

The Morphological Evolution of High-rise Residential Building Plan in Shanghai under Urban Social Changes

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Abstract

High-rise residential buildings are not simply objective products of cities, which are influenced by urban social changes and national housing standards. Human-oriented design has been continuously paid attention to in the development of contemporary Chinese urban housing. However, the morphology of high-rise housing in China tends to be in a lack of variety.

The paper made a summary of the types of high-rise residential building plan in Shanghai from the 1980s to the present, and explained the process of change from the perspective of urban social changes. The form of high-rise residential plan could be divided into three types: gallery apartment building, tower-type apartment building and combined apartment building under the influence of social economy and housing standard in different periods. From 1980 to 1990, the form of high-rise residential plan was diversified, such as gallery and tower-type apartment building. In 1990s, tower housing became mainstream. In 2000s, the type was dominated by tower-type and combined apartment. Since 2016, China has implemented the two-child policy. To meet the need of various families, the form of residential building plan should be more flexible.

The evolution of high-rise residential form can partly reflect the changes of urban society. Research on residential morphology can provide a basis for the sustainable development of high-density cities in China.

Keyword: urban social changes, high-rise housing, residential plan, morphological evolution

Introduction

In 2021, the Ministry of Housing and Urban-Rural Development proposed that the county's new residential buildings should mostly be built with 6 floors and the highest should not exceed 18 floors. The proposal was aimed at reducing the damage from urban development to the county's landscape. However, high-rise housing is still the primary solution for China to alleviate the problem of high-density urban living. With the construction of high-density residential areas, China is faced with the problem that cities look the same (Wang et al., 2020).

Related researches of high-rise housing focused on energy saving and green design, but the evolution and formation reason of its form were seldom discussed. Taking Shanghai as an example, the development of urban high-rise housing was put out under the urban social change in this study. Social economy, family structure, the change of housing standards were sorted out in Shanghai since 1980s. The characteristics of

plan form and dwelling units of high-rise housing in different periods were summarized. The study on the evolution of the plan form of high-rise residential buildings reflected the urban social changes in Shanghai since the reform and opening up.

Background

After the reform and opening up, China's social structure has changed dramatically, which affected the quantity and quality of residential space. On the one hand, rapid urbanization led to an increase in the total demand for housing. On the other hand, there were different stages of urbanization in different regions, leading to diversified demand (Liu, 2004).

Under the background of social transformation, housing has changed from welfare distribution goods to commodities, and then developed into the coexistence of commodities and social security goods (Zhang, 2021). The macro changes of residential space in the context of social changes in China were often discussed by scholars, but the changes of residential form from a micro perspective were seldom discussed in the past 40 years.

High-rise residential buildings in Shanghai

As the site of the first high-rise apartment in China, the morphological types of high-rise residential buildings are rich and representative in Shanghai. In the 1980s, there were already some high-rise apartments. From 1928 to 1948, there were 35 high-rise apartments constructed with 8-20 floors and an area of 34.25 square meters (Shen, 1991). In the 1950s and 1970s, the housing construction was dominated by multi-storey houses to adapt to the economic development at that time (Shen, 1991). High-rise residential buildings were greatly developed in the 1980s to alleviate the contradiction between the shortage of land and large population (Shen, 1991). In 2021, there were 408 new developments for sale in downtown Shanghai, of which the number of high-rise residential communities accounted for 52 percent¹.

Form of high-rise residential buildings

With the development of high-density cities in China, there were more and more discussions on the design of high-rise residential buildings. Zhai et al. (2009) pointed out that due to the lack of effective spatial planning guidance, the coordination with the surrounding environment was often ignored in high-rise residence development. He (1998) and Tang (1998) put forward design suggestions of standard plan design of tower-type apartment building. In terms of diachronic research, Liu (2005) analysed the evolution of the facade style of urban residential buildings in Beijing. Zhu (1998) summed up the four forms of slab high-rise residential buildings in Shanghai. Sun (2007) selected typical cases of high-rise residential buildings in

¹ Web of city real estate in Shanghai. <http://sh.cityhouse.cn/ha/pr11-bl13-ur1-sp3/>

Shanghai from 1980s to 2007 for analysis, proving that the evolution process of high-rise residential plan is the pursuit of better orientation, convenient and economic traffic, reasonable and safe fire routes, and comfortable dwelling unit. However, few studies discussed the evolution of the plan form of high-rise residential buildings in the context of urban social development.

