Proceedings of the International Conference on Social Psychology and Humanity Studies
DOI: 10.54254/2753-7048/10/20230384

Coordination of Public Service Facilities and Greening in Residential Communities in Beijing

Yixin Wang [1,a,*]

[1] *College of Architecture and Urban Planning, Beijing University of Technology, Beijing, China*
a.wangyixin@emails.bjut.edu.cn
**corresponding author*

Abstract: The coordination of green space and public service facilities is of great importance in improving the spatial quality of existing residential districts. This paper adopts the method of a questionnaire survey to investigate the current cooperation between green space and service facilities in residential communities in urban areas in Beijing, China, explores the possibility of their coordinated development in residential areas, and puts forward countermeasures and suggestions for their collaborative transformation. The results show that the three types of facilities that residents thought should be coordinated most with green space were cultural and sports, educational, and social welfare facilities, while commercial service facilities were the most frequently used. Based on the survey results and considering the difficult degree of collaborative transformation of different service facilities and practical problems in implementation, three suggestions were put forward: (a) Differentiated hierarchical control strategies should be put forward for the collaborative transformation of service facilities and green space for different types of communities. (b) Urban planners should optimize the spatial layout relationship between green space and service facility land and pay attention to their functional combination, considering both spatial and functional coordination. (c) In the actual reconstruction, the residents' willingness to transform different public service facilities, the frequency of use, and the objective economic conditions of the community should be comprehensively considered, and the reconstruction should be carried out in stages according to the order of priority.

Keywords: greenspace, public service facilities, residential communities, Beijing

1. Introduction

The city's green spaces combine ecological services with human well-being, which significantly impacts the quality of life for people and the environment. Beijing's urban construction is centered on enhancing the urban living environment during this profound change in urban and rural growth [1,2]. People's tremendous desire for a high-quality life under the guidance of livability can only be satisfied by efficiently increasing the quality of the living environment [3]. To give residents better outdoor space, it is now a worry to figure out how to combine urban residential areas' greenery with the current period's practical needs.

The rise of Chinese cities has recently entered a period of internal improvement, with the emphasis steadily moving away from economic growth and towards enhancing people's quality of life and the shrewd management of land resources. Urban development planning increasingly shifts to renewal

DOI: 10.54254/2753-7048/10/20230384

and reconstruction planning based on the creation of storage space, in contrast to the prior emphasis on the ongoing extension and expansion of the city. Big cities, exemplified by Beijing, have steadily shifted to urban renewal operations of coordinating stock resource allocation and optimizing function layout under the current development backdrop of "giving priority to stock and driving increment" [4]. The primary stage of the upcoming regeneration will be the urban renewal of public space, which focuses on enhancing the environmental quality of green space, and the urban renewal of facilities, which focuses on renovating public service facilities and safety facilities [5]. Green spaces and service facilities have been the subject of considerable study and policy, but the topic of their interaction has not gotten enough attention.

Therefore, this research concentrates on the service facilities and green space in residential neighborhoods against the backdrop of stock and investigates their potential connections and the potential for cooperative growth. Through a questionnaire survey, the status quo and satisfaction level of green space within the residential community are investigated, the current issues are explored, and the possibility of coordinated development of service facilities and green space inside the residential district is examined. The report also suggests remedies and recommendations for enhancing the quality in collaboration with service facilities, as well as optimization techniques for residential green space.

2. Background

The Master Plan of Beijing (2016-2035) proposed strengthening detailed governance and promoting functional restructuring. The renewal of Beijing's central urban area gradually develops precision with superimposed functions [6]. Therefore, under the concept of encouraging joint setting of facilities, promoting resource sharing, and advocating functional combination, the government proposes to optimize the spatial layout relationship between green space and service facility land, enhance the functional combination of green space and public service facilities, and lay more green space around service facilities or the path to service facilities. It aimed to provide the residents with more ecological services of green space.

As a world-class international metropolis, Beijing has always been committed to increasing green space using returned and dredged green space to improve citizens' living quality and build a livable city [7,8]. However, this traditional way of green enhancement has its limitations: the economic input in this mode is large, the subsequent funds cannot be balanced, and the sustainability is not strong; on the other hand, with the continuous development of the economy and society, people's demand for the quality of living space is constantly improving. This kind of green construction, which cannot penetrate the residential community, makes it difficult to meet people's beautiful pursuit of "opening the window to see green". According to the preliminary survey and relevant existing studies, the "quantity" of green space in residential communities continues to increase in the high-density built-up environment of urban Beijing, and the spatial relationship with buildings and roads becomes closer [9]. However, the spatial connection between service facilities and green space is decreasing (Fig. 1). Therefore, this study explores the optimization strategy of residential green space and the suggestions for improving coordination with service facilities in the high-density built environment.

