Cross-Border Living in Hong Kong and Shenzhen: Insights into the Residential Environment Preferences of Young Professionals

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Abstract

Hong Kong is experiencing an outflow of young professionals, according to the Census and Statistics Department of HKSAR Government. Some Hong Kong professionals choose to become cross-border commuters and live in Shenzhen due to lower rents, spacious rooms or better services. As housing is a key factor in young people's workplace choices, satisfying their housing preferences is crucial for understanding how to support talent. This study used the Analytical Hierarchy Process (AHP) to evaluate spatial factors of six rental-oriented housing cases near the Hong Kong-Shenzhen border, and a cross-tabulation analysis to compare the needs of different young professional groups. The evaluation covered community environment, facilities, apartment features, and proximity to leisure and transportation facilities. Data from 56 questionnaires were used to form the AHP judgment matrices. The findings highlight the impact of population profiles on the living space preferences of young professionals, and the characteristics of apartments and communities that are attractive to young people. Based on these outcomes, design principles for communities and apartments targeting young professionals are proposed, offering guidance for future youth community planning.

Keywords

Cross-border commuting, young professionals, residential environment preference, Analytical Hierarchy Process, Hong Kong

1. Introduction

To mitigate the housing shortage for local youth and attract external skilled workers, the Hong Kong Government proposed the Youth Hostel Scheme (YHS) in 2011 and planned several professional apartment projects for workers in science and innovation companies in the Northern Metropolis in 2023 (HKSAR Government, 2011; HKSAR Government, 2023). However, the young population in Hong Kong continues to show an outflow trend (Lam, 2023; The Census and Statistics Department of HKSAR Government, 2022). Attracting external young professionals and controlling the outflow of local youth have become challenges (The Census and Statistics Department of HKSAR Government, 2019; The Hong Kong Federation of Youth Groups, 2021). Some studies indicate that cross-border labour mobility plays an important role in adjusting supply and demand in labour markets, improving regional integration and boosting agglomeration economy (Edzes et al., 2022; Hass & Osland, 2014; Jacob et al., 2019; Organisation for Economic Co-operation and Development, 2013). In 2021, there were about 4,200 cross-border commuters in Hong Kong and Shenzhen (Lu, 2021). Understanding the residential preferences of young professionals in the context of cross-border commuting is crucial for creating more attractive professional communities and mitigating the labour shortage of Hong Kong.

Some scholars argue that housing availability and recreational spaces are significant for attracting young people (Barinova et al., 2022; Kulawczuk et al., 2019). Satisfying the preferences in spatial plans, especially inducing recreational and improving public spaces, can help mitigate youth outflow (Kulawczuk et al., 2019). People make residential choices based on their preferences for a set of community characteristics, including location features (Kain & Quigley 1970; Kim, 2020; Soon & Tan, 2019). Commuting methods and residential location are highly related to satisfaction (Mouratidis et al., 2019; Mouratidis, 2020). Kim (2020) has taken proximity, neighbourhood environment, apartment features and building sustainability into the analytical hierarchy process (AHP) and found the most preferred factor group in housing choice of young adults is 'apartment features', including separate kitchen, balcony and storage. However, Kim's AHP system was not applied to the quantitative evaluation of housing or community cases, resulting in a lack of translation of research findings into design principles.

Rental housing is important for young professionals as new urban dwellers (Li et al., 2021). Most young people are in transitional periods of living independently from their families and accumulating wealth to own a home (Castro Campos et al., 2016; Jin et al., 2023; Li et al., 2021; The Hong Kong Federation of Youth Groups, 2016). In this period, their financial capacities are usually limited, and home purchasing is difficult – leading most young people to seek rental accommodation instead (Castro Campos et al., 2016; Jin et al., 2023; Li et al., 2021; The Hong Kong Federation of Youth Groups, 2016).

This study explores the spatial factors important

for young professionals when they are making housing-renting decisions and how population profiles affect residential spatial preferences among them. By comparing these preferences with existing communities and apartments, the most suitable apartment and community characteristics can be identified. The results offer direct and feasible design principles for future apartment and community planning aimed at supporting young professionals' quality of life.

2. Literature Review

Cross-border Commuting

Cross-border commuting can enhance labour force allocation between areas with economic differences, and greater income difference often leads to more cross-border commuting (Edzes et al., 2022). It also helps balance labour supply and demand, promotes regional integration and agglomeration economy (Edzes et al., 2022; Hass & Osland, 2014; Jacob et al., 2019; Organisation for Economic Co-operation and Development, 2013).

The borders in Europe, North America, Singapore-Johor, and Hong Kong-Shenzhen are key examples of cross-border commuting locations worldwide. In Europe, income gaps and shared languages drive cross-border commuting (Broersma et al., 2022, Decoville et al., 2013). Decoville et al. (2013) categorised European cross-border commuting into specialisation, polarisation and osmosis. At the US-Canada Border, price difference motivates cross-border behaviours (Chandra et al., 2014). Singapore-Johor studies indicated that students (Yuen & Cheung, 2014), tourism (Chang, 2004; Hampton, 2009; Hampton, 2010), transport systems (Barter, 2006), labour force and capital flow (Barter, 2006; Hutchinson, 2021; Putri & Salim, 2019) etc. are all possible factors for cross-border commuting.

Commuting satisfaction is crucial for housing choices (Kain & Quigley, 1970; Kim, 2020; Mouratidis, 2020; Soon & Tan 2019), and many scholars focus on the impact of time on commuting satisfaction. Longer commuting time usually causes lower level of satisfaction (Chatterjee et al., 2020), but too short time is not the ideal for commuters either (Milakis & Van Wee 2018; Páez & Whalen, 2010; Redmond & Mokhtarian, 2001; Ye et al., 2020). Most commuters consider a travel time less than 45 minutes to be acceptable (Milakis & Van Wee, 2018; Páez & Whalen, 2010; Ye et al., 2020). Most residential, industrial, commercial and business areas within Hong Kong and Shenzhen are about 60-75 minutes, which exceeds the comfortable commuting range of 45 minutes (Chen et al., 2022).

At the Hong Kong-Shenzhen border, cross-border behaviours of students and senior citizens have been frequently explored (Chan et al., 2020; Chan et al., 2017; Leung & Waters, 2022; Waters & Leung, 2024; Waters & Leung, 2021; He et al., 2023). However, young professionals' commutes are rarely studied in the context of urban or community design.

Young Generation and Young Professionals in Housing Rental Markets

Young adulthood involves young people leaving parents, entering society, and becoming independent (Häggman-Laitila, 2019; Lanoye, 2017; Lenz, 2001). Shildrick et al. (2012) demonstrated that the young working class often meets challenges between unsatisfactory works, unstable jobs and unemployment. The young generation tend to rent rather than buy houses due to high cost (Vliet, 1998), and social housing is often not available or preferable for them (Rugg and Quilgars, 2015). Compared to other generations, homelessness and pressures relating to rental housing are more common for young people (Tan, 2009).

Billari and Liefbroer (2010) found many young professionals feel forced to rent housing that is unsatisfactory for them, and the transition from parents' homes to society is increasingly complex and delayed. Lu & Burgess (2023) analysed Shanghai young professionals' housing patterns through in-depth interviews, discovering that despite policies aimed at increasing housing affordability, professionals need to adopt multi-stage housing and rental strategies.

Lin et al. (2021) found that housing price increases in cities were positively correlated with attractiveness to young professionals, but this positive relation may disappear because of the bubbles created by continuous price increases. Excessive housing prices may create a crowding-out effect of professionals (Lin et al., 2021).

Rental Status of Young People in Hong Kong and Shenzhen

In China, the term 'floating population' refers to individuals whose hukou (household registration) cities differs from their residence places (Wu, 1997). This group drives significant demand in housing rental markets, with young professionals under 30 accounting for over 77% of rentals (Ba & Yang, 2016). In Shenzhen, the floating population exceeds 12 million, making up over 68% of the total population (Shenzhen Statistical Bureau, 2021), leading to a larger rental market than Beijing, Shanghai and Guangzhou, where over 60% of housing is occupied by tenants (Li et al., 2021). Hong Kong, however, has only about 78,000 floating residents, or 1.1% of its total population (The Census and Statistics Department of HKSAR Government, 2022). Yet, 50.1% of young professionals in Hong Kong still live in rented housing, even though most are not part of the floating population (The Hong Kong Federation of Youth Groups, 2016).

Due to the unaffordability of home ownership, young professionals in Hong Kong regard renting as a long-term solution, including high-quality or low-quality private housing, subdivided housing or public housing (Castro Campos et al., 2016). In Shenzhen, the private rental sector includes urban village rental housing, commercial rental housing and long-term rental apartments, and the public rental sector includes public rental housing and professional rental housing[1] provided by the government (Castro Campos et al., 2016; Jin et al., 2023). Rental plays an important role in most hous-

ing routes of youth, including private renting to owning, private renting to professional renting and progressive private renting[2] (Jin et al., 2023).