Methodology

The evolution of the plan form of high-rise residential buildings in Shanghai was divided into four periods: 1980s, 1990s, 2000s and 2010s. Typical cases were selected in each period. The evolution of plan form and dwelling units were summarized. Through the website of Shanghai Bureau of Statistics, the consumption and household population of each period were collected. Changes in policy and criteria were clarified through literature. Finally, the economic, demographic and policy factors leading to the emergence of different forms were analysed.

Results and Discussions

Evolution of plan form of high-rise residential buildings

Since the 1980s, there has been mainly three kinds of plan forms of high-rise residential buildings in Shanghai: gallery type, tower type and combined type. In the 1980s and 1990s, high-rise residences were mainly gallery type and tower type. In the 1990s, the combined apartment buildings gradually occupied the mainstream. Restricted by the structural stability, gallery apartment buildings could not be built too high. As a result, the floor area ratio of gallery apartment buildings was not high. After 2000, gallery apartment buildings were rarely seen in residential areas, and were often used in dormitory buildings. Tower-type and combined apartments were more commonly used today.

Gallery type residence was divided into inner gallery type and outside gallery type. The plan of inner gallery type was rectangular, with a long corridor in the middle and rooms arranged on both sides, such as Lu's residence (Figure 1). Only one side of gallery type residence had windows. There was insufficient sunlight and ventilation in the rooms. In the Xiaomuqiao Road apartment, windows were set every two households on the corridor wall, so that the inner corridor could get sunlight. The corridor was bended and the exterior walls were curved in Weihai Garden, so that every household could have sunlight from two directions. A similar approach was taken to increase sunlight for each household in Yan'an greenbelt square.

In gallery type residence, only one side of each dwelling unit had direct daylight, while the other side had windows on the corridor wall. Kitchens and toilets usually faced the corridors. The lampblack of kitchens could cause pollution to the air in corridors. In order to get enough sunlight and ventilation, notches were set on the exterior walls in outside-gallery apartments, such as 63 Quyang Road residence.

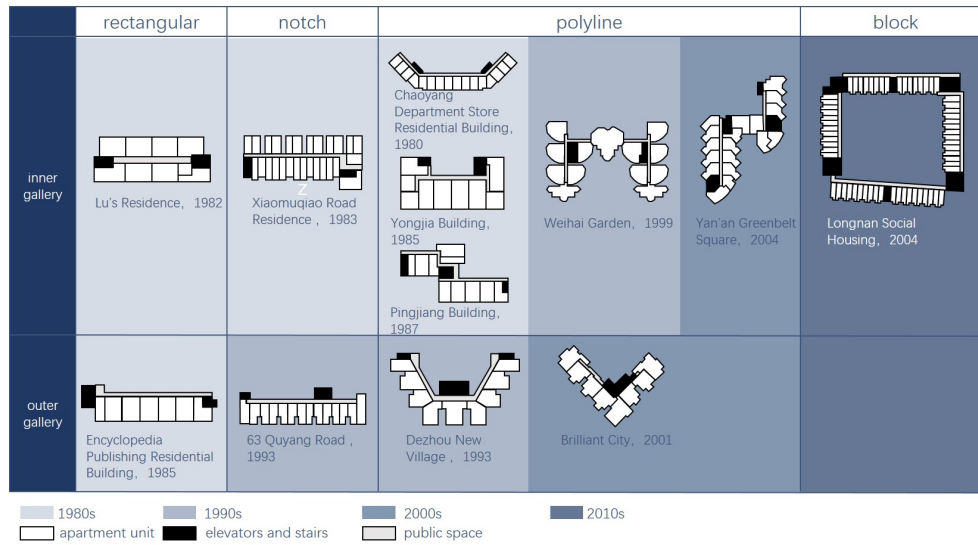


Figure 1. This figure shows the evolution of gallery apartment building from 1980s to 2010s in Shanghai.

Tower-type apartment buildings were widely constructed at the beginning due to their advantages of land saving. Their conditions of sunlight and ventilation were better than that in gallery apartments. The stairs and elevators were usually in the centre of the plan of a tower-type apartment. The plan forms of tower-type apartments were more diverse. There were square, windmill-shaped, cross-shaped, X-shaped, butterfly-shaped and T-shaped plans. Each household had different sunlight conditions.