Figure 1: Relationship between afforestation and public service facilities in modern typical residential areas.

DOI: 10.54254/2753-7048/10/20230384

3. Methods

The survey was conducted by issuing online questionnaires. The research objects are residents of residential communities in different districts of Beijing. A total of 286 questionnaires were collected, of which 275 were valid. The questionnaire mainly covers the following three aspects. In the first part, social demographic information is collected to determine the personal information of residents, such as gender and age, and the relevant basic information of the residential area, such as the location of the residential area, the construction period, and the property type. To better understand the objective economic conditions of future community renovation, the first part also investigated the property costs of different types of communities.

The second part is the evaluation of residents on the status quo of green space and service facilities in the residential community, including the score of the perfection of the two, the frequency of visits, and the current degree of coordination.

The third part asks about the residents' specific views on the coordination between community green space and public service facilities, including whether it is necessary to coordinate, the demand for the coordination, and the possible impact of coordination on the use of service facilities by residents.

Based on the Planning and Design Index of Residential Public Service Facilities in Beijing, residential public service facilities in Beijing are divided into the following eight types: municipal public facilities, transportation facilities, social welfare facilities, educational facilities, medical and health facilities, cultural and sports facilities, and commercial service facilities.

4. Results

4.1. Basic Information about the Residents and Their Community

The results of the questionnaire covered communities of all geographical locations, housing types, and construction years in Beijing, and people of all genders and ages were covered (Fig. 2).

Results show that the houses were mainly built from 2001 to now and are mainly located in the central urban area. The main residential types are commercial houses, and the distribution of property fees is relatively average, in the 1–4 yuan range. In addition to the core areas in the central urban areas, the property costs of 1–4 yuan accounted for many residents. The residents of commercial houses are the main group, and the amount of property fees are normally distributed, with the 2-4 yuan range accounting for a large proportion (Fig. 3).

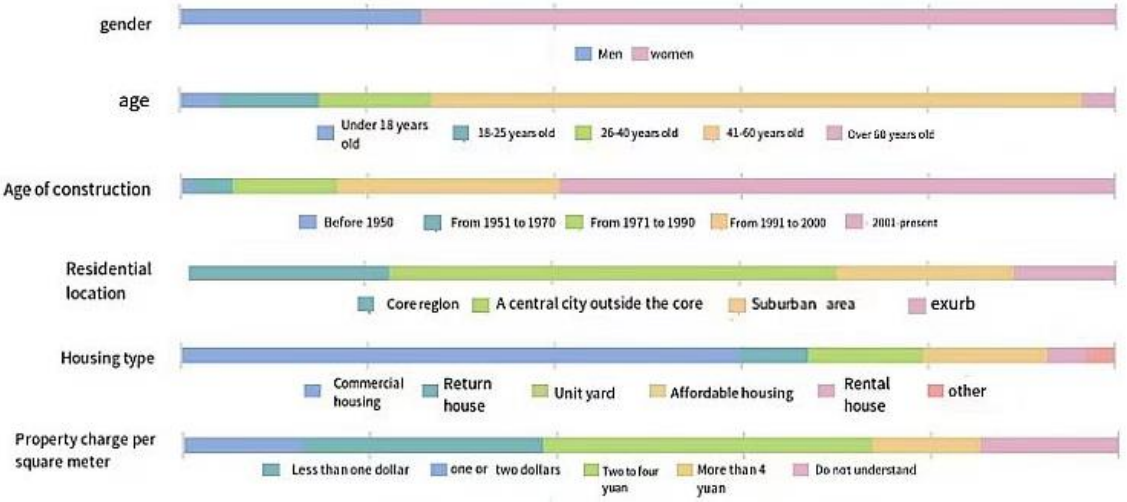

Figure 2: Basic information statistics of residents and residential areas.