Housing renting of young people in Hong Kong is mainly due to the transitional period after leaving parents (Castro Campos et al., 2016; The Hong Kong Federation of Youth Groups, 2016), while in Shenzhen, it is more contributed by floating population (Ba & Yang, 2016; Li et al., 2021). Hong Kong young professionals usually adopt renting as a long-term strategy, while the youth in Shenzhen regard the renting as a short-term strategy before they leave Shenzhen or can own a property in Shenzhen (Jin et al., 2016; The Hong Kong Federation of Youth Groups, 2016).

Residential Preference and Housing Spatial Preference of Young Professionals

The housing preferences are not limited to location (Kain & Quigley, 1970; Kim, 2020) but also include multidimensional factors such as socioeconomic status (Soon & Tan, 2019), spaciousness (Kauko, 2006), functionality (Kauko, 2006), and cultural norms (Jabareen, 2005). Li et al. (2021) demonstrates that indoor features, community features and the services provided can all affect tenants' residential satisfaction.

Some studies have found that separate rooms, closeness to public transportation systems and support services provided by brand apartment rental companies are shared rental trends among young professionals of Hong Kong and Shenzhen (The Hong Kong Federation of Youth Groups, 2016; Ba & Yang, 2016; Yim & Lau, 2024; Li et al., 2021; Jin et al., 2023). Young professionals in Hong Kong have rated separate toilets, windows and room partitions are the most important indoor elements, and public lounges, gyms, jogging tracks and storage facilities as important public facilities for a community (The Hong Kong Federation of Youth Groups, 2016). In the interviews conducted by the Hong Kong Federation of Youth Groups and the Hong Kong institute of Architects (2016), working youth had higher expectations for single youth housing and were looking for rooms of about 30 m2. Using one-way ANOVA analysis, Li et al. (2021) found that village housing cannot meet most of the needs of young white-collar professionals in Shenzhen.

Analytical Hierarchy Process (AHP) and Community Quality

The Analytical Hierarchy Process (AHP), developed by Saaty in the 1970s for industrial welfare allocation, has been widely applied to decision-making in economy transportation, ecology, and sociology (Anselin et al., 1989; Saaty, 1975; Saaty 1977; Song & Hu, 2009; Wedley, 2017). In housing preference studies, Wu (2010) identified young consumers' priorities through the AHP: public transit accessibility, workplace proximity, safety, medical facilities and educational facilities. Kim (2020) expanded the AHP criteria to include apartment features (separate kitchen and balcony), neighbourhood environment, and sustainability, revealing apartment functionality as the dominant preference. Notably, Kim (2020) innovated the AHP methodology by having users define judgment matrices

rather than the traditional researcher-defined framework (Saaty, 1982; Saaty 1987).

Research Gaps

Most prior studies have neglected the limited financial capacity of young professionals during the transitional period (Castro Campos et al., 2016; Jin et al., 2023; Li et al., 2021; The Hong Kong Federation of Youth Groups, 2016). Besides, home ownership (Rameshkkumar et al., 2024; Wang & Li, 2004; Wu, 2010; Huang et al., 2015), renting by young professionals has not been considered much.

Although some research has touched on the impact of socio-economic factors on housing preferences, it often focused on certain dwelling types and ignored specific spatial factors. Kim (2020) and Wu (2010) proposed AHP frameworks to evaluate which factors are more significant among young adults' preferences, but used a qualitative ranking of spatial dimensions. They did not use the AHP system to quantitatively evaluate housing or community cases with spatial features, such as room size, green coverage and service-point proximity. The AHP system was developed but not applied, so the research results were not able to be translated into design principles. In addition, the impact of cross-border commuting on the residential preferences of young professionals is has not yet been studied.

3. Methodology

In this paper, based on the AHP framework, a study of young professionals' rental preferences has been conducted with six rental-oriented apartment complexes close to the Hong Kong-Shenzhen border. Specific spatial factors such as green space, public facilities, public services and wind environment were systematically measured and counted. A quantitative link was established between these factors and the AHP system to supplement the evaluation processes of Kim (2020) and Wu (2010)'s studies. Based on these outcomes, this study provides direct and feasible design principles of future apartment and community design.

4. Research Process

Study Area and Case Selection

Based on the impact of commuting satisfaction and residential location on housing choices (Kain & Quigley 1970; Kim, 2020; Mouratidis, 2020; Soon & Tan, 2019) and the fact that longer commuting time can lead to lower satisfaction (Chatterjee et al., 2020), six cases near the HK-SZ border and within 1,000 metres of metro stations were selected (Table 1). The cases are in the Northern District (HK), Tai Po (HK), Luohu (SZ) and Futian (SZ).

Most young professionals in both cities are single or unmarried (Shenzhen Statistical Bureau & NBS Survey Office in Shenzhen, 2020; The University of Hong Kong Social Science Research Centre & Youth Development Commission, 2014; Zhenai & Zhaopin, 2020; Li et al., 2021). Rental preferences among the youth in both cities include separate rooms, proximity to public transport and support services from brand apartment rental companies such as Boyuplus,

Uhomes.com and Ziroom (The Hong Kong Federation of Youth Groups, 2016; Ba et al., 2016; Yim & Lau, 2024; Li et al., 2021; Jin et al., 2023). According to the above, rental-oriented apartments or communities with the following features were selected (Table 1, Figure 1):

(1). Services provided by brand apartment rental companies

(2). Separate single rooms rented as units

(3). Metro stations within 500 metres

Construction of the AHP Evaluation System

Based on the literature about residential preferences, community facilities and measure meth-

	Name	District	City	Building/Community Type	Operation Type
Case 1	Shengshi-Jiachuang Apartment (SSJCA)	Luohu	Shenzhen	Several Storeys Converted from Storage and Transportation Complex	Serviced Apartment for Long-term Rental
Case 2	E-harbour Apartment (EHA)	Futian	Shenzhen	Super High-rise in Office Complexes	Serviced Apartment for Long-term Rental
Case 3	CJIA Apartment (CJIA)	Futian	Shenzhen	A Whole Building Converted from Storage Building	Hotel with Long-term Rental Functions
Case 4	AITE Apartment (AITEA)	Luohu	Shenzhen	An Entire Building Converted from Village Housing	Village Housing Management by Rental-oriented Apartment Brands
Case 5	Fanling Centre Apartment (FLCA)	Northern	Hong Kong	Sub-divided Units in Private Estate	Sub-divided Units Managed by Rental-oriented Apartment Brands
Case 6	Dai Nam Building Apartment (DNBA)	Tai Po	Hong Kong	An Entire Building Converted from Tong Lau (Tenement Building)	Serviced Apartment for Long-term Rental

Table 1. Case Selection: Six Rental-oriented Apartment Projects

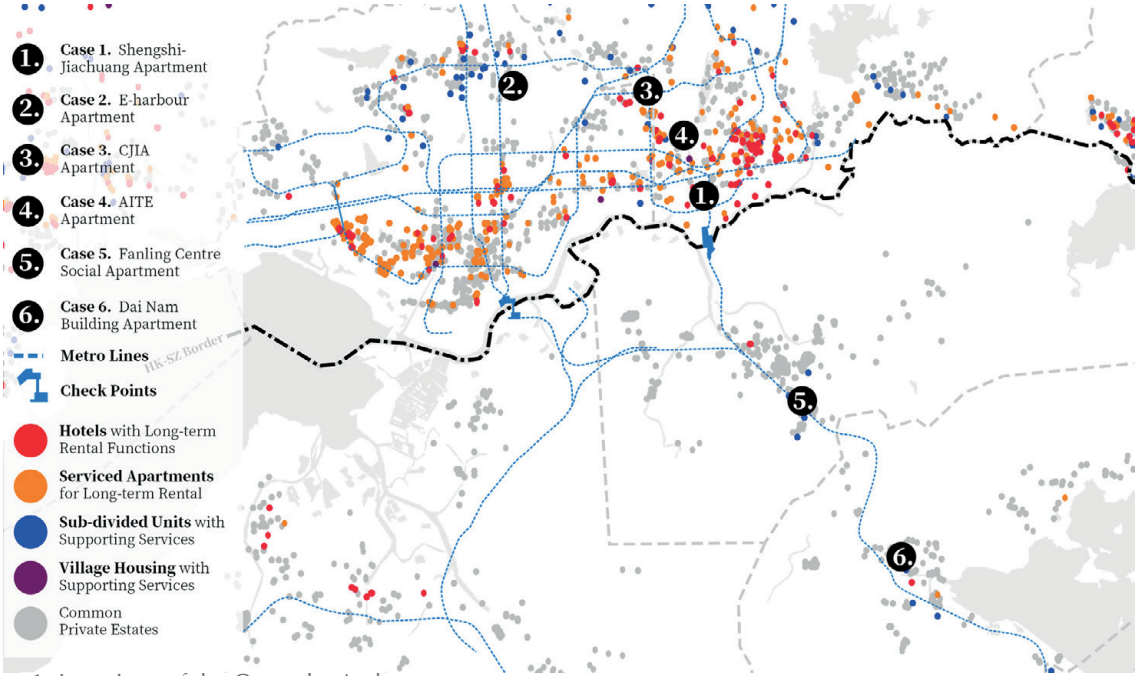

Figure 1. Locations of the Cases, by Author

ods in Table 2, here are spatial factors to be focused on in this study (Table 3):

