

# Analysis on the design of old housing's elderly-oriented improvement from the perspective of environmental sustainability

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**Abstract.** Under the severe background of the international ecological and energy situation, the effective practice of sustainable green and ecological development concepts is important for maintaining the earth environment on which mankind depends and promoting the peaceful and orderly development of human society. As a large energy consumer and carbon emitter, the Chinese government is committed to vigorously promoting the people's livelihood project for the transformation of old communities, and innovating and transforming the places in the city's old houses that "have poor living experience for the elderly". This kind of project applies the concepts of environmental protection, green and energy saving to the design of old house renovation. The rational regeneration and transformation of old houses can reduce the waste of resources and energy on the one hand, and improve the living environment of the elderly on the other hand, so as to obtain the greatest economic and social benefits and realize the needs of sustainable urban development.

**Keywords:** Environmental sustainability; Elderly-oriented; Old houses; Interior design.

## 1. Introduction

China is the most populous country in the world. At present, the population is entering the climax period of aging, facing a very severe aging situation, and the issue of elderly care is imminent. With the continuous improvement of people's living standards, the process of urbanization has also deepened. In the brutal urban construction model of "demolition of the old and building the new", a lot of resources are consumed. At the same time, ecological problems such as building pollution have also threatened the human settlements and restricted the process of social development. In recent years, under the call of the government, the rapid urban renewal method of "demolition of the old and building the new" has gradually transitioned to the gradual "organic renewal" development model. In the transformation of old communities in cities and towns vigorously promoted by the government, it is advocated to follow the principles of protection and regeneration, and to promote the concept of sustainable development of the human settlement environment. The General Office of the State Council pointed out in the "Guiding Opinions on Comprehensively Promoting the Reconstruction of Old Urban Communities" that when vigorously promoting the transformation of old urban communities, the level of public services such as community pension and medical care should be improved to cope with the increasingly serious social problems of aging. . However, the housing in the 1980s and 1990s was restricted by the social and economic aspects of the time, mainly to meet the basic housing needs, thus ignoring the consideration of special elderly groups. This kind of building cannot meet the high-quality life needs of an aging society. Therefore, it is necessary for the government and practitioners to formulate corresponding design measures for elderly-oriented in view of the problems existing in the interior of the old residences when renovating the interiors of the old communities. This is conducive to the sustainable development of urban construction to a certain extent.

## **2. The main problems existing in the elderly-oriented suitability of housing in old urban communities**

### **2.1 Defects in residential building structure**

Most of the old residential buildings in my country were built in the 1980s and 1990s, and they are in the early stage of my country's economic and social development, with a weak economic foundation. The design was influenced by the economy and the background of the times, and no elevator was installed. For the elderly, body organs gradually weaken with age. Walking up and down the stairs not only aggravates the damage to the kneecaps of the feet, but as the body's fitness decreases, climbing stairs for a long time will lead to physical weakness. In a large number of old buildings, there is no daylight or insufficient daylight in passages and parts of the space. The elderly are prone to accidents such as collisions and falls, which are not conducive to the needs of the healthy development of the elderly.

### **2.2 Unreasonable residential space layout**

The urban old quarters were basically constructed at the beginning of the reform, and the interior design industry has just emerged. Residential design in the interior space planning is mainly to solve people's most basic living needs, without considering the rationality of the living environment from the perspective of the elderly and humanization, which is not conducive to the convenience and comfort of the elderly's living life. In the architectural design, the kitchen and bathroom spaces have not been paid attention to. The apartment structure generally has large bedrooms and balconies, and the living room, kitchen and bathroom are too small, resulting in unreasonable functional structure layout. This has caused great difficulties for the activities of the elderly and the use of barrier-free facilities. Moreover, the close space such as the kitchen and dining room, bedroom and bathroom is far away, which leads to confusion in the production line and low work efficiency.