DOI: 10.54254/2753-7048/10/20230384

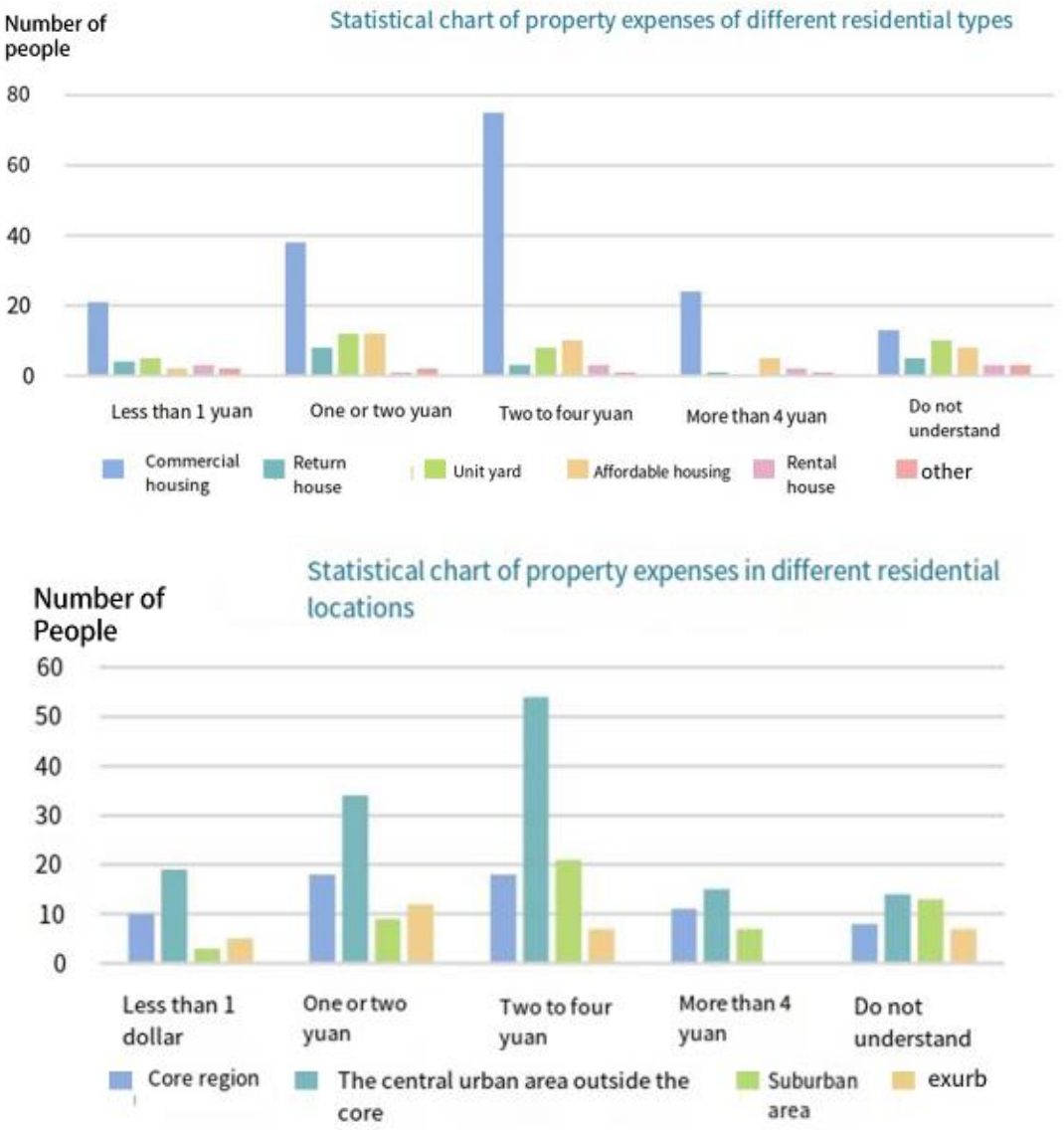

Figure 3: Property cost analysis of different residential types and residential locations.

4.2. Current Situation and Coordination of Public Service Facilities and Green Space

The results indicate that 37.1% of people live in residential areas with necessary public utility amenities. Education, medical, and health facilities, commercial service facilities, community management service facilities, and transportation facilities all account for about 80% of the people in the residential area. Social welfare facilities, cultural and sports facilities, and municipal transportation facilities are among them and are the least complete in the residential area (Fig. 4).

The commercial and transportation facilities are used the most frequently, followed by occasionally used cultural and sporting facilities, occasionally used medical and health facilities, and occasionally used community management service facilities. Children under 12 mainly use educational, cultural, and sports facilities, while people over 60 primarily use health facilities and commercial services (Fig. 5).