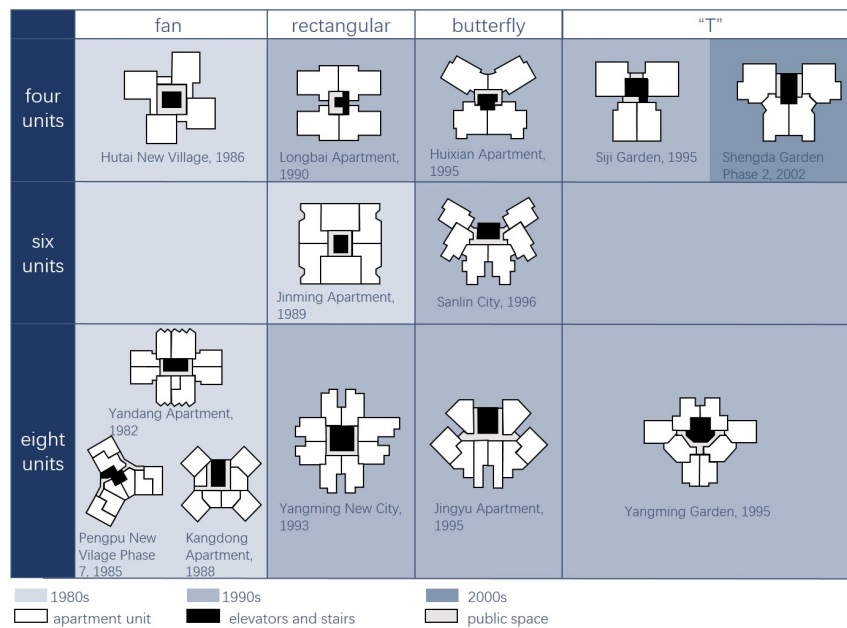


Figure 2. This figure shows the evolution of tower-type apartment building from 1980s to 2010s in Shanghai.

A combined apartment building was a combination of household units (Figure 4), each with staircases or staircases and elevators. Since the commercialization of housing in the 1990s, combined apartment buildings have gradually become the most widely constructed type in high-rise apartments. The staircases and elevators were usually placed on one side of the plan, such as the north side, to provide more south-facing

rooms. There were two to four households on each floor. The plans of combined apartment buildings were mostly axisymmetric.

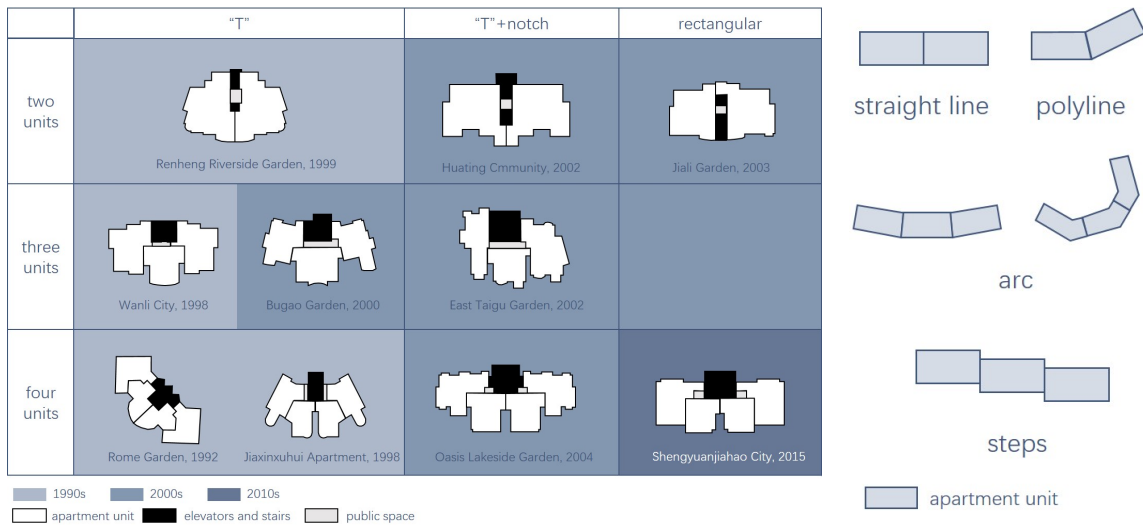


Figure 3. This figure shows the evolution of combined apartment building from 1980s to 2010s in Shanghai.

Figure 4. This figure shows the combination mode of apartment units.