### **2.3 Residential supporting facilities are relatively backward**

The supporting hydropower and network infrastructure projects in old communities mainly provide basic daily life requirements and meet people's daily lighting, domestic water and basic electricity needs. Restricted by information technology at the time, there were basically no network information service facilities, let alone related intelligent facilities and products. As a whole, there are the phenomena of small total power distribution capacity, insufficient water pressure, and backward network information facilities. It is not conducive to the interaction of residents with external information, and to meet the needs of people for high-quality life in the contemporary information age.

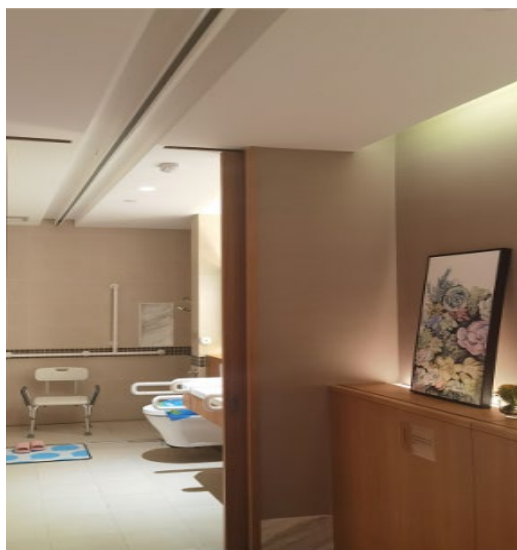
### **2.4 Lack of humanized design concept**

During the 1980s and 1990s, when people moved from collective housing to owning individual housing, the housing requirements remained at the most basic living function needs. There is a lack of barrier-free facilities, and the humanized design for ageing is not set. Functional planning is mainly reflected in basic residential functions: such as bedroom, bathroom, kitchen, etc. There is a lack of personalized functional spaces such as calligraphy and painting rooms, gymnasiums, tea tasting rooms, etc. according to the occupants' personal interests and hobbies. And for a long time, people mainly paid attention to the decoration of interior surface effects, and ignored the extension of connotation. Failed to take the ergonomics point of view and take the occupant's psychological and physical characteristics as the starting point for the corresponding personalized design considerations. It cannot satisfy the modern people's pursuit of high-quality living standards.

### 3. Strategies for the renovation of urban old houses' indoor adaptability

#### 3.1 Additional elevators and daylighting measures

Comfortable environmental space and convenient humanized facilities play a key role in the physical and mental health of the elderly. In the process of transforming old communities to adapt to aging, designers should establish an age-friendly environment and facilities from the perspective of ergonomics and according to the physical characteristics of the elderly. In terms of building construction, elevators should be added according to the structure and lighting of the building. The location of the elevator is generally selected at the stairs or public walkways. When choosing the location, care should be taken not to block the lighting of the original building and the convenience of public passages. For spaces with poor indoor local lighting, appropriately expand the lighting scale of indoor and outdoor doors and windows when structural conditions permit. Indoor partition walls can be made of light-transmitting materials or virtual shapes, such as glass, low partitions, etc. It can also be used to enhance the illuminance of indoor light tools to adjust the entire indoor light. However, due to the visual degradation of the elderly, the ability to change light and shadow is weakened, and the ability to adapt to sharp changes in light is relatively poor. Therefore, when setting up lighting fixtures, local special lighting should be carried out according to the needs of use in addition to the general basic lighting. In the selection of light sources, floodlights with uniform and soft illumination should be used as much as possible, such as light strips, downlights, soft incandescent lamps, and ceiling lamps. Smart products can also be used to intelligently control the intensity and weakness of the light, so that the brightness can be adjusted according to the intensity of the light. Changes are needed to avoid the discomfort caused by the glare and intensity of the lighting to the occupants (see figure 1 for details).