DOI: 10.54254/2753-7048/10/20230384

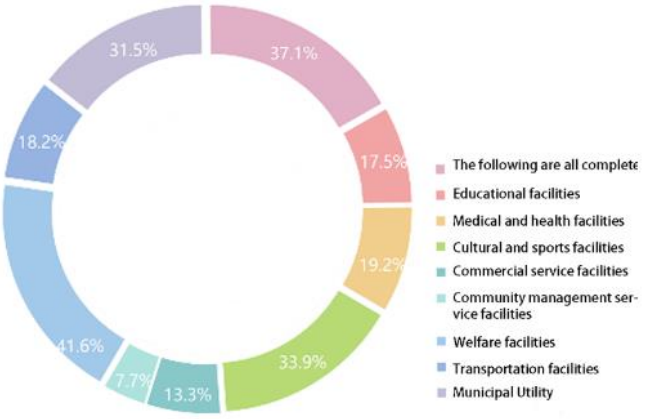

Figure 4: Statistics of incomplete public service facilities in the residential community.

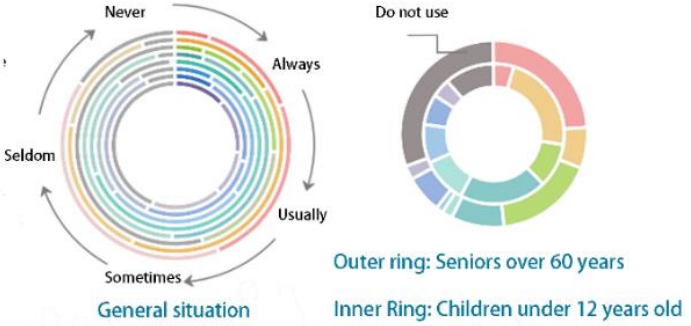

Figure 5: Use frequency of different public service facilities in the community.

Residents have high satisfaction with the status quo of education, medical and health, business service, and community management service facilities. The overall green space evaluation of the residential district is concentrated in the average or good range (Fig. 6).

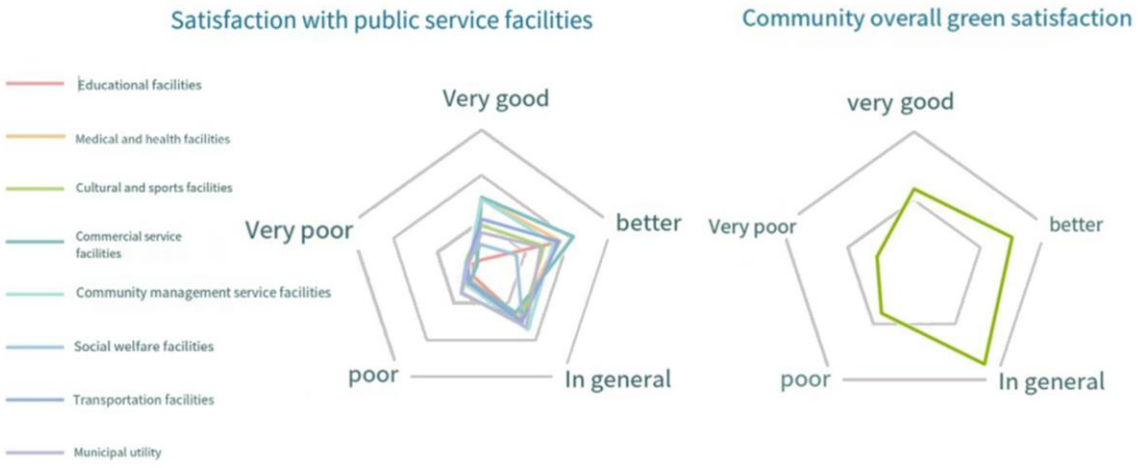

Figure 6: Public service facilities and community overall green satisfaction.

DOI: 10.54254/2753-7048/10/20230384

At present, educational, cultural and sports, and social welfare facilities have a large proportion of activities coordinated with green space, and the current degree of coordination between cultural and sports facilities and green space is the highest (Fig.7).