Dwelling unit

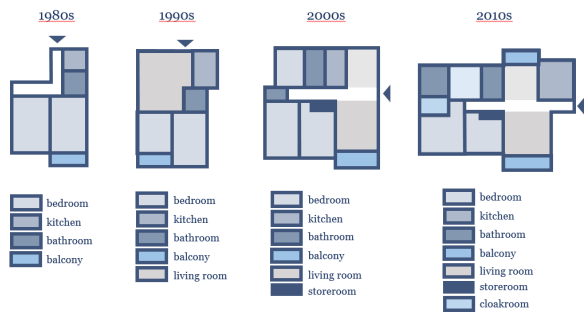


Figure 5. This figure shows the different dwelling units of apartment building from 1980s to 2010s in Shanghai.

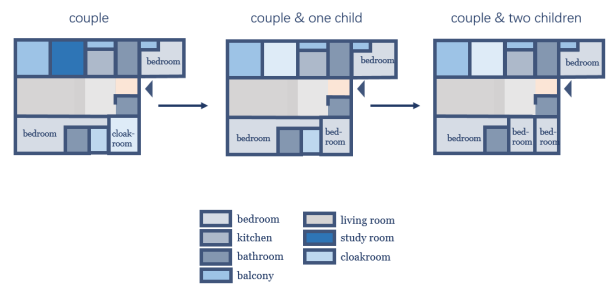


Figure 6. This figure shows the "two-child family dwelling unit".

From the 1980s till now, the dwelling unit of high-rise apartment buildings in Shanghai has experienced three divisions (Figure 5). After 1978, the housing system of China gradually transformed from welfare housing system to social housing security system (Zhou et al., 2020). The construction goal during this period was “one apartment for one family” (Zhou et al., 2020). Each apartment had 2-3 bedrooms, a bathroom and a kitchen. There was no living room in an apartment or there was a small space for families to eat together. Bedrooms were the main space in an apartment at that time.

In the 1990s, with the popularity of TV, watching TV has become the main way for families to entertain themselves in leisure time. People need a space for families to gather around at home. Then living rooms appeared and became important. Kitchens also gradually expanded.

Entering the 21st century, the dining room was separated from the living room. There was a separation of dining room, living room and bedrooms. Bathrooms were divided into dry and wet areas. There were two bathrooms in the apartment with three bedrooms or more.

In 2010, the design of dwelling units was more refined than before. The entrance in the apartment was provided with a porch. Storerooms were added to the apartments. With the implementation of the two-child policy, some real estate companies introduced "two-child family dwelling unit" for parents with two children (Figure 6). The dwelling unit were flexible and changeable. For example, the children's room was designed to be a large separable bedroom. When children were young, they shared one bedroom so parents could take care of two children at the same time. And when the children grew up and needed personal space, the bedroom could be divided into two small bedrooms.

The era of consumer durables

Chinese society is entering an era of consumer durables. In the past, necessities such as food accounted for most of people's consumption expenditure. As economic conditions improved, consumer durables such as houses, cars and high-grade electrical appliances began to enter people's lives.

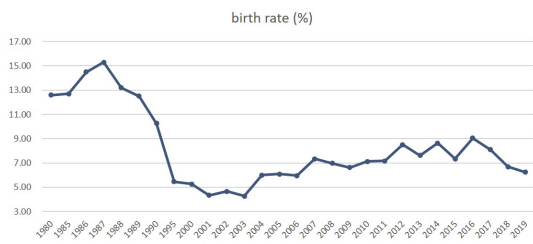


Figure 7. This figure shows the birth rate from the 1980s to 2010s in Shanghai.

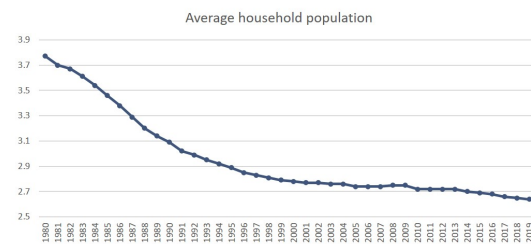


Figure 8. This figure shows the average household population from the 1980s to 2010s in Shanghai.