**Figure 1.** Taibao Homeland-toilet and bedroom lighting in the senior housing demonstration experience center (from promotional pictures)

#### 3.2 Improve supporting facilities

In recent years, with the rapid development of the Internet of Things and Internet technologies, intelligent products have continued to spread. In particular, the impact of the global epidemic has accelerated the take-off of intelligence and informatization, and smart homes are gradually moving towards millions of households. This model puts the traditional home care model under the perspective of "Internet +", and integrates various social care service resources by making full use of mobile Internet, Internet of Things, big data and other information technology to promote institutions, communities and homes. Effective connection of elderly care services. In the interior renovation design, humanized smart devices and products should be appropriately introduced according to the economic situation to ensure the seamless connection between the occupants and the social

information, and the improvement of the quality of living. For example, the intelligent safety alarm system is pre-installed: kitchen gas leak alarm device, emergency call for help in the bathroom and bedroom. According to the situation of the head of the household, some intelligent medical care and health care products are added: intelligent massage beds, infrared medical beds, etc., intelligent performance products: intelligent infrared airbag cabinet drawers, intelligent power-assisted sofa chairs, etc. (see figure 2 for details). It also presets and expands the capacity of water and electricity to the home, increases the fiber optic network to the home, provides infrastructure for existing life and future smart elderly remote services, and adds urban cloud services and other elderly service platforms according to the development of the times.

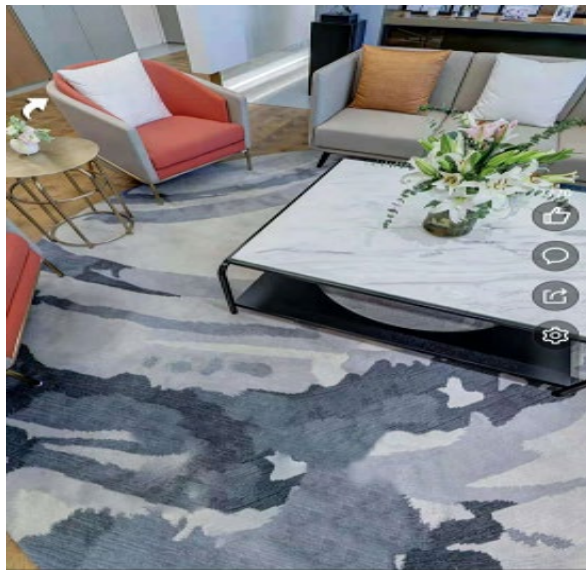


**Figure 2.** Taibao Homeland -smart bed and monitoring integrated machine in the bedroom of the senior housing demonstration experience center (from the promotional picture)

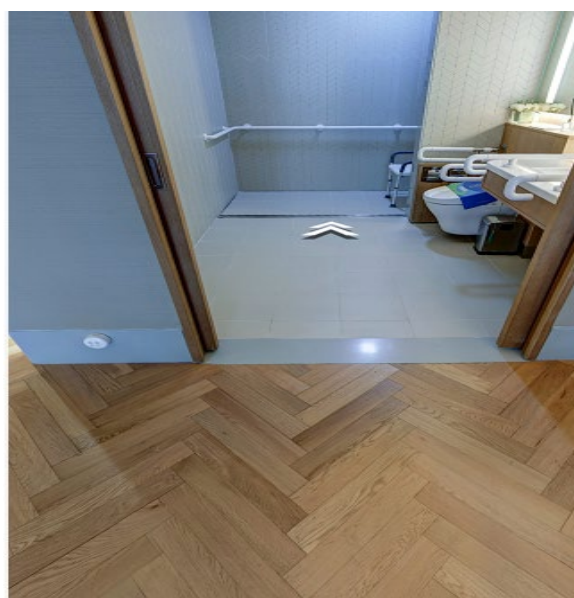
### 3.3 Elderly-oriented colors and material application