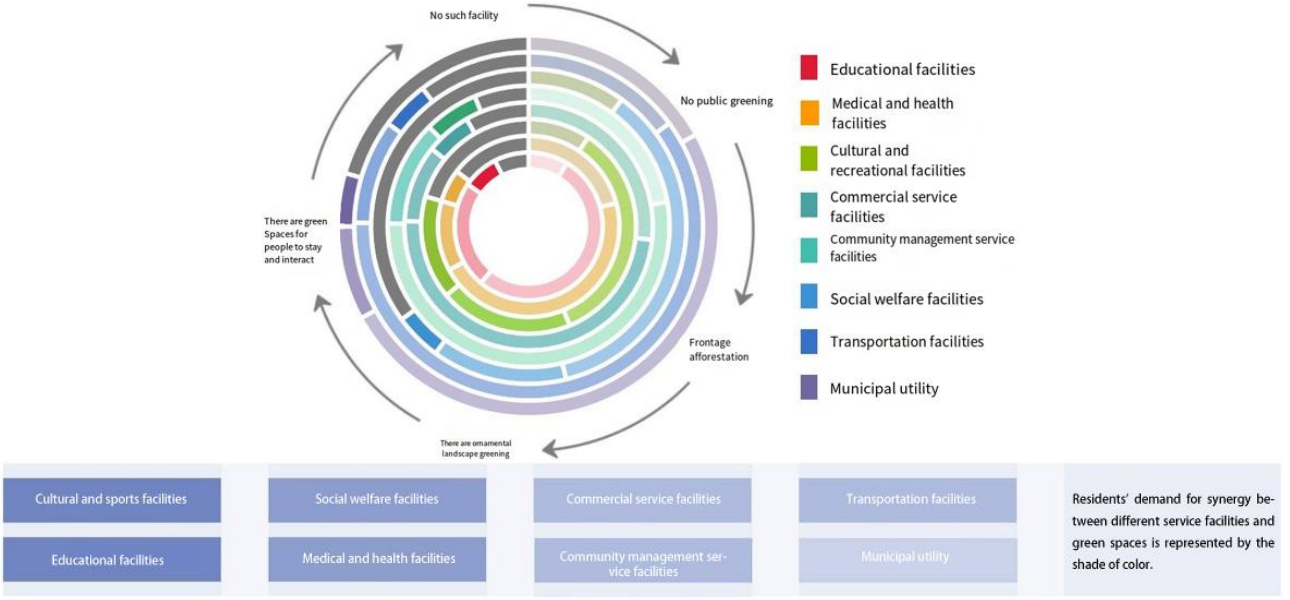

Figure 7: Coordination between public service facilities and afforestation status.

4.3. The Necessity of Coordination Between Public Service Facilities and Green Space

Among the residents who participated in the questionnaire survey, 92.7% believe that it is necessary to coordinate the public service facilities and green space in the residential community, showing a strong tendency. Given different types of service facilities, residents also choose three types of facilities that they think are most necessary to coordinate with green space. The results show that the three types of facilities that residents considered most necessary for collaboration were cultural and sports, educational, and social welfare facilities. It is followed by medical, health, and commercial service facilities. 80.9% of the residents believed that green space and cultural and sports facilities should be coordinated in planning, 76.4% believed that educational facilities should be coordinated, and 48.3% believed that social welfare facilities should be coordinated (Fig. 8).

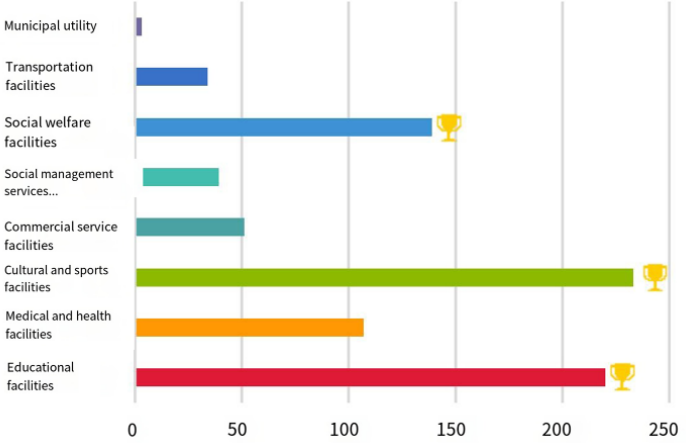

Figure 8: Priority of residents' willingness to collaborate renovation of different types of public service facilities.

DOI: 10.54254/2753-7048/10/20230384

The spatial location relationship between three kinds of public service facilities and green space is preliminarily determined, and the influence of the degree of collaboration between different service facilities and green space on residents' experiences of service facilities is investigated. According to the survey results, more residents will use service facilities or stay nearby to experience green space (Fig. 9). In general, the collaboration between service facilities and green space could optimize residents' experiences using public services.