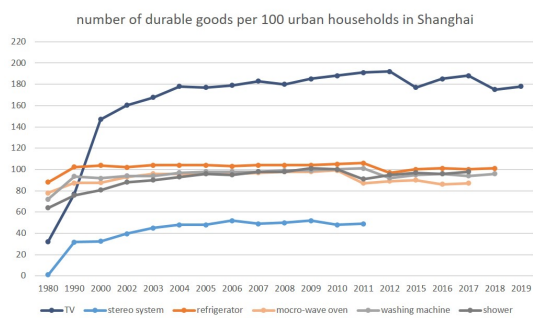


Figure 9. This figure shows the number of durable goods per 100 urban households from the 1980s to 2010s in Shanghai.

year	apartment area /m ²	usable area /m ²	number of habitable space
1975	42-90	-	-
1985	60-65	-	-
1991	26-70	-	-
1994	66-76	-	-
2001-2012	-	≤60	small-size dwelling unit
	-	60-90	middle-size dwelling unit
	-	> 90	big-size dwelling unit
2013-2021	-	≤60	small-size dwelling unit
	-	60-90	middle-size dwelling unit
	-	> 90	big-size dwelling unit

Table 1. This table shows the standards of the apartment area in Shanghai.

Figure 9 shows the amount of consumer durables per 100 urban households in Shanghai at the end of the year from 1980 to 2019. Before 1990, there was less than one TV set per household. By 2000, almost every household had a TV set. By 2012, each household had nearly two televisions. The house is the spatial container for these consumer durables. Changes in the number of consumer durables per household can also

be reflected in changes in the dwelling unit. Living rooms appeared in more dwelling units in the 1990s, providing space for family activities like watching television together.

The influence of family structure on house type

The changes in China's family structure are closely related to national policies. Due to population pressure, China introduced the basic national policy of "family planning" in 1982. In 2015, the two-child policy was implemented, allowing all legal couples to have two children. In May 2021, the the three-child policy was put forward to improve China's population structure and dealing with an aging population. Since the reform and opening up, the family structure in China has gradually changed from the backbone family to the nuclear family. With the decline of fertility rate, the trend of late marriage and late childbearing, and the rise of DINK families, the number of two-person families in China is increasing.

In terms of birth rate, Shanghai's birth rate increased rapidly from 1978 to 1987, and declined rapidly from 1988. The birth rate dropped every year between 2016 and 2019 (Figure 7). In terms of the average household population, the average household population decreased year by year from 3.77 to 3.09 in 1979 and 1980 (Figure 8). It has fallen below three since the late 1980s. In the ten years after 1982, the average household population dropped rapidly to less than three people. Despite the implementation of the two-child policy in 2015, the average household population continued to decline.

The decline in the average household size has curbed people's pursuit of apartment area. After 2000, the number of dink families and young people living alone gradually increased. Small dwelling unit will still occupy important position in the housing market. At the same time, some parents chose to bear three children. The changeable dwelling unit came into being in order to respond to the different needs of children in different ages.

The housing standards

The direct factor that affects the area of high-rise apartments in Shanghai is housing design standard. In early Shanghai, the upper limit and lower limit of building area of urban workers' residential buildings were stipulated. After the commercialization of residential buildings, the number of residential spaces was restricted (Table 1). In the overall trend, the standard of apartment area restrictions was first strict and then loose. And the housing standard added a regulation on the number of habitable spaces (bedrooms and living rooms).

Conclusions

Characteristics of plan form of high-rise residential buildings

In the 1980s, the plan form of high-rise residential buildings in Shanghai was mainly corridor type and tower style. In the 1990s, tower type and combined type were dominated. After 2000, combined apartment buildings were dominated. There were two kinds of corridor type plan, outside corridor type and inside

corridor type. There were various plan forms of tower-type apartment building, such as fan, rectangular, butterfly and T-shape. The plan form of the combined type was mostly the deformation of the T-shape. The plan of combined apartment building was usually arranged in straight line, polyline, arc and steps.

Since the 1980s, the main spaces in a high-rise apartment in Shanghai were bedrooms. Living room appeared in the 1990s, and people also had dinner in living room. In the 2000s, dining room was separated from living room. After 2010, there were more rooms in an apartment of a family, such as storeroom and cloakroom. Nowadays, as the differentiation of dwellers' demand, the design of dwelling unit is more diverse. Some apartments have spacious porch spaces.

Factors of urban social change

The change of the plan form of high-rise residential buildings was an epitome of the social development of cities in China. In the 1990s, China entered the era of durable consumer goods. Owe to the rapid improvement of the national economy, home appliances such as televisions and stereos multiplied. Living room appeared with televisions and stereos.

Instead of a decline in the average household size, Shanghai's per capita living space has been increasing since the 1980s. This shows that people's living quality has been improving constantly. In 2006, the implementation of the *9070 policy* limited the growth of apartment area to a certain extent and stabilized the housing price. However, after the implementation of the two-child policy, large apartments with three or four bedrooms have become increasingly popular in Shanghai's housing market.

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