People's psychology in the indoor space of living will be affected by color, light, quality of objects and other environmental factors, which will have a positive or negative potential impact on psychology. As people grow older, people's vision, hearing, smell, and ability to respond to actions gradually decline, and people's psychology changes due to changes in the body and work. Therefore, from the perspective of humanity, create a warm, peaceful, and fresh color space. The environmental atmosphere has played a positive role in promoting the mentality of the elderly. The atmosphere of the space environment mainly comes from the color matching of interior decoration, and different colors bring people different feelings. Bright colors make people feel cheerful. The gray and dark colors make people feel melancholy. The high-purity colors give people liveliness, enthusiasm, excitement, and a sense of joy. The colors with lower purity give people a sense of tranquility and peace. Therefore, in terms of indoor color matching, we should adopt soft tones with low purity and high color brightness according to personal preferences to create a comfortable, quiet and relaxing visual environment suitable for aging space (see figure 3 for details). Different material properties play a vital role in safety. The elderly have increased demands for safety and comfort due to the decline of their physical functions, aiming at the elderly with fragile bones, weakened physical functions, and poor mobility and response capabilities. When renovating old houses, the environmental protection and safety of the materials themselves are given key considerations. For example, when choosing floor materials, if there is water space in the kitchen, bathroom, etc., you should pay attention to its non-slip properties. It is appropriate to choose some non-slip materials such as non-slip bricks and polished stones. Bedrooms and living rooms should pay attention to warm and

comfortable wooden floors and other softer refolding materials to improve the comfort of living (see figure 4 for details) and achieve sustainable living.



**Figure 3.** Taibao Homeland -a picture of soft decoration color matching in the living room of the senior housing demonstration experience center (from promotional pictures)



**Figure 4.** Taibao Homeland –a picture of bedroom wooden floor and bathroom non-slip tiles in the senior housing demonstration experience center (from promotional pictures)

#### 4. Conclusion

Since the reform and opening up, with the rapid economic development, people's living standards have been continuously improved, and higher requirements have been placed on the living environment. The concept of sustainable development is a manifestation of advancing with the times and will inevitably play an important role in the future development of the ecological environment. In the people's livelihood project that the government vigorously promotes the transformation of old communities, it is necessary to implement the concept of sustainable development into all stages of the design, minimize the impact on the ecological environment, reduce energy consumption, so as to make the "human needs" and "environmental protection" meet a state of harmony. To a certain extent, this concept is also conducive to the sustainable development of environmental art design.

## References

- [1] Zhou Gang, Zhang Jingjie, Zhang Chao. Discussion on the Characteristics of the Reconstruction of Old Residential Districts and the Opportunities and Problems Brought by it [J]. Chongqing Architecture, 2021 (03):33-35.
- [2] Li Ying. Research on the Relationship between Urban Ecological Environment Protection and Sustainable Development [J]. Resources Economization & Environmental Protection, 2021 (02):128-129.
- [3] Guo Liqun, Sun Tong. Research on the Design of Suitable Aging Environment Reconstruction in Old Community [J]. Intelligent Building & Smart City, 2011 (01):21-23.
- [4] Zhou Yanmin, Wang Fuqing. The Design of Residential Housing for the Elderly under the Mode of "Home Care for the Elderly" [J]. Modern Urban Research, 2011 (10):68-74.
- [5] Li Qian. New Home-based Care Model of Old Housing Alteration for Elderly [D]. Shandong: Qingdao University of Technology, 2011.
- [6] Wang Xin. Design Cases and Strategies for the Reconstruction of the Space in Old Urban Residential Units [J]. City & House, 2015 (06):36-41.
- [7] Li Zhen, Chen Feihu. Research on the Barrier-Free Design in the Living Environment of the Elderly [J]. Sichuan Architecture, 2008 (04):43-44.
- [8] Liu Dongwei, Jia Li, Wang Shanshan. Research on the Universal Design of Housing Suitable for Aging under the Home Care Mode>[J]. Architectural Journal, 2015 (06):1-8.
- [9] Housing Consortium for Senior Citizens of Japan. Handbook of Housing Design for the Elderly [M]. Beijing: China Construction Industry Press, 2011 :13-28.