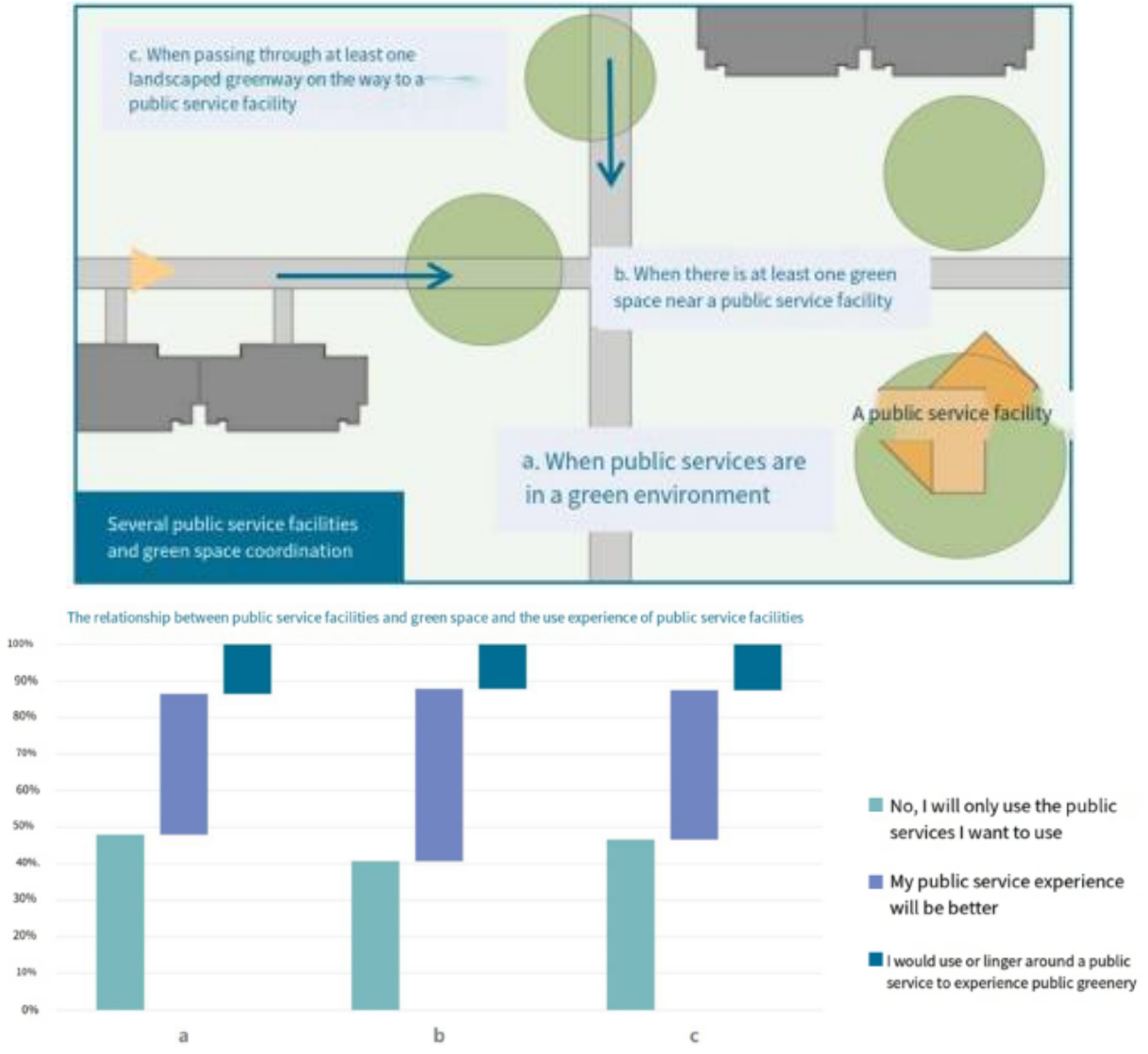

Figure 9: Coordination between service facilities and green space & Influence degree on service facilities use experience.

5. Discussion

5.1. Evolution of Residents' Collaborative Needs

The results show that residents still show great demand for the coordination of green space and service facilities, although they are mostly positive about the completeness and satisfaction of public service facilities and green space. In addition, residents' experience of using service facilities can be greatly

DOI: 10.54254/2753-7048/10/20230384

improved by placing service facilities in the green, adding green layouts on the way to service facilities, or placing green layouts in the line of sight near service facilities. Even so, such collaboration can make residents willing to spend more time near service facilities to experience green facilities, which can also effectively improve the spatial vitality of service facilities.

Therefore, the collaborative transformation of service facilities and green space is a strong necessity, which can better meet the residents' high-level pursuit of public space.

The specific types of public service, cultural and sports, educational, and social welfare facilities could be coordinated with green space. Commercial service facilities are used most frequently. To effectively improve the quality of the human living environment, the coordination between commercial service facilities and green space should also be fully considered. In the future collaborative transformation design, the priority of residents' willingness to transform and the actual frequency of use should be fully considered, and priority should be given to the collaborative transformation of these four types of service facilities based on the actual needs of residents.