(1). Community Environment:

a. Green space, including community green coverage and community Park[3] area

b. Sound environment, including distance to main roads or highways, indoor decibel level and outdoor decibel level

c. Wind environment, including the ground coverage ratio (GCR) and passive ventilation design of buildings

(2). Community Facilities:

a. Catering, including grocery shops and restaurants

b. Shared space, including shared kitchens, shared offices or reading spaces and gyms

c. Delivery and express, including food delivery collection facilities and express collection facilities

(3). Apartment Features:

a. Size, including room unit size, window-to-floor ratio

b. Separate functions, including separate kitchens or cooking facilities and separate toilets

(4). Proximity:

a. Commuting, including the distance to check points and metro stations

b. Leisure, including the distance to shopping malls and city parks[4]

Based on literature review, the spatial factors affect residential preferences of young professionals are used to form a questionnaire. Then, spatial factors are ranked in order of importance by users, and the AHP evaluation systems of various young groups were developed. A cross-tabulation analysis of young professional types based on the questionnaire results is conducted for various young professional groups. The population profiles in the cross-tabulation analysis includes:

1) Age Groups

2) Genders

3) Reasons for the Cross-border Commute (including work, education, shopping etc…)

4) Availability of Co-residents and Relationships

5) Job Occupations

6) Educational Levels

7) Linguistic Abilities

8) Main Commuting Modes

9) Income Levels

10) Weekly Working Hours

Factors		Reference
Community Environment	Green Space, including Community Green Coverage and Community Park Area	Kim, 2020; Wu, 2010
	Sound Environment, including Distance to Main Roads or Highways, Indoor Decibel Level and Outdoor Decibel Level	Murphy & King, 2016
	Wind Environment, including the Ground Coverage Ratio (GCR) and Passive Ventilation Design of Buildings	Dehghani-sanij et al., 2015; Ng et al., 2011
Community Facilities	Catering, including Grocery Shops and Restaurants	Kim, 2020; Switalla, 2024; Wu, 2010
	Shared Space, including Shared Kitchens, Shared Offices or Reading Spaces and Gyms	Kleeman et al., 2022; Wu, 2010; Wu, & Ge, 2020
	Delivery and Express, Including Food Delivery Collection Facilities and Express Collection Facilities	Saad, 2018
Apartment Features	Size, including Room Unit Size, Window-to-floor Ratio	Kauko, 2006; Nedhal, 2016; The Hong Kong Federation of Youth Groups, 2016
	Separate Functions, including Separate Kitchens or Cooking Facilities and Separate Toilets	Kauko, 2006; The Hong Kong Federation of Youth Groups, 2016; Kim, 2020
Proximity	Commuting, including the distance to Check Points and Metro Stations	Kim, 2020; The Hong Kong Federation of Youth Groups, 2016; Wolday & Böcker, 2023; Wu, 2010
	Leisure, including the distance to Shopping Malls and City Parks	Kim, 2020; Wu, 2010

Table 2. Factor Selection and Related Literatures

Case Studies and Analysis

In Hong Kong and Shenzhen, apart from apartments specifically constructed for rental purposes, many rental oriented housings are converted from non-residential buildings. In this study, three mainstream construction/renovation and operation models are discussed:

1) Companies acquire entire buildings (like former storage or office spaces), renovate them, and re-lease them as residential units, including Shengshi-Jiachuang Apartment (SZ), CJIA Apartment (SZ), AITE Apartment (SZ) and Dai Nam Building Apartment (HK).

Factors	Dimensions (x)	Normalisation Methods (x')
1.1.1 Community Green Coverage	Percentage (%)	$x' = \frac{x - X_{min}}{X_{max} - X_{min}}$
1.1.2 Community Park Area (including rooftop gardens)	Square Metre (m^2)	$x' = \frac{x - X_{min}}{X_{max} - X_{min}}$
1.2.1 Distance to Main Roads or Highways	Metre (m)	$x' = \frac{x - X_{min}}{X_{max} - X_{min}}$
1.2.2 Indoor Average Decibel Level	Decibel (dBA)	$x' = 1 - \frac{x - X_{min}}{X_{max} - X_{min}}$
1.2.3 Outdoor Average Decibel Level	Decibel (dBA)	$x' = 1 - \frac{x - X_{min}}{X_{max} - X_{min}}$
1.3.1 Ground Coverage Ratio (GCR)	Percentage (%)	$x' = 1 - \frac{x - X_{min}}{X_{max} - X_{min}}$
1.3.2 Passive Ventilation Design of Buildings	Yes=1, No=0	$x' = x$
1.3.3 Window-to-floor Ratio (average)	Percentage (%)	$x' = \frac{x - X_{min}}{X_{max} - X_{min}}$
2.1.1 Grocery Shops	Number	$x' = \frac{lgx - lgX_{min}}{lgX_{max} - lgX_{min}}$
2.1.2 Restaurants	Number	$x' = \frac{lgx - lgX_{min}}{lgX_{max} - lgX_{min}}$
2.2.1 Shared Kitchen	Yes=1, No=0	$x' = x$
2.2.2 Shared Office or Reading Space	Yes=1, No=0	$x' = x$
2.2.3 Gym	Yes=1, No=0	$x' = x$
2.3.1 Food Delivery Collection Facilities	Yes=1, No=0	$x' = x$
2.3.2 Express Collection Facilities	Yes=1, No=0	$x' = x$
3.1.1 Room Unit Size (average)	Square Metre (m^2)	$x' = \frac{x - X_{min}}{X_{max} - X_{min}}$
3.2.1 Separate Kitchen or Cooking Facilities	Yes=1, No=0	$x' = x$
3.2.2 Separate Toilet	Yes=1, No=0	$x' = x$
4.1.1 Proximity to Check Point	Kilometre (km)	$x' = 1 - \frac{lgx - lgX_{min}}{lgX_{max} - lgX_{min}}$
4.1.2 Proximity to Metro Station	Metre (m)	$x' = 1 - \frac{x - X_{min}}{X_{max} - X_{min}}$
4.2.1 Proximity to Shopping Malls	Metre (m)	$x' = 1 - \frac{x - X_{min}}{X_{max} - X_{min}}$
4.2.2 Proximity to City Parks	Metre (m)	$x' = 1 - \frac{x - X_{min}}{X_{max} - X_{min}}$

Table 3. Methods of Dimensional Normalisation

2) Companies collect private properties from homeowners and standardise the renovations or subdivisions before re-leasing to tenants, including the Fanling Centre Apartment (HK).

3) A few buildings, such as E-harbour Apartment (SZ), were purpose-built for rental use.

i. Shengshi-Jiachuang Apartment (Luohu, Shenzhen)

This case, located within 500m to the Lo Wu checkpoint, was originally a transport, warehousing, wholesale and office building. The ground floor is now a bus terminus, floors 2–4 remain for wholesale and warehousing, the 5th-floor is a bathing and recreation centre, and floors 6–10 have been renovated for rental. The large building size and non-residential origin functions cause many rooms to be lit only by a 7m × 7m internal patio and poorly ventilated (Figure 2). On the community scale, the case is well-located, surrounded by abundant catering, shopping, entertainment, and medical services, and is close to metro stations and checkpoints (Figure 8 and 9).

ii. E-harbour Apartment (Futian, Shenzhen)

This is a tower apartment in a super high-rise office area with good lighting and ventilation (Figure 3). It has a huge atrium for passive ventilation, and internal facilities are relatively comprehensive (Figure 3). However, at the neighbourhood scale, the supporting services including dining, shopping and entertainment are few.

iii. CJIA Apartment (Futian, Shenzhen)

This apartment was originally a large warehouse-office building. The ground floor is currently the service centre, the floors 2-7 are long-term rental units, and floor 8 is short-term rental units. The ventilation and light environment are poor due to the mismatch of original functions, and some rental units of the floor 8 are windowless (Figure 4). There are many catering services available, and the case is close to the metro station. Surrounded by other converted warehouses with little greenery, it has only some strip parks along streets.

Figure 2. Apartment Layout of Shengshi- Jiachuang Apartment (Luohu, Shenzhen), Drawn by the Author Based on the Baidu Satellite Map and Field Observations

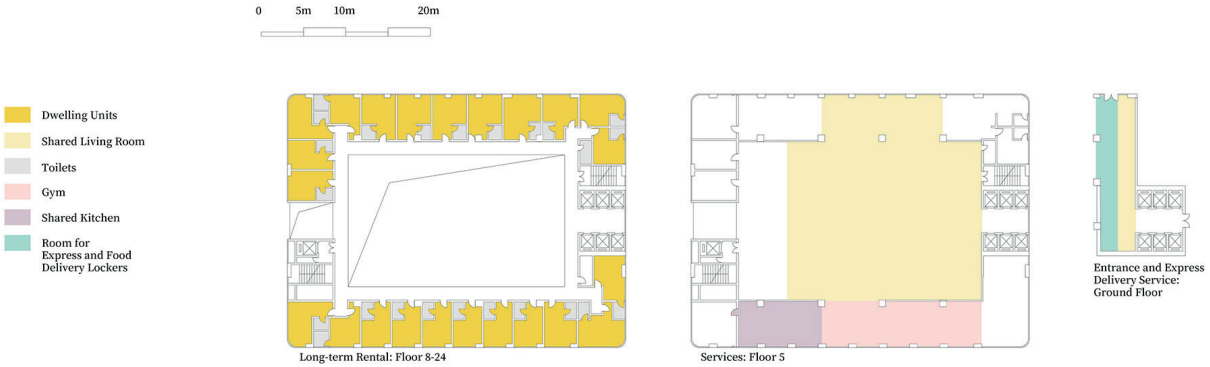

Figure 3. Apartment Layout of E-harbour Apartment (Futian, Shenzhen), Drawn by the Author Based on the Baidu Satellite Map and Field Observations

Figure 4. Apartment Layout of CJIA Apartment (Futian, Shenzhen), Drawn by the Author Based on the Baidu Satellite Map and Field Observations

iv. AITE Apartment (Luohu, Shenzhen)

This case is converted from a village house and lacks internal facilities like service centre, shared kitchen, gym, shared living room and food delivery lockers (Figure 5). Each unit has its own toilet but no cooking facilities. Located in an urban village, more external dining, entertainment, grocery, and medical services are available. However, the community also lacks green spaces and parks.

v. Fanling Centre Apartment (Northern, Hong Kong)

This case is converted from private housing, so it has the same community services as private properties. It is adjacent to a railway line and the lower part of the building is a commercial complex. The subdivided units also mean the tenants must share the kitchens and toilets (Figure 6). The case is very close to the shopping malls, Metro station and community parks. The community, however, is not very densely served by diverse services.

vi. Dai Nam Building Apartment (Tai Po, Hong Kong)

This apartment is converted from a Tong Lau (tenement building). During the conversion, separate toilets were added to most of the units. The ventilation and lighting conditions are also good (Figure 7). The community is well served by catering, grocery, entertainment and medical services, and the greenery is also abundant.

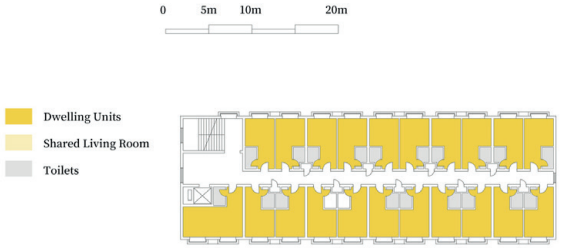

Figure 5. Apartment Layout of AITE Apartment (Luohu, Shenzhen), Drawn by the Author Based on the Baidu Satellite Map and Field Observations

Figure 6. Apartment Layout of Fanling Centre Apartment (Northern, Hong Kong), Redrawn from the Floor Plan of Centaline Property's Website

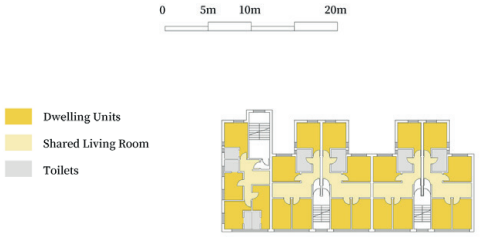

Figure 7. Apartment Layout of Dai Nam Building Apartment (Tai Po, Hong Kong), Drawn by the Author Based on the Google Satellite Map and Field Observations

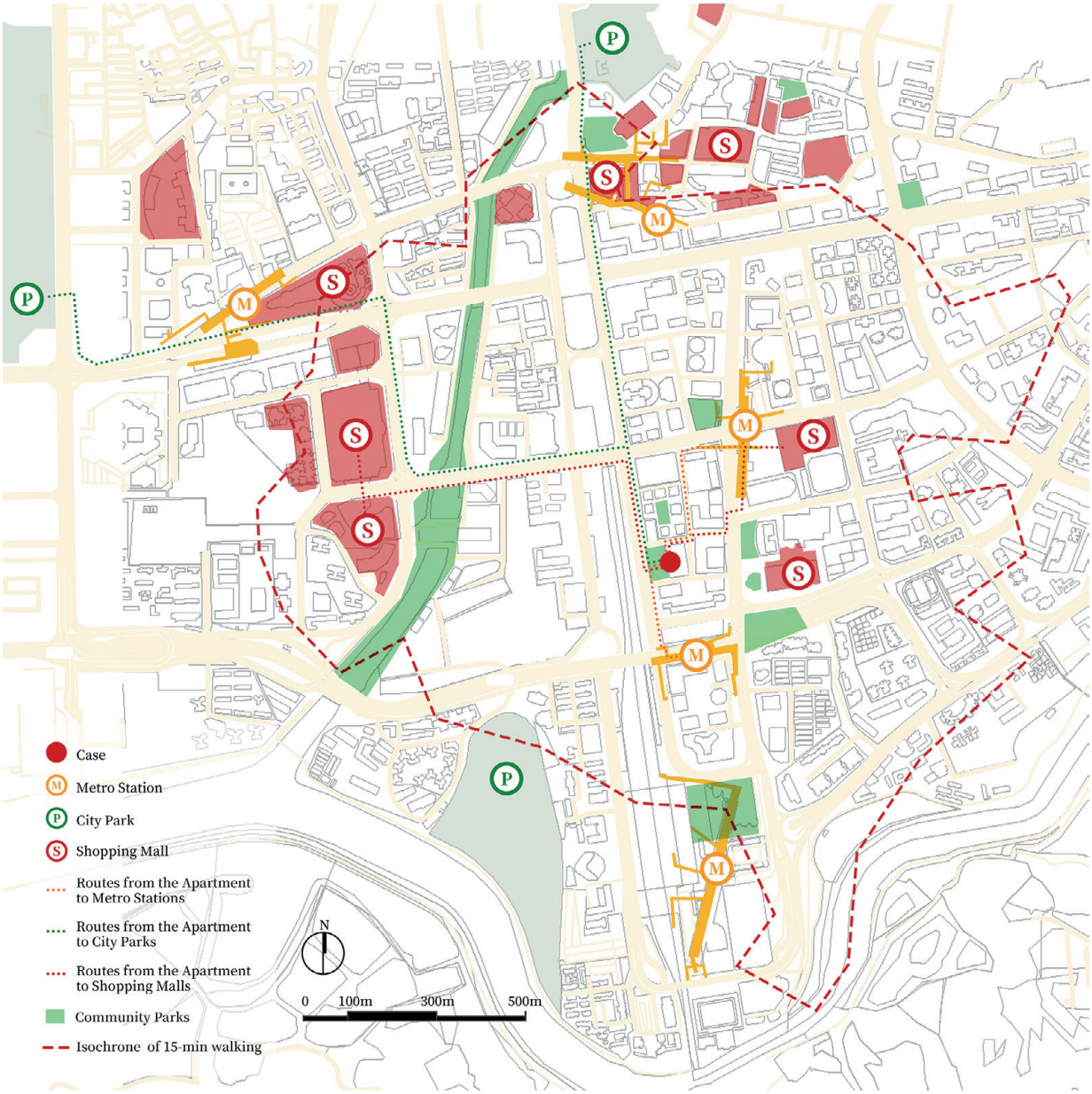

Figure 8. Distribution of Parks, Shopping Centres and Metro Stations in the Community of Shengshi- Jiachuang Apartment (Luohu, Shenzhen), by Author

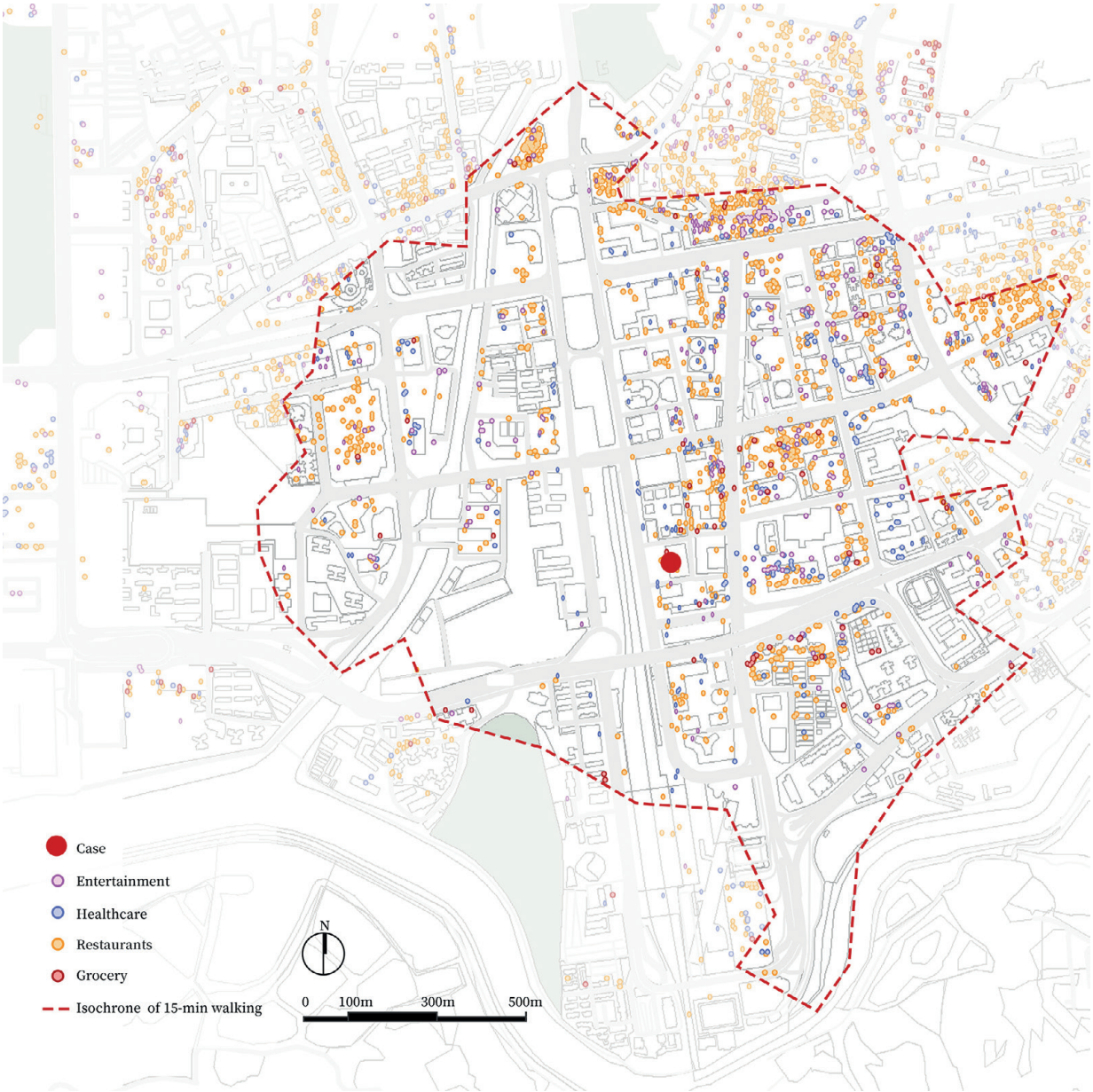

Figure 9. The POIs of the Community of Shengshi- Jiachuang Apartment (Luohu, Shenzhen), by Author, Data Source: Amap

Quantification of the Indicators

Apart from proximity factors, observations of neighbourhoods and apartments are quantified within 15-min walking isochrones from the apartments, using satellite maps and fieldwork. Directly measured factors include community green coverage, community park area, distance to main roads or highways, ground coverage ratio, room unit size, window to floor ratio and the indicators of proximity. Grocery shops and restaurants are counted within the isochrones. The presence and absence of some features like passive ventilation design, shared facilities, delivery and express facilities, and separate functions are marked as 1 or 0. Using a decibel meter, noise levels are measured indoors and outdoors at 8:00 and 20:00, and the average is taken. After data collection, the factors units are normalised with the formula in Table 3.

Factors	Shengshi-Jiachuang	E-harbour	CJIA	AITE	Fanling Centre	Dai Nam Building
1.1.1 Community Green Coverage	11%	9%	10%	7%	13%	20%
1.1.2 Community Park Area (including rooftop gardens)	103,962m^2	51,622m^2	107,980m^2	25,389m^2	117,112m^2	110,318m^2
1.2.1 Distance to Main Roads or Highways	40m	60m	90m	15m	60m	140m
1.2.2 Indoor Average Decibel Level	59dBA	54dBA	45dBA	48dBA	49dBA	46dBA
1.2.3 Outdoor Average Decibel Level	86dBA	74dBA	79dBA	76dBA	83dBA	78dBA
1.3.1 Ground Coverage Ratio (GCR)	30.7%	16.5%	27.9%	31.7%	38.9%	39.8%
1.3.2 Passive Ventilation Design of Buildings	No=0	Yes=1	No=0	No=0	No=0	No=0
1.3.3 Window-to-floor Ratio (average)	15.7%	42.3%	15.2%	16.2%	49.8%	60.2%
2.1.1 Grocery Shops	59	4	56	37	28	74
2.1.2 Restaurants	2889	61	809	406	204	756
2.2.1 Shared Kitchen	No=0	Yes=1	Yes=1	No=0	Yes=1	Yes=1
2.2.2 Shared Office or Reading Space	No=0	Yes=1	Yes=1	No=0	No=0	Yes=1
2.2.3 Gym	Yes=1	Yes=1	Yes=1	Yes=1	No=0	No=0
2.3.1 Food Delivery Collection Facilities	Yes=1	Yes=1	Yes=1	No=0	No=0	No=0
2.3.2 Express Collection Facilities	Yes=1	Yes=1	Yes=1	No=0	Yes=1	Yes=1
3.1.1 Room Unit Size (average)	20.4m^2	20.1m^2	33.0m^2	20.5m^2	6.4m^2	8.8m^2
3.2.1 Separate Kitchen or Cooking Facilities	No=0	No=0	Yes=1	No=0	No=0	No=0
3.2.2 Separate Toilet	Yes=1	Yes=1	Yes=1	Yes=1	No=0	Yes=1
4.1.1 Proximity to Check Point	1km	6km	5.5km	3km	5.5km	12km
4.1.2 Proximity to Metro Station	250m	400m	150m	1100m	350m	700m
4.2.1 Proximity to Shopping Malls	350m	1000m	750m	1000m	100m	600m
4.2.2 Proximity to City Parks	1800m	1600m	1900m	550m	750m	950m

Table 4. Data of the 6 Rental-oriented Apartment in Hong Kong and Shenzhen

Case layouts are mapped through field observations, street maps and satellite maps. Case types and distribution are plotted in ArcMap with POIs provided by Amap and OpenStreetMap. The case types and distribution are plotted in ArcMap with POIs provided by Amap and OpenStreetMap (Figure 1). After the factor quantification, the AHP systems for various young professional groups are developed to evaluate the cases, which helped to find more desirable apartment or community typologies.

AHP Evaluation

To obtain more objective weightings, the study uses the users' average ranking ratings of the indicators, instead of the researchers' Delphi ratings in traditional AHP methods. The rating comparison method is indicated in Table 6. [X] is the upward integer of X. Rating (X) is the average rating from the questionnaire respondents (Table 5). Through this method, the AHP judgement matrices (Table 7) and the weights (Table 8) for all the samples are obtained.

Factor subcategory weights were multiplied by normalized dimension values of the factors in each case to obtain final score for each case (Table 9, Taking the full sample as an example). Similarly, final case ratings for different population groups were obtained (Table 10).

	Rating from Commuters									
Factors	Total	Gender		Commute Time				Commute Status		
		Female	Male	≤20min	20-40min	40-60min	≥60min	Commute in HK	SZ-HK Cross-border Commute	Commute in SZ
Close to Public Transport Systems or Borders	7.41	7.57	7.25	5.33	7.5	8.53	8.33	8.73	8.07	5.5
Good Ventilation and Daylight	7.38	6.69	7.79	7.47	8.33	7.12	6.67	6.68	7.36	8.15
Spacious Room	6.73	6.18	7.29	7.47	5.92	6.71	6.67	6.32	7.14	6.9
Quiet Environments (Indoor and Outdoor)	6.7	7.68	5.71	7.47	7.75	6.24	5.33	5.91	6.29	7.85
Separate Functions (Including Toilet and Cooking)	6.18	6.46	5.89	5.4	5.58	7.06	6.5	6.82	6.43	5.3
Close to Shopping Malls or City Parks	5.2	4.69	5.43	4.73	5.92	4.82	5.58	6	4.64	4.7
Adequate Community Greenery	4.71	4.21	5.21	4.87	5.08	5.12	3.58	5.05	3.71	5.05
Diverse Catering Services	4.05	3.32	4.79	4.6	3.67	3.65	4.33	4.18	3.86	4.05
Express and Delivery Facilities (Express and Food Delivery Lockers)	3.55	4.32	2.79	4.4	2.17	3.12	4.5	2.95	4	3.9
Shared Spaces (Including Reading Room, Kitchen and Gym)	3.09	3.32	2.86	3.27	3.08	2.65	3.5	2.36	3.5	3.6

Table 5. Rating of all Samples and Various Population Profiles

	Factor A.	Factor B.	Factor C.	...
Factor A.	1	⌈ Rating(A.)-Rating(B.)⌉+1	⌈ Rating(A.)-Rating(C.)⌉+1	...
Factor B.	$\frac{1}{\lceil \mathrm{Rating(A.)} - \mathrm{Rating(B.)} \rceil + 1}$	1	⌈ Rating(B.)-Rating(C.)⌉+1	...
Factor C.	$\frac{1}{\lceil \mathrm{Rating(A.)} - \mathrm{Rating(C.)} \rceil + 1}$	$\frac{1}{\lceil \mathrm{Rating(B.)} - \mathrm{Rating(C.)} \rceil + 1}$	1	...
...	...	...	...	...

Rating(A.) > Rating(B.) > Rating(C.)

Table 6. Calculation Method of Judgement Matrices

	Close to Public Transport Systems or Borders	Good Ventilation and Daylight	Spacious Room	Quiet Environments (Indoor and Outdoor)	Separate Functions (Including Toilet and Cooking)	Close to Shopping Malls or City Parks	Adequate Community Greenery	Diverse Catering Services	Express and Delivery Facilities (Express and Food Delivery Lockers)	Shared Spaces (Including Reading Room, Kitchen and Gym)
Close to Public Transport Systems or Borders	1	2	2	2	3	4	4	5	5	6
Good Ventilation and Daylight	1/2	1	2	2	3	4	4	5	5	6
Spacious Room	1/2	1/2	1	2	2	3	4	4	5	5
Quiet Environments (Indoor and Outdoor)	1/2	1/2	1/2	1	2	3	3	4	5	5
Separate Functions (Including Toilet and Cooking)	1/3	1/3	1/2	1/2	1	2	3	4	4	5
Close to Shopping Malls or City Parks	1/4	1/4	1/3	1/3	1/2	1	2	3	3	4
Adequate Community Greenery	1/4	1/4	1/4	1/3	1/3	1/2	1	2	3	3
Diverse Catering Services	1/5	1/5	1/4	1/4	1/4	1/3	1/2	1	2	2
Express and Delivery Facilities (Express and Food Delivery Lockers)	1/5	1/5	1/5	1/5	1/4	1/3	1/3	1/2	1	2
Shared Spaces (Including Reading Room, Kitchen and Gym)	1/6	1/6	1/5	1/5	1/5	1/4	1/3	1/2	1/2	1
SUM	3.90	5.40	7.23	8.82	12.53	18.42	22.17	29.00	33.50	39.00

Table 7. Judgement Matrices of All Samples

	Close to Public Transport Systems or Borders	Good Ventilation and Daylight	Spacious Room	Quiet Environments (Indoor and Outdoor)	Separate Functions (Including Toilet and Cooking)	Close to Shopping Malls or City Parks	Adequate Community Greenery	Diverse Catering Services	Express and Delivery Facilities (Express and Food Delivery Lockers)	Shared Spaces (Including Reading Room, Kitchen and Gym)	Weight(ω)
Close to Public Transport Systems or Borders	0.2564	0.3704	0.2765	0.2268	0.2394	0.2172	0.1805	0.1724	0.1493	0.1538	0.2243
Good Ventilation and Daylight	0.1282	0.1852	0.2765	0.2268	0.2394	0.2172	0.1805	0.1724	0.1493	0.1538	0.1929
Spacious Room	0.1282	0.0926	0.1382	0.2268	0.1596	0.1629	0.1805	0.1379	0.1493	0.1282	0.1504
Quiet Environments (Indoor and Outdoor)	0.1282	0.0926	0.0691	0.1134	0.1596	0.1629	0.1353	0.1379	0.1493	0.1282	0.1277
Separate Functions (Including Toilet and Cooking)	0.0855	0.0617	0.0691	0.0567	0.0798	0.1086	0.1353	0.1379	0.1194	0.1282	0.0982
Close to Shopping Malls or City Parks	0.0641	0.0463	0.0461	0.0378	0.0399	0.0543	0.0902	0.1034	0.0896	0.1026	0.0674
Adequate Community Greenery	0.0641	0.0463	0.0346	0.0378	0.0266	0.0271	0.0451	0.0690	0.0896	0.0769	0.0517
Diverse Catering Services	0.0513	0.0370	0.0346	0.0284	0.0199	0.0181	0.0226	0.0345	0.0597	0.0513	0.0357
Express and Delivery Facilities (Express and Food Delivery Lockers)	0.0513	0.0370	0.0276	0.0227	0.0199	0.0181	0.0150	0.0172	0.0299	0.0513	0.0290
Shared Spaces (Including Reading Room, Kitchen and Gym)	0.0427	0.0309	0.0276	0.0227	0.0160	0.0136	0.0150	0.0172	0.0149	0.0256	0.0226

Table 8. Weights of all Samples

Factors	Shengshi-Jiachuang		E-harbour		CJIA		AITE		Fanling Centre		Dai Nam Building		Weight(ω)	Approximate value required to score more than 0.5
1.1.1 Community Green Coverage	0.31		0.15		0.23		0.00		0.46		1.00			>20%
1.1.2 Community Park Area (including rooftop gardens)	0.86	0.74	0.29	0.22	0.90	0.57	0.00	0	1.00	0.73	0.93	0.97	0.0517	>100,000m²
1.2.1 Distance to Main Roads or Highways	0.20		0.36		0.60		0.00		0.36		1.00			>90m
1.2.2 Indoor Average Decibel Level	0.00	0.07	0.46	0.61	1.00	0.72	0.79	0.58	0.71	0.47	0.93	0.9	0.1277	<50dBA
1.2.3 Outdoor Average Decibel Level	0.00		1.00		0.56		0.94		0.33		0.78			<80dBA
1.3.1 Ground Coverage Ratio (GCR)	0.39		1.00		0.51		0.35		0.04		0.00			<30%
1.3.2 Passive Ventilation Design of Buildings	0.00	0.13	1.00	0.87	0.00	0.17	0.00	0.12	0.00	0.27	0.00	0.33	0.1929	If apartment footprint > 1200 m², Yes=1
1.3.3 Window-to-floor Ratio (average)	0.01		0.60		0.00		0.02		0.77		1.00			> 40%
2.1.1 Grocery Shops	0.93	0.97	0.00	0	0.91	0.79	0.77	0.63	0.67	0.50	1.00	0.83	0.0357	>25
2.1.2 Restaurants	1.00		0.00		0.67		0.49		0.32		0.65			>500
2.2.1 Shared Kitchen	0.00		1.00		1.00		0.00		1.00		1.00			Yes=1
2.2.2 Shared Office or Reading Space	0.00	0.33	1.00	1	1.00	1	0.00	0.33	0.00	0.33	1.00	0.67	0.0226	Yes=1
2.2.3 Gym	1.00		1.00		1.00		1.00		0.00		0.00			Yes=1
2.3.1 Food Delivery Collection Facilities	1.00	1	1.00	1	1.00	1	0.00	0	0.00	0.5	0.00	0.5	0.029	Yes=1
2.3.2 Express Collection Facilities	1.00		1.00		1.00		0.00		1.00		1.00			Yes=1
3.1.1 Room Unit Size (average)	0.53	0.53	0.52	0.52	1.00	1.00	0.53	0.53	0.00	0.00	0.09	0.09	0.1504	> 20m²
3.2.1 Separate Kitchen or Cooking Facilities	0.00	0.5	0.00	0.5	1.00	1	0.00	0.5	0.00	0	0.00	0.5	0.0982	Yes=1
3.2.2 Separate Toilet	1.00		1.00		1.00		1.00		0.00		1.00			Yes=1
4.1.1 Proximity to Check Point	1.00	0.95	0.55	0.65	0.59	0.8	0.82	0.41	0.59	0.69	0.00	0.21	0.2243	< 6km
4.1.2 Proximity to Metro Station	0.89		0.74		1.00		0.00		0.79		0.42			< 500m
4.2.1 Proximity to Shopping Malls	0.74	0.41	0.00	0.11	0.28	0.14	0.00	0.5	1.00	0.93	0.44	0.57	0.0674	< 500m
4.2.2 Proximity to City Parks	0.07		0.22		0.00		1.00		0.85		0.70			< 1000m
Rating	0.5129		0.5892		0.6715		0.3816		0.4071		0.4362			

Table 9. Final Case Scores from the Rating of all Samples

Factors	Weights									
	Total	Gender		Commute Time				Commute Status		
		Female	Male	≤20min	20-40min	40-60min	≥60min	Commute in HK	SZ-HK Cross-border Commute	Commute in SZ
Close to Public Transport Systems or Borders	0.22	0.21	0.17	0.07	0.17	0.28	0.27	0.30	0.25	0.09
Good Ventilation and Daylight	0.19	0.15	0.24	0.21	0.26	0.16	0.16	0.13	0.19	0.27
Spacious Room	0.15	0.10	0.19	0.21	0.09	0.12	0.16	0.11	0.16	0.15
Quiet Environments (Indoor and Outdoor)	0.13	0.24	0.08	0.21	0.20	0.10	0.06	0.08	0.10	0.21
Separate Functions (Including Toilet and Cooking)	0.10	0.12	0.10	0.08	0.07	0.14	0.12	0.15	0.12	0.08
Close to Shopping Malls or City Parks	0.07	0.06	0.07	0.05	0.09	0.05	0.09	0.09	0.05	0.05
Adequate Community Greenery	0.05	0.04	0.06	0.06	0.06	0.06	0.03	0.06	0.03	0.06
Diverse Catering Services	0.04	0.03	0.05	0.05	0.03	0.03	0.04	0.04	0.04	0.04
Express and Delivery Facilities (Express and Food Delivery Lockers)	0.03	0.04	0.02	0.04	0.02	0.03	0.05	0.02	0.04	0.03
Shared Spaces (Including Reading Room, Kitchen and Gym)	0.02	0.03	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.03

Table 10. Weights of all Population Groups

Cases		Shengshi-Jiachuang	E-harbour	CJIA	AITE	Fanling Centre	Dai Nam Building
Total		0.5129	0.5892	0.6715	0.3816	0.4071	0.4362
Gender	Female	0.482	0.6108	0.7112	0.4151	0.4281	0.5166
	Male	0.5005	0.5878	0.6579	0.372	0.3735	0.4237
Commute Time of One-way	≤20min	0.4198	0.5842	0.6736	0.3901	0.3456	0.4935
	20-40min	0.4323	0.6136	0.6047	0.3734	0.4439	0.5091
	40-60min	0.558	0.5833	0.6981	0.3761	0.4103	0.4224
	≥60min	0.5841	0.591	0.7077	0.3896	0.4182	0.3966
Commute Pattern	Commute in Hong Kong	0.5875	0.5522	0.6981	0.3951	0.4438	0.4289
	Cross-border Commute	0.5454	0.6141	0.71	0.3882	0.3891	0.4105
	Commute in Shenzhen	0.3984	0.6182	0.6319	0.3707	0.3689	0.5055

Table 11. Final Case Scores from the Perspectives of Various Population Profiles

5. Results

Attractive Apartment and Community Patterns among Various Young Professional Groups

According to Table 11, CJIA (0.6715) and E-harbour (0.5892) apartments are the most attractive among all samples, with high ratings of the cross-border and in-city commuters of Shenzhen. For respondents with commute time less than 20 minutes, Dai Nam Building was also rated highly (0.4935). Shengshi-Jiachuang Apartment is favoured by commuters with over 40 minutes' commute (40-60 min: 0.558, >60 min: 0.5841), for Hong Kong in-city commuters (0.5875) and cross-border commuters (0.5454).

Commuting Patterns of In-City and Cross-border Commuters of Hong Kong and Shenzhen

According to the questionnaire results, most young professionals prefer shorter commute times than their current commute time. Cross-border commuters have the longest commutes, with about half over 80 minutes. Hong Kong in-city commuters typically have a commute time of 30-60 minutes, while Shenzhen in-city commuters often live close to their workplaces (10-30 minutes). Metro is the major commute way for Hong Kong in-city commuters and cross-border commuters, while in Shenzhen, cycling has replaced half of the metro commute. The metro is replaced by bicycles in large ratio when the commute time is less than 20 minutes.

Most young professionals living in Hong Kong go across the border for shopping and entertainment. The reasons for crossing the border from Shenzhen to Hong Kong are more varied, with the majority commuting for education and work, and a small number of respondents (22.22 %) travelling to Hong Kong for shopping. Only 27.27% young professionals living in Hong Kong go to Shenzhen on a regular weekly basis. For education, frequency varies from 1-5 times weekly, while work-related travel is usually 5 times or more.

Highly Rated Community Patterns and Spatial Indicators to be Achieved

According to Table 9, factors scored more than 0.5 are regarded as highly scored for a community. Receiving a score of more than 0.5 can be interpreted as achieving an above average level. By comparing the value in the Table 4 and the scores that more than 0.5 in the Table 9, the approximate values required to obtain a score of 0.5 or higher were provided in the last column of the Table 9.

Spatial Preferences of Different Young Professional Groups for Housing Rental

i. Overall Characteristics

Respondents rated proximity to public transport or borders as the most important spatial factor (7.41) (Figure 10). Ventilation/daylight (7.38), room spaciousness (6.73), and environmental quietness (6.7) were also highly valued. Conversely, catering services (4.05), express/delivery facilities (3.55), and shared spaces (3.09) were deemed insignificant.

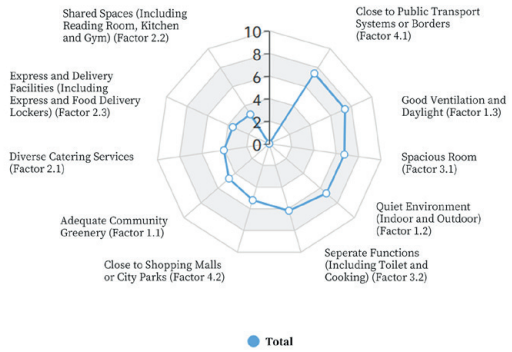

Figure 10. Spatial Factors and Average Rating by all Samples (by Author)

ii. Spatial Preference Patterns of Commute Time

The cross-tabulation analysis of different one-way commute times shows that the importance of proximity to public transport systems or checkpoints increases with commute time (Figure 11). Similarly, the importance of separate functions also rises with commute time, but it begins to decrease when the commute exceeds 60 minutes (Figure 11 and Figure 12).

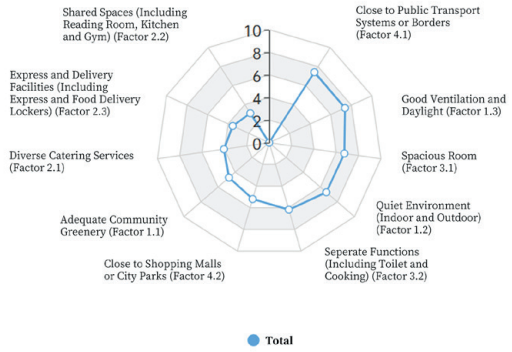

Figure 11. Spatial Factor Preferences Influenced by One-way Commute Time, by Author

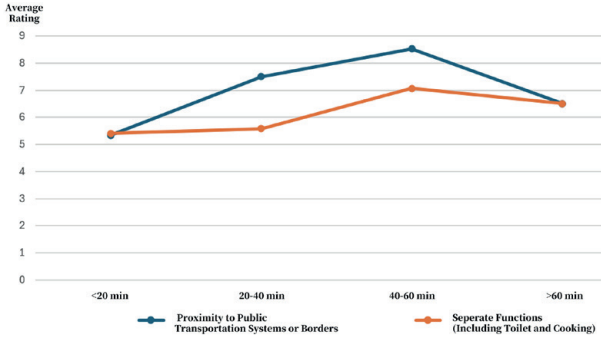

Figure 12. Commute Time Sensitive Factors: Proximity to Public Transportation Systems and Borders and Separate Functions (Including Toilet and Cooking), by Author

iii. Preference Patterns of Cross-border and Non-cross-border Commuters

The in-city commuters of Hong Kong and Shenzhen-Hong Kong cross-border commuters share similar spatial preference patterns (Figure 13). In contrast, Shenzhen in-city commuters value quietness (average rating: 7.85) and ventilation/daylight (8.15), while do not care much about proximity to public transport or checkpoints (5.5).

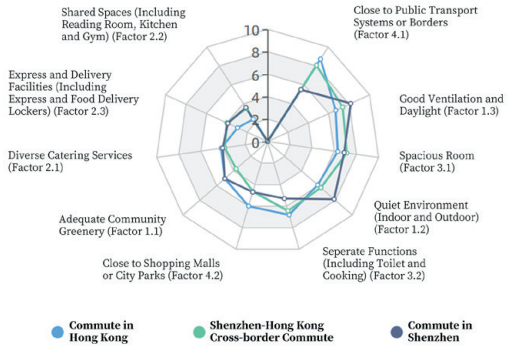

Figure 13. Spatial Factor Preferences Influences by Different Commute Patterns, by Author

6. Discussion

Impacts of Commute Patterns

Most Cross-border commuters and Hong Kong in-city commuters have longer commute time than Shenzhen in-city commuters, which makes the proximity to metro stations or check points the most important consideration (Figure 13). Young professionals can easily find cheaper apartments in Shenzhen, which may result from the even distribution and large supply of rental-orientated housing (Figure 1). In Shenzhen, young professionals tend to live near their workplaces, which increases bicycle use and reduces concerns for transportation factors (Figure 11, Figure 12 and Figure 13).

Compared to Shenzhen in-city commuters, the other two groups value separate toilets and kitchens more (Figure 13). Many Hong Kong rental units are converted from private housing, leading to shared kitchens and toilets even after subdivision (Figure 6 and Figure 7). In contrast, Shenzhen's rental housing, often converted from storage/office buildings or newly built, allows for more space and flexible subdivision with separate functions (Figure 2, 3 and 4). As apartments with separate functions are common in Shenzhen, young professionals there do not think it is a core consideration.

Shenzhen in-city commuters prioritise good ventilation and daylight (Figure 13). This may also result from the original layouts of certain buildings. The old storage or office buildings provide more spaces for subdivision, but these also create living units without external windows or facing a dark patio. In addition, in Shenzhen, many apartment buildings converted from village houses, such as AITE Apartment (Figure 5) and Shui Wai Lemon Apartment (Zhou & Yau, 2023), often have insufficient spacing between them and neighbouring buildings, leading to poor ventilation and daylight. This makes ventilation and daylight a common problem in Shenzhen. In Hong Kong, rental-orientated dwellings are often directly subdivided from private dwellings with better window-to-ground ratios (Table 4), ensuring better ventilation and daylight. These differences make young professionals commuting in Shenzhen pay more attention to ventilation and daylight.

Apartment and Community Preferences among Various Young Professional Groups

i. Apartment and Community Patterns among all Respondents

According to Table 11, CJIA apartment has the highest score among most population profiles, including commuters with over 40 minutes one-way commute, cross-border and Hong Kong in-city commuters.

E-harbour Apartment scores higher than CJIA Apartment in ventilation and light environment indicators, including window-to-floor ratio, passive ventilation design and ground coverage ratio (Table 9). Planned in an office area, the service point density of E-harbour Apartment within the community is much lower than converted apartments close to residential areas or those directly converted from private housing, such as CJIA Apartment, Shengshi-Jiachuang

Apartment (Figure 9) and Dai Nam Building Apartment.

Despite lower scores in ventilation and daylight from its large scale and insufficient window-to-floor ratio, CJIA Apartment is still scored the highest among all respondents (Table 9 and Table 11). Its location near residential areas means higher density of catering, grocery services and community parks. Besides, it is close to the metro station and checkpoints.

The discussion above indicates that it is not a good solution to completely separate the residential and office areas and to plan the professional apartments within the office area. Young professionals in office zones are often not able to provide a high demand for services due to low residential density, which results in a relatively low density, diversity and distribution of services in office zones (Table 4 and 9), while normal residential areas with abundant and dense services can complement this.

ii. Apartment and Community Preferences among Different Commute Patterns

According to Table 11, E-harbour apartment was scored the highest among young professionals commuting in Shenzhen or across the border, while the CJIA was scored the highest among professionals commuting in Hong Kong. The difference is also mainly due to the proximity to transportation system and quietness in communities (Table 9).

iii. Unattractive Apartment and Community Patterns

The AITE Apartment is not attractive for most groups (Table 11, 0.3816 among all respondents). The reasons include lack of separate kitchen and toilet functions, insufficient shared space and poor ventilation, long distance from metro stations, and lack of community greenery (Table 9). These problems indicate that Shenzhen's urban village patterns are usually insufficiently ventilated and lack of greenery. This low-rise, high-density, lack of amenities and poor proximity model is unattractive to most young professionals.

iV. Discussion Based on Commuting Characteristics of Young Professional Profiles

According to the questionnaire results, as ideal commute time for young professionals of all commuting patterns is smaller than their actual commute time, their commute time should be minimised. Since some metro commutes are replaced by bicycle commutes when commuting distances are shorter, bicycle-friendly design should be considered when young apartments and their workplaces are planned in the same community or 15-min walking isochrone.

Apartment and Community Planning for Young Professionals

According to Table 5, in each group, factors rated above 6 or more than 1 point higher than their counterparts were regarded to be more important for that group and need higher quality. Based on this and the discussion of young professional profiles, we can conclude the design principles for each group. As there is a significant overlapping between Shenzhen in-city

commuters and commuters of 0-30 minutes, Hong Kong in-city commuters and commuters of 30-60 minutes, and cross-border commuters and commuters commuting more than 60 minutes (Figure 11 and 13), the design principles for different commute times are omitted here.

i. Hong Kong In-city Commuters

1. Community Environment:

(1) Ground coverage ratio should be below 30%.

(2) When the footprint of an apartment building is more than 1200m2, passive ventilation layouts such as large ventilation atria are required.

(3) Green coverage should be over 20%.

(4) Parks within 15-min walking isochrone are over 100,000m2.

2. Community Facilities:

(1) Integrate communities of young professionals, office areas, and normal residential areas to share service points like catering, grocery, and entertainment.

(2) Ideally, over 500 restaurants and 25 grocery shops should be within the 15-min walking isochrone.

(3) Provide bicycle-friendly facilities such as cycling lanes and shared bicycle parking lots.

3. Apartment Features:

(1) Provide separate toilet and cooking function in each living unit.

(2) Living units are preferably larger than 20 m^2.

(3) Window-to-floor ratios of living units are preferably over 40 %.

4. Proximity:

(1) Apartments should be within 500m from metro stations.

(2) Workplaces are preferably located within the 15-min walking isochrone.

(3) Shopping centres are required within 500m.

(4) City parks over 100,000m2 should be within 1000m of apartments.

ii. Cross-border Commuters

1. Community Environment:

(1) Ground coverage ratio should be below 30%.

(2) When the footprint of an apartment building is more than 1200m2, passive ventilation layouts such as large ventilation atria are required.

(3) Apartments should be located more than 90m from main roads and highways.

(4) Apartments should be away from other noise sources such as railways and markets.

2. Community Facilities:

(1) Provide express and food delivery lockers in apartments.

(2) Provide shared spaces, including reading room, gym, sport fields and kitchen.

3. Apartment Features:

(1) Provide separate toilet and cooking function.

(2) Living units are preferably larger than 20 m².

(3) Window-to-floor ratios of living units are preferably over 40 %.

(4) Living units need to be well soundproofed, indoor acoustic environment should be below 50 decibels, and the outdoor environment should be below 80 decibels.

4. Proximity:

(1) Apartments should be within 500m from metro stations.

(2) Communities should be within 6km from check points.

iii. Shenzhen In-city Commuters

1. Community Environment:

(1) Ground coverage ratio should be below 30%.

(2) When the footprint of an apartment building is more than 1200m2, passive ventilation layouts such as large ventilation atria are required.

(3) Apartments should be located more than 90m from main roads and highways.

(4) Apartments should be away from other noise sources such as railways and markets.

(5) Green coverage should be over 20%.

(6) Parks within 15-min walking isochrone are over 100,000m2.

2. Community Facilities:

(1) Provide shared spaces, including reading room, gym and kitchen.

(2) Provide bicycle-friendly facilities such as cycling lanes and shared bicycle parking lots.

(3) Integrate communities of young professionals, office areas, and normal residential areas to share service points like catering, grocery, and entertainment.

3. Apartment Features:

(1) Provide separate toilet and cooking function.

(2) Living units are preferably larger than 20 m².

(3) Window-to-floor ratios of living units are preferably over 40 %.

(4) Living units need to be well soundproofed, indoor acoustic environment

should be below 50 decibels, and the outdoor environment should be below 80 decibels.

4. Proximity:

(1) Apartments should be within 500m from metro stations.

(2) Workplaces should be in the 15-min walking isochrone.

7. Conclusions

This study has adopted the Analytical Hierarchy Process (AHP), encompassing community environment, facilities, apartment features, and proximity within 15-minute isochrones, to evaluate six apartment cases and their communities in Hong Kong and Shenzhen. The preferences of young professional profiles were compared based on cross-tabulation analysis. The findings illustrated that the proximity to metro stations and checkpoints should be taken into consideration.

The study also analysed the commute patterns of Shenzhen-Hong Kong cross-border commuters and in-city commuters of Shenzhen and Hong Kong. It was discovered that the distance from apartments to workplaces could be significantly reduced for most in-city commuters, with cycling-friendly designs to facilitate bicycle commuting. For cross-border commuters, metro lines remain the optimal choice.

The proposed design principles can guide future youth community projects, ensuring that location selection, layout, and facility arrangement are better adapted to the actual needs. It will also help enhance the attractiveness of both Hong Kong and Shenzhen to young professionals and mitigate the youth outflow trend of Hong Kong.

Notes

1. Professional rental housing is provided to highly educated and skilled professionals by Shenzhen government (Jin et al. 2023). After the companies apply to the government, these professionals can rent the units at about 60% of the market rent (Gong and MacLachlan 2020; Jin et al. 2023).

2. Progressive private renting refers to a strategy adopted by migrants who frequently change their residence in the private rental sector (Jin et al. 2023). These migrants usually own properties in peripheral cities of their workplaces or in their hometown, so they only rent housing in better conditions rather than owning properties (Jin et al. 2023).

3. Community parks here refer to small parks under 100,000 square metres, including playgrounds, pocket parks, and street-side strip parks, mainly offering community recreational and sports facilities.

4. City parks here refer to large parks over 100,000 square metres, such as country, forest, and comprehensive parks, serving all citizens.

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