styles according to the needs of different users, increasing the building's aesthetics, greatly improving the efficient use of space, easy to secondary space development.

After the city jobsites narrow environmental requirements, but also will promote the application of the assembly of the building. Figure 5 is the highest in the world assembled concrete frame structure (Ginza area in Tokyo, Japan, residential and 2 underground floors, the ground 58 floors with a total height 193.5m, with a total construction area of 380,000 m<sup>2</sup>), which is still higher than the direct costs of civil engineering now Pouring structure, the main reason for using assembly inadequate downtown construction site, high environmental requirements.



Figure 5 the world's tallest prefabricated concrete frame building

### 3.4 The technology used in intelligent buildings

In building design some smart devices installed in the building in the appropriate location, to achieve an intelligent control network, so that every member in the building can be a bad environment for external regulation by the sensor, so that the building at the same time External corresponding components of solar energy and other energy conversion, and finally these components into an energy converter, to achieve as much as possible inside the building energy self-loop, but can be adjusted inside the building's environment, to meet the requirements of sustainable development.

Such as the current building control systems, which can be implemented communications, fire fighting, security, office, security and other functions through the main chain of command and management system, and finally to provide users with a "safe, efficient, comfortable" life and work of bad territory.

## 4 Prospects For Residential Building For Sustainable Development

Table 1

No. <sup>o</sup>	Index <sup>o</sup>	Property <sup>o</sup>	2015 <sup>o</sup>	2020 <sup>o</sup>
1 <sup>o</sup>	Recycled water utilization rate (%) <sup>o</sup>	Core <sup>o</sup>	Severe water shortage area greater than or equal 25 <sup>o</sup> <u>Dryland</u> greater than or equal to 15 <sup>o</sup>	Severe water shortage area greater than or equal to 30 <sup>o</sup> <u>Dryland</u> greater than or equal to 20 <sup>o</sup>
2 <sup>o</sup>	Per capita construction land area (sqm/ person) <sup>o</sup>	Core <sup>o</sup>	In less than 85 <sup>o</sup>	In less than 80 <sup>o</sup>
3 <sup>o</sup>	Daily average concentration of PM 2.5 standard Days <sup>o</sup>	Leading <sup>o</sup>	Greater than or equal 292 <sup>o</sup>	Greater than or equal 310 <sup>o</sup>
4 <sup>o</sup>	Housing price to income ratio <sup>o</sup>	Core <sup>o</sup>	Less than or equal to 10 <sup>o</sup>	Less than or equal to 6 <sup>o</sup>
5 <sup>o</sup>	Affordable housing coverage (%) <sup>o</sup>	Expand <sup>o</sup>	Greater than or equal to 20 <sup>o</sup>	Greater than or equal to 30 <sup>o</sup>
6 <sup>o</sup>	Urban Disaster Prevention Level <sup>o</sup>	Expand <sup>o</sup>	Meet the specification requirements; fixed shelter area per capita than or equal to 3 square meters <sup>o</sup>	

Table 1 above shows that, after the per capita area of land for construction will be gradually reduced, and also the reduction without breaking people's housing prices to income ratio, it is forced to develop sustainable buildings. With the continuous development of BIM technology, by building models to simulate the various functions to achieve the sustainable development of the building, the energy consumption to a minimum, so that environmentally friendly energy integration. Meanwhile

sustainable building is the current major problem plagued the people, and its development requires not only innovative architectural design division, but also with the need for common humanity, to work together to build eco-building easy living, feeling architecture, culture building, making it more harmonious people's lives.

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