5.2. The Difficulty of Collaborative Transformation of Different Public Service Facilities

In the existing residential district, the coordination degree between the current cultural and sports facilities and community green space is the highest, and the existing green space situation is the best. Therefore, the objective conditions of the collaborative transformation of cultural and sports facilities and green space are better, the implementation difficulty of the planning transformation is low, and it is easy to achieve results in a short time in the actual implementation.

In addition, the green land should be more mixed and compatible, the commercial services and cultural and sports facilities in the residential groups should be arranged in the green shared space, and leisure and communication facilities such as small retail stores, gyms, and bookstores should be introduced. This practice can effectively produce economic benefits because property power belongs to the surrounding afforestation maintenance department. Referring to the operation mode of railway +property of the Hong Kong MTR Corporation[10], we suggest implementing the operation mode of park + property, introducing the concept of a green economy, integrating leisure teahouses, parking lots, western restaurants, leisure bars, cultural clubs, and other economic facilities in the green space. Through the management or operation of for-profit facilities, this mode can obtain long-term sustainable maintenance and management funds for green space, which is conducive to collaborative transformation and long-term maintenance.

Based on the above analysis, among the four public service facilities with strong demand for reconstruction, the two facilities with strong feasibility of collaborative reconstruction with community greening are cultural and sports, as well as commercial service facilities.

5.3. Practical Problems of Transformation Implementation

The collaborative transformation between community green space and service facilities still faces some objective and realistic problems, including policy, economy, and land use.

Regarding policy issues, the ownership departments of green space and service facilities are inconsistent, and there is no relevant cooperation mechanism. There is a lag problem in the implementation path of planning for inventory areas. Moreover, the existing norms and standards are mainly for newly built areas, with insufficient consideration for inventory areas and a lack of implementation guidelines.

Regarding economic issues, residents pay lower property fees for housing estates with property rights, such as common property and affordable and public rental houses, and the property companies have insufficient expenses for planning and renovation. At the same time, there is a lack of relevant reward mechanisms for property rights holders who agree to reform.

DOI: 10.54254/2753-7048/10/20230384

Regarding land use, the old residential areas are very short of land resources due to the long building time and the lack of objective conditions for reconstruction. In addition, the population density in the core area of Beijing is relatively high, the construction area per capita is small, and the encroachment of public space exists, leading to the limited green space available for renovation. To some extent, these factors have become difficulties in collaborative transformation, which cannot be easily solved in a short time.

5.4. Collaborative Planning Strategies of Community Green Space and Public Service Facilities

5.4.1. Hierarchical Control

Considering that different types of communities have different characteristics and practical problems, different hierarchical control strategies should be proposed for the collaborative transformation of public service facilities and community green space.

For the old residential areas, the way of micro-renewal should be adopted to appropriately reduce the density of buildings, especially illegal and other temporary buildings, and integrate the scattered green space, improve the area of green patches, reduce the degree of fragmentation, and provide space for the setting of public open space. In the case of constant plot indicators, priority should be given to the way of adjustment. It is suggested to adopt the method of public participation, co-governance, and co-construction of existing green space, actively listen to residents' opinions, and respect the planning principle of suitable old space. Conditionally, the unit compound can negotiate the unit to open the attached green space.

For communities in good condition, the method of reasonable evaluation and organic transformation of key areas could be adopted for those needing reconstruction. To comprehensively coordinate the property management department and communicate with the superior government departments to apply for the relevant renovation funds or incentive mechanisms. Or through introducing operational facilities to provide reconstruction funds to achieve the goal of collaborative reconstruction planning. At the same time, attention should be paid to building all-age-friendly communities. For the renovation of commercial, medical, cultural, sports, educational and other public service facilities frequented by older people and children, differentiated needs between groups should be fully considered to reflect the aging and child-friendly planning.

For newly built communities, the collaborative design of green space and service facilities should be fully considered in the planning and design stage so that service facilities and community green space can be organically coordinated. At the same time, we should try our best to promote the cooperative management of management departments to avoid division and functional fragmentation effectively.

5.4.2. Considering Spatial and Functional Coordination

Under the concept of encouraging the joint setting of facilities and promoting the sharing of resources to improve the collaborative efficiency of community green space and service facilities, it is necessary to consider the coordination of space and function to maximize the coordination effect and optimize the space experience. On the one hand, by optimizing the spatial layout relationship between the green space and the land used for service facilities, the rationality of the layout of the community green space is improved, and the green space is more distributed around the service facilities or the path to the service facilities so that residents can use the facilities and provide more ecological services accompanied by the community green space. On the other hand, the green space around service facilities with high utilization rates should be optimized. For example, the rest of the green space should be constructed around commercial service facilities, and the green space with health care

DOI: 10.54254/2753-7048/10/20230384

functions should be built around social welfare facilities. In the new community, more attention should be paid to improving the quality of green space and the functional combination of green space and service facilities.

5.4.3. Implement Renovation in Order of Priority

In the collaborative and practical transformation of community green space and public service facilities, the residents' different demands for different types of service facilities and green space coordination, as well as the daily use frequency of service facilities, should be considered comprehensively, and the practical needs of residents should be considered from a humanistic perspective. At the same time, the functional and economic benefits of the actual transformation also deserve attention. Based on the above analysis, if the reconstruction conditions are limited in the reconstruction implementation stage, priority should be given to the reconstruction of cultural and sports facilities and commercial service facilities. After achieving certain spatial quality improvement effects and economic benefits, the collaborative planning and renovation design of educational facilities, social welfare facilities, and green space should be done as far as possible.

6. Conclusion

This study analyzes the public service facilities and green space of residential districts under the background of stock and explores the possibility of their collaborative development. In the urban area of Beijing, a questionnaire survey was conducted to investigate the use status and satisfaction degree of green space inside residential areas, explore the possibility of coordinated development of service facilities and green space inside residential areas, and optimize strategies and countermeasures for the coordinated improvement of green space and service facilities in residential areas under the background of inventory.

The results show that cultural and sports, educational, social welfare, and commercial service facilities are the most necessary to cooperate with green space based on the residents' willingness to reform and the difference in the frequency of facility use. In terms of coordination strategies, hierarchical management, and control strategies for different community types should be followed, and spatial coordination and functional coordination should be taken into account in the transformation. The transformation should be implemented in stages according to the priority to achieve the planning goals of optimizing the community space experience and improving space utilization efficiency.

References

[1] *Zhou Xiaoxia, Jin Yunfeng and Zou Keren. 2020. Research on Urban Public Open Space Construction based on urban renewal under the background of inventory planning. Residential Science and Technology (11),35-38.*

[2] *Bao Ziteng, Luo Xiaolong, Gu Zongni and Zhang Zhutian. 2022. Urban renewal Models and Trends in the context of inventory planning. Urban Environment Design (01),331-335.*

[3] *Chen Dongfei, Jin Yunfeng and Song Meiyi. 2019. Guidance and Control of public open space in community Living circle under Livable orientation. Proceedings of the 2019 Annual Conference of the Chinese Society of Landscape Architecture (eds.) (pp.753-759). (China Architecture and Building Press).*

[4] *Jin Yunfeng, Liang Yinxin, Cui Yuhan and Zou Keren. 2021. Urban Public Space Renewal Model in the Context of Governance: A Case Study of spatial governance on both sides of Huangpu River. Chinese Urban Forestry (03),25-29.*

[5] *Hu Liang, Sheng Shenghao and Wang Qian. 2016. Evaluation and quantitative improvement of public facilities in built-up areas: A case study of community health service sites and public green space in Huairou Old Town. Beijing Planning and Construction (06),34-38.*

[6] *Geng Chao. 2019. Research on the transformation and improvement of Small and micro green Spaces in Beijing Old City based on Urban Repair (Master's Thesis, North China University of Technology).*

DOI: 10.54254/2753-7048/10/20230384

[7] *Liu Qing and Yang Tianjiao. 2021. Urban master planning and spatial evolution of the first green isolated area in Beijing. Beijing Planning and Construction (04),71-74.*

[8] *Zhang Nan. 2019. Research on Planning and design of Microgreen Space in Capital Functional Core Area under the theory of "Urban Repair" (Master Dissertation, Beijing University of Civil Engineering and Architecture).*

[9] *Gao Junjie, Xue Fei, Zhao Yue, Zhao Tengfei, Guo Hao, and CAI Shuning. 2021. A quantitative study of green Space in existing residential areas under the concept of living Circle: A case study of seven residential areas built in different years in Beijing. Urban Planning Society of China. (eds.) Spatial Governance for High-quality Development -- Proceedings of the 2021 Annual Urban Planning Conference in China (02 Urban Renewal) (pp.100-111). (China Architecture and Building Press).*

[10] *Liao Yuanjing. 2019. Investigation and Planning Research on the Commercial Status of Beijing Subway Station (Master's Thesis, Tsinghua